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**Did a Successful Fight against
COVID-19 Come at a Cost? Impacts
of the Pandemic on Employment
Outcomes in Vietnam**

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Keyword: COVID-19, employment, wage inequality, differences-in-differences, RDD, Vietnam

JEL Classification: E24, I30, J21, O12

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1. Introduction

The ongoing COVID-19 pandemic has wreaked havoc on rich and poor economies across the globe. Yet, despite its modest status as a low middle-income country, Vietnam has received strong praise for its early fight against the pandemic, which outperformed richer countries with far more developed medical systems. In particular, the country's strict lockdown measures such as banning all commercial flights into and out of the country, rigorous quarantines, social distancing, and staying-at-home orders were regarded as effective and were well supported by the public. As a result, while most other countries were still grappling with the outbreak, Vietnam mostly had it under good control when the pandemic first occurred in 2020. Tracking data from John Hopkins University suggest that by the end of this year, the country registered an extremely low fatality rate of 78 deaths, which compares favorably with its population size of slightly more than 96 million.¹

But did this success come at a cost to Vietnam's labor force? How did the COVID-19 pandemic affect the country's employment outcomes? Which population subgroups and which sectors were most impacted? We seek answers to these questions since they offer relevant evidence to policy makers, who are eager to capitalize on the country's preliminary medical success to speed up economic growth.

Using the difference-in-differences (DID) econometric model and rich data from the Labor Force Surveys (LFSs), we find that the unemployment and temporary layoff rates increased after the pandemic outbreak in late March 2020. The quality of employment, as measured by wage jobs, jobs with contract, and formal jobs, was also reduced. Compared to the first quarter of 2020, workers' monthly wages decreased by 11% in the second quarter,

¹ The numbers of Covid-19 infection cases and deaths have increased for Vietnam in 2021 because of the delta variant, as did other countries around the world. But we focus our analysis on the outbreak immediate impacts in 2020 when survey data are available.

7.2% in the third quarter, and 8.2% in the fourth quarter. Informal household workers and FDI sector workers were more affected than public sector workers, and workers in the transportation and tourism sectors were most heavily affected. More worrisomely, the proportion of workers working below the minimum wages increased by 32%, strongly fueling wage inequality growth. Further analysis using the regression discontinuity design (RDD) model that exploits the rich monthly LFS data points to the national lockdown in April 2020 as the main channel of pandemic impacts.

Our study makes several new contributions. First, we add to the small, but growing literature on the pandemic impacts on labor outcomes in a poorer country setting. Although a large number of studies generally find negative pandemic effects on employment in high income countries (e.g., Adams-Prassl *et al.* 2020; Béland *et al.*, 2020; Coibion *et al.*, 2020; Gupta *et al.*, 2020; Albanesi and Kim, 2021; Dang and Nguyen, 2021), far fewer studies have been rigorously conducted for poorer countries. Even fewer studies offer a countrywide comparison of before-and-after pandemic impacts, perhaps owing to a lack of nationally representative survey data that span (waves of) the pandemic outbreak.²

The few existing studies find negative pandemic impacts. Examining the effects of the pandemic on the gender gaps in India during April-August 2020, Deshpande (2020) found women to have higher unemployment levels than men after the first wave of the outbreak, and incomes in rural sector to decline more for both genders. Jain *et al.* (2020) observed a 40% decline in active employment after one month of intensive lockdown in South Africa, with half of this comprising job terminations.³ Analyzing 16 household surveys from nine

² See also Bloom *et al.* (2020) and Brodeur *et al.* (2021) for recent review studies on the impacts of the pandemic.

³ A few other studies restrict analysis to certain population subgroups or simulation for possible pandemic effects. For example, analyzing a survey of worker in low-income areas of urban India, Dhingra and Machin (2020) find that about a quarter of workers lost their job, 9 percent more were not working any hours, and

countries in Africa, Asia, and Latin America (Colombia), Egger *et al.* (2021) estimate that the median share of all households that suffer decline in employment beginning March 2020 is 30%. Using high frequency phone survey data in the labor market in 39 countries, Khamis *et al.* (2021) also document that work stoppage was common, averaging 34% across countries.

Second, to our knowledge, hardly any existing studies analyze a wide range of employment indicators as we do in this paper. Specifically, we look at unemployment, temporary layoffs, labor market participation, employment with labor contract and social insurance, working hours, and monthly wages. We also examine the pandemic effects on the proportion of below-minimum wage workers and provide new analysis on wage inequality. While protecting low-wage workers with minimum wages is among the key labor policies in most countries, barely any evidence currently exists on pandemic effects on wage inequality in poorer countries.

Finally, by leveraging large-scale LFS data spanning the past six years, from 2015 to 2020 with district-level minimum wage data that we manually compile, we are able to estimate heterogeneous effects of the pandemic on different population subgroups such as gender, age, education levels, and below-minimum wage workers. We can also examine disaggregated effects for employment industries and wage quintiles and can further map out the effects geographically for different provinces across the country. While these granular details on the pandemic heterogeneous impacts provide useful inputs for policies, they are not offered in previous studies.

This paper consists of six sections. We describe the data and country background in the next section (Section 2.1 and 2.2) before discussing the estimation method in Section 3. We

earnings fell by 85 percent under lockdown. Dang, Lanjouw, and Vrijburg (2021) offer projections on the pandemic effects on employment outcomes in India based on pre-pandemic trends.

subsequently test in Section 4 the assumptions underlying our analytical method (Section 4.1) and provide the estimation results (Section 4.2) and various robustness checks and heterogeneity analysis (Section 4.3). We offer further analysis on low-wage workers and wage inequality in Section 5 and finally conclude in Section 6.

2. Data and country background

2.1. Data description

We analyze data from the most recent Labor Force Surveys (LFSs) between 2015 and 2020, which are the official source of labor statistics and conducted annually by the General Statistics Office (GSO) of Vietnam. The LFSs use a two-stage stratified cluster design and has 126 strata comprising of urban and rural areas in 63 provinces throughout the country.⁴ The LFSs are nationally representative on a quarterly basis and at the urban/ rural and provincial levels. The sample size is equally allocated throughout the year, with around one-twelfth of the sampled households being surveyed each month. Besides collecting basic individual demographic information, the LFSs collect detailed data on employment and wages for people age 15 and older as well as data on unemployment for unemployed people. Our estimation sample sizes range between 600,000 to more than 620,000 observations for each year in the period 2015-2020.

Minimum wages are adjusted annually and represent an important labor policy issue in Vietnam.⁵ As such, we manually collect minimum wage data for all the districts (i.e., around

⁴ At the first-level administrative division, Vietnam consists of 58 provinces and 5 central-level cities or municipalities. A province is divided into districts, and a district is further divided into communes or wards. In 2018, there were around 700 districts and 11 thousand communes.

⁵ Minimum wages have been classified into four regions (categories) since 2008. Vietnam has 63 provinces covering 713 districts, and these districts are classified into these four categories of minimum wages. The minimum wage levels and the list of districts in each minimum wage categories are adjusted and issued in annual government decrees (Government of Vietnam, 2014-2019).

700 districts) from 2015 to 2020 from the Government of Vietnam’s annual Decrees on minimum wages and merge these data with the LFS data. These combined data allow us to compute the proportion of workers receiving wages below the minimum wages in their residence district. The nominal minimum wages have been raised annually, with year-on-year increases of 15% in 2014, 12% in 2016 and 6% in 2020 (see Figure A.2, Appendix A).

We examine the impacts of the COVID-19 pandemic on a wide range of employment outcomes including unemployment, temporary layoff, and (whether workers have) a wage job, a job with a contract, a formal job (i.e., with social insurance), the number of working hours during the last seven days, monthly wages, and wages below the minimum wages. Table 1 presents the summary statistics of the outcome variables for the 2015-2020 period. The country’s unemployment rate is low and hovers around 2% in recent years, possibly because of a large number of people working in the informal sector and the agricultural sector (Demombynes and Testaverde, 2018).⁶ The proportion of workers with a wage job increases from 39.5% in 2015 to 48.4% in 2020. In 2020, wage workers with contracts account for 30% of the workforce, while wage workers with a formal job (defined as a job with social insurance) account for 26.7%. In this study, we define workers as having a formal job if they contribute to social insurance (together with the employers) through their wage.⁷ We discuss the dynamics of these employment outcomes in the next section.

2.2. Country background

⁶ Following the International Labor Organization (ILO), Vietnam defines an employed person as a person aged 15 or older who has worked (for pay or profit) for at least one hour during a given week or who has a job but currently is not working for a cause (such as on holidays, sick leave, or maternity leave).

⁷ In Vietnam, workers with social insurance are considered as working in the formal sector. Without social insurance, workers do not receive benefits (or pensions) when they are unemployed (or retired). We deflate wages in all the years to the prices in December 2020 using monthly CPIs obtained from the GSO.

Vietnam offers an interesting case study. The country has been widely praised for its success with containing two waves of COVID-19 in 2020 (Huynh, 2020; Trevisan *et al.*, 2020; Hartley *et al.*, 2021). The first wave of COVID-19 started in late March 2020 with around 10 infection cases detected a day (MoH, 2020). Despite the low case number, Vietnam closed its international borders from 22 March 2020 and imposed a strict nationwide lockdown in April 2020.⁸ The country implemented a nationwide lockdown in all its 63 provinces, of which 27 provinces applied a 15-day lockdown and the remaining provinces applied a lockdown of 20 to 30 days. The lockdowns were successful, resulting in no new cases by April 2020 and the subsequent resumption of all economic activities. Yet, after three months of no community transmission, the pandemic's second wave began in Da Nang—a major city in central Vietnam (Djalante *et al.*, 2020). A second lockdown was implemented in Da Nang city and social distancing was applied in several neighboring provinces, which successfully contained the pandemic after two months. However, the strong lockdown measures against the pandemic were costly for the economy. Consequently, the government has been pursuing the dual target of containing the pandemic and maintaining economic growth.

Figure 1 plots the average employment outcomes by quarters during the 2015-2020 period, which generally suggest negative trends after the pandemic occurred in March 2020. Indeed, the unemployment rate in Quarter 1, 2020 was lower than those in the corresponding quarters in previous years, but it was higher than those in previous years for the other quarters.⁹ The temporary layoff rate sharply increased 30-fold to 3.1% in Quarter 2 (from an

⁸ According to Directive No. 15/CT-TTg dated March 27, 2020, social isolation was implemented within 15 days from April 1, 2020 nationwide on the principles that families are isolated from families, villages are isolated from villages, communes are isolated from communes, districts are isolated from districts, and provinces are isolated from provinces.

⁹ These differences are statistically significant at the conventional levels. There is a season trend in employment in Vietnam. Within the same year, the first quarter has a higher unemployment rate than other quarters. To save

average of less than 0.1% in previous years) before decreasing to 0.3% in Quarter 3 of the same year. Yet, the average number of working hours during the last seven days remains around 41 hours in 2020 and similar to those in the previous years.

While average monthly wages tend to be higher in the first quarters because of pay bonus for the new-year holiday, the average wages in the second to fourth quarters of 2020 were lower than those of 2019. The proportion of workers working below minimum wages in the second and the fourth quarters was substantially higher in 2020 than in previous years, despite a lower figure in Quarter 1. These numbers are consistent with the summary statistics shown earlier, possibly indicating adverse pandemic impacts on low wage workers. Indeed, while the proportion of workers below the minimum wages tends to decrease in recent years, it increases by more than half, from 4.6% in 2019 to 7.3% in 2020 (Table 1).

3. Estimation method

Since the COVID-19 pandemic occurred in late March 2020 and Vietnam subsequently imposed the first national lockdown in April 2020, any pandemic(-induced) negative effects on employment and incomes would have occurred starting from Quarter 2 in 2020.¹⁰ We estimate the pandemic effects on employment outcomes in Vietnam, using a difference-in-differences (DID) econometric model that compares the differences in outcomes between Quarter 1 and other quarters in 2020 with those averaged over the preceding five years.

space, we plot the proportions of workers having a job with a labor contract and a formal job in Figure A.1 in Appendix A, which show decreases in quarters 2 to 4 for 2020.

¹⁰ The second lockdown implemented in some central provinces July 2020 would further strengthen these negative effects.

Specifically, the observed difference in individuals' employment outcomes between Quarter 1 and Quarter 2 of 2020 can be expressed as the sum total of the pandemic effects and the seasonal (time) effects as follows¹¹

$$\Delta Y = E(Y_{Q2}^{2020}) - E(Y_{Q1}^{2020}) = \Delta Y_{Covid}^{2020} + \Delta Y_{Time}^{2020} \quad (1)$$

where $E(Y_{Q1}^{2020})$ and $E(Y_{Q2}^{2020})$ are respectively the expected outcomes of individuals in the first and second quarters in 2020, and ΔY_{Covid}^{2020} and ΔY_{Time}^{2020} are respectively the COVID-19 effects and seasonal effects. We cannot observe these effects separately. But assuming that the seasonal effects in 2020 are similar to those in previous years, we can use the latter to substitute for the former. More specifically, we assume

$$\Delta Y_{Time}^{2020} = E(Y_{Q2}^{2015-2019}) - E(Y_{Q1}^{2015-2019}) \quad (2)$$

where $E(Y_{Q1}^{2015-2019})$ and $E(Y_{Q2}^{2015-2019})$ are the expected outcomes of the first and second quarters averaged over the past five years from 2015 to 2019. In these years, there were no economic shocks between the first and second quarters; consequently, the averaged differences in the employment outcomes over this period can capture the seasonal effects. Averaging the pre-pandemic outcomes over five preceding years also helps remove fluctuations and provide better comparison, but for robustness checks we present estimates using any single year in these five years.

Substitute (2) into (1), we obtain

$$E(Y_{Q2}^{2020}) - E(Y_{Q1}^{2020}) = \Delta Y_{Covid}^{2020} + E(Y_{Q2}^{2015-2019}) - E(Y_{Q1}^{2015-2019}) \quad (3)$$

and after rearranging the terms, we obtain

$$\Delta Y_{Covid}^{2020} = [E(Y_{Q2}^{2020}) - E(Y_{Q1}^{2020})] - [E(Y_{Q2}^{2015-2019}) - E(Y_{Q1}^{2015-2019})] \quad (4)$$

¹¹ We suppress the individual notation in the subsequent equations to make notation less cluttered.

Equation (4) is a DID estimator, in which the first outcome differences are between the second quarters and the first quarters (i.e., comparing the terms inside the square brackets), and the second outcome differences are between 2020 and the preceding five years, 2015-2019 (i.e., comparing the two square brackets).

More generally, we can extend Equation (4) to examine the pandemic impacts in the other quarters

$$\Delta Y_{Covid}^{2020} = [E(Y_{Qj}^{2020}) - E(Y_{Q1}^{2020})] - [E(Y_{Qj}^{2015-2019}) - E(Y_{Q1}^{2015-2019})] \quad (5)$$

where j indicates the quarter of the year, $j= 2, 3$, or 4 .

Pooling all the quarters together, we obtain the estimating regression for Equation (5)

$$y = \beta_0 + \beta_1(PY.Q_2) + \beta_2(PY.Q_3) + \beta_3(PY.Q_4) + \\ + \beta_4 Q_2 + \beta_5 Q_3 + \beta_6 Q_4 + \beta_7 LY + B'X + \sigma_d + \tau_t + \varepsilon_{dt} \quad (6)$$

where y is an employment outcome for individuals. PY is a dummy variable indicating year 2020, the year of the pandemic. Q_2 , Q_3 , and Q_4 are the dummy variables corresponding to Quarter 2, Quarter 3 and Quarter 4, with Quarter 1 being the reference quarter. The pandemic effects on employment outcomes in these quarters are measured by β_1 , β_2 and β_3 , the coefficients of the interaction terms between PY and Q_2 , Q_3 and Q_4 . X are the (matrix of) control variables including age, gender, and education, and ε is the error term. We also include in Equation (6) the district fixed effects (σ_d) and the year fixed effects (τ_t) to control for unobserved factors that occur in the same district or the same year. The summary statistics of the control variables are presented for each year in Table A.1 in Appendix A.

As discussed earlier, a useful feature of the LFSs is that the data are collected monthly, so we can estimate the immediate pandemic impacts on employment outcomes on a monthly basis. These monthly impacts start from April 2020 and are estimated in comparison to

Quarter 1, 2020. Specifically, we can replace the dummy variables for Quarters 2 to 4 in Equation (5) with the dummy variables indicating the months

$$\Delta Y_{Covid}^{2020} = [E(Y_{Mk}^{2020}) - E(Y_{Q1}^{2020})] - [E(Y_{Mk}^{2017-2019}) - E(Y_{Q1}^{2017-2019})] \quad (7)$$

where k indicates the month of the year, $k = 4, 5, \dots, 12$. Similar to Equation (6), we can estimate Equation (7) with the following DID regression

$$y = \alpha + \sum_{k=4}^{12} \theta_k PY.M_k + \sum_{k=4}^{12} \gamma_k M_k + \phi LY + \Lambda' X + \mu_d + \rho_t + v_{dt} \quad (8)$$

where θ_k are the coefficients of interest.

For more analysis into the mechanism underlying the pandemic effects, we also estimate the local effects that are caused by the pandemic-induced lockdown using the alternative (sharp) regression discontinuity design (RDD) model.¹² We use the lockdown date of April 2020 as the cutoff, and we use a bandwidth of 9 months around this cutoff (i.e., July 2019 to March 2020 on the left and April 2020 to December 2020 on the right). Put differently, we consider month as the conditioning (assignment) variable. We estimate the following equation

$$y = \delta_0 + \delta_1 LM + \delta_2 Month + \delta_3 Month.LM + \Delta' X + \zeta_d + \phi_t + \xi_{dt} \quad (9)$$

where $Month$ equals 0 for April 2020 and ranges from -9 (July 2019) to 8 (December 2020). The treatment variable is the national lockdown, which equals 1 for the months starting from April 2020 and 0 otherwise (i.e., LM equals 1 if $Month \geq 0$, and 0 otherwise). The local effects of the April 2020 lockdown is estimated by δ_1 .

One potential issue with Equation (9) is that it can capture not only the lockdown effects but also the seasonal effects in 2020. To examine the seasonal effects, we can estimate the same model in Equation (9) using data before 2020 (i.e., the 2015-2019 period), which can serve as the placebo test for the RDD model. If seasonal effects exist, we can combine a DID

¹² See, e.g., Lee and Lemieux (2010) and Cattaneo *et al.* (2019) for more detail treatment of the RDD method.

estimation strategy with the RDD model in Equation (9) for more robust analysis. A similar approach has, for example, been used by Dustmann and Schönberg (2012) and Carneiro *et al.* (2015) to evaluate the impacts of policy reforms on maternal leave benefits on children's long-term outcomes in Germany and Norway.

Specifically, we estimate the following RDD-DID regression

$$y = \lambda_0 + \lambda_1 LM.COVID + \lambda_2 Month.COVID + \lambda_3 Month + \lambda_4 Month.LM.COVID + \lambda_5 LM + \lambda_6 Month.LM + \lambda_7 COVID + \Gamma'X + \Theta'X.COVID + o_d + \varrho_t + \epsilon_{dt} \quad (10)$$

where COVID is a dummy variable that equals 1 for the period July 2019-December 2020, and 0 for the months before July 2019. The coefficient of interest is λ_1 .

4. Empirical results

4.1. Testing assumptions

Our DID estimation strategy relies on two key assumptions. The first assumption is that employment outcomes in Vietnam were not affected by the pandemic in Quarter 1 of 2020 (such that this quarter can represent the reference quarter in Equation (5)). This is a reasonable assumption, since the pandemic occurred in late March 2020 (and lockdown measures occurred after that). Indeed, plotting the employment outcomes on a quarterly basis for the period 2015-2020, Figure 1 shows that, compared to Quarter 1 in the preceding years, Quarter 1 of 2020 generally has a lower unemployment rate, higher proportions of wage jobs and of workers with labor contracts and social insurance, a higher number of working hours, a higher average wage, and a lower proportion of below-minimum wages workers. The only exception is the temporary layoff rate, but this rate is very low at less than 0.1% for all the first quarters.

To formally test this assumption, we compare changes in the employment outcomes between Quarter 4 of 2019 and Quarter 1 of 2020 with similar changes between the corresponding quarters of the preceding years. We restrict the sample to the first and fourth quarters, and construct a dummy variable (denoted by Year 2019-2020 in Table 2) which equals 1 for the fourth quarter of 2019 and the first quarter of 2020, and 0 otherwise. We regress the employment outcomes on this variable, a dummy variable for the first quarters, the interaction term between these two variables, and other control variables. The interaction term represents the pandemic effects in the first quarter of 2020 and follows the same DID strategy as in Equation (6). The regression results, reported in Table 2, indicate that the lockdown has statistically insignificant effects in Quarter 1 of 2020.

The second assumption is the standard “parallel trend” assumption for the DID model, which requires that in the absence of the pandemic, the changes in outcomes between Quarter 1 and the other quarters of 2020 are similar to the corresponding changes between Quarter 1 and the other quarters of the preceding years. To visually examine this assumption, we plot in Figure 2 the employment outcomes of Quarter 1 against those for the remaining three quarters over the six years. If the parallel trend assumption is satisfied, we should see parallel lines that represent the outcomes in the pre-pandemic years. Indeed, Figure 2 shows that the lines are roughly parallel during 2015-2019, but either cross-cut each other (Panel A, B, C, and F respectively for unemployment, temporary layoff, and the proportions of workers having a wage job or working below the minimum wages) or diverge (Panel E, monthly wages) in 2020. These results support the parallel trend assumption.

4.2. Estimated pandemic impacts

Table 3 reports the DID regressions of employment outcomes using the LFS data from 2015 to 2020 (using Equation (6)). Except for working hours, the interaction terms between the pandemic year (*PY*) and Quarters 2 to 4 are statistically significant in all the regressions, which suggests pandemic negative effects on employment outcomes for Quarters 2 to 4 of 2020. The estimated impact magnitudes are largely similar.

Specifically, the unemployment rate increased by nearly 1 percentage point in Quarters 2 to 4 (of 2020) (Column 1). While the absolute magnitudes appear small, compared with the pre-pandemic average unemployment rates of around 2% (Table 1), this increase in the unemployment rate is equivalent to a 50% increase. This figure is higher than the 34% average increase across 39 countries observed by Khamis *et al.* (2021). The pandemic also had large effects on the temporary layoff rate, raising it by 3 percentage points in Quarter 2 (Column 2). But the impacts tapered off to 0.3 and 0.04 percentage points respectively in Quarters 3 and 4. The effects on the number of working hours were, however, statistically insignificant (Column 6). Thus for people who did not lose their job, their working hours appeared unaffected by the pandemic.

The pandemic affected not only the employment rate but also the quality of employment, reducing the probability of having a wage job by roughly 1.5 percentage points (Column 3) and the probabilities of having a job with a labor contract or of having a formal job by around 1 percentage point (Columns 4 and 5) in Quarters 2 to 4. These decreases roughly translate into reductions of 3 or 4% compared to the mean values in 2019. The pandemic lowered the monthly wages by 11% in Quarter 2, 7.2% in Quarter 3, and 8.2% in Quarter 4 (Column 7). More worrisomely, the pandemic witnessed the proportion of workers below the minimum wages increasing by 5.5 percentage points in Quarter 2, 2.8 percentage points in Quarter 3,

and 10 percentage points in Quarter 3 (Column 8). These are roughly equivalent to relative increases of 61% to 217% compared to the means in 2019.

Further analysis of potential mechanism

To zoom in on the pandemic effects, we first estimate the monthly effects (θ_k s in Equation (8), with the full regression results presented in Appendix A, Table A.2) and plot in Figure 3 the θ_k s from April to December of 2020. Figure 3 shows that the negative effects on unemployment were largest in April and May, 2020 and these effects declined in the subsequent months. A similar result holds for the temporary layoff rate, the probability of having a wage job, monthly wages, and the number of working hours (but mostly in April 2020). In contrast, the proportion of workers receiving wages below the minimum wages was higher in April and May, 2020.¹³

The COVID-19 pandemic might impact the labor market through two main channels, government-imposed lockdowns and fear of the virus, which leads to individuals voluntarily reducing their economic activities and subsequently the labor market slowdown (Aum *et al.*, 2021; Goolsbee and Syverson, 2021). For Vietnam, the stronger impacts in the few months immediately after the national lockdown provide supportive evidence for the first channel. In addition, the negative effects only occurred in April 2020 but not in Quarter 1 of 2020 (Table 2).

To further examine this hypothesis, we take advantage of the rich LFS monthly data to estimate the local effects of the national lockdown in Vietnam using the RDD model. In

¹³ Since the LFSs do not collect data separately on regular wages, bonus or overtime payment, monthly wages include these items. The sudden large effect on monthly wages in December 2020 might result from a decrease in end-of-year bonus, which might help result in a similar sudden negative effect on below-minimum wage workers in the same month. To save space, we plot in Figure A.4 (Appendix A) the monthly lockdown effects on the proportions of workers having a job with a labor contract or a formal job. This figure similarly show negative lockdown effects in almost all the months in 2020.

Table 4, we present the effects estimates of the lockdown using different samples and models. The full results of the RDD regressions are reported in Table A.3 to A.5 in Appendix A. We first use the 2019 and 2020 LFSs to estimate the local effects of April 2020 (using Equation (9)). Next, to control for seasonal effects we add the LFSs in 2015 to 2018 and employ the RDD-DID model specified in Equation (10). To examine whether the estimates from the RDD-DID model are sensitive to addition LFSs, we use two samples of data: the 2017 to 2020 LFSs and the 2015 to 2020 LFSs. Overall, the local effects of the April 2020 lockdown on the labor outcomes are negative and strongly statistically significant, which further confirms that the lockdown represents a major channel of negative pandemic impacts on labor market outcomes.

4.3. Robustness checks and heterogeneity analysis

Robustness checks

Our results remain robust to a battery of robustness checks, which include using other modelling specifications, varying the composition of the (years in the) reference group, and conducting various placebo tests.

First, further employing different model specifications, we estimate the pandemic effects by quarters using models without the control variables and models without district fixed-effects (Tables A.6 and A.7, Appendix A). We also control for province fixed effects instead of district fixed effects (Table A.8, Appendix A). The results are very similar to those presented in Table 3.

Second, we examine in Tables A.9 to A.13 (Appendix A) whether our estimates are sensitive to exclusion (or inclusion) of a specific control year during 2015-2019. A potential concern is that one of these years could have had different labor dynamics and as a result,

had different employment indicators from the other years. In particular, Table A.9 reports the results dropping the 2015 LFS, Table A.10 reports the results dropping the 2016 LFS, and so on with Table A.13 finally presenting the results dropping the 2019 LFS. The estimates are qualitatively similar to those in Table 3. Furthermore, we restrict the estimation sample to the 2020 LFS and only one LFS before 2020 (i.e., the reference group include only one year before 2020). The results, presented in Table A.14 to A.18 (Appendix A) for all the five different single-year reference groups, show negative lockdown effects regardless of which year is selected as the reference year.

Finally, we conduct several following placebo tests. We exclude the 2020 LFS from the analysis sample and subsequently consider each year of the period 2015 to 2019 as the treatment year. For example, in Table A.19, we use 2015 as the treatment year and estimate the effects on the employment outcomes of the interactions between this year and Quarters from 2 to 4 (using Equation (6)). We expect the interaction terms β_1 , β_2 and β_3 to be statistically insignificant and of small magnitude for this year. We repeat the same exercise for the other years and show the estimation results in Tables A.20 to A.23, Appendix A. Indeed, these interaction terms have very small magnitudes and are not statistically significant at the conventional levels, except for unemployment and having a wage job for some placebo years. This suggests that these two variables might be more affected by seasonality and we should take caution in estimating and interpreting the pandemic effects on these two variables.

Heterogeneity analysis

The large sample of the LFSs allows us to examine the pandemic heterogeneous effects on different population sub-groups. But since these effects were quite similar among Quarters

2 to 4 of 2020, we combine these three quarters into one group for better interpretation. We employ a simpler variant of Equation (6) and regress (log of) monthly wages on a dummy variable indicating Quarters 2 to 4, a dummy variable for 2020, the interaction term between these two variables, and other control variables for different population subgroups.¹⁴

Figure 4 shows that the pandemic effects on monthly wages were relatively similar across demographic characteristics and geographic regions. Workers with less than primary education were less affected than those with higher education achievement. This is possibly due to the fact that these workers mostly work in the agricultural sector, which is less affected by the pandemic (including subsequent lockdown measures).¹⁵ Regarding gender, there were no statistically significant differences for the effects between men and women, and neither do the regions. There were somewhat smaller effects for rural workers than urban workers, but the difference was not statistically significant.

Figure 5 reports the heterogeneous effects across employment sectors. The pandemic had the smallest effects on public sector workers, reducing their monthly wages by 4.7%. But the corresponding impacts on informal household workers and FDI sector workers were twice as large at 9.5%. Workers in the transportation, tourism (hotels and restaurants), and trade sectors were most heavily affected, with their monthly wages being reduced by around 16%. On the other hand, there were no statistically significant effects of the lockdown on workers in the mining, gas, and water industries, which is perhaps unsurprising since these industries were allowed to operate under lockdown to provide essential goods for the basic functions of the economy.

¹⁴ Table A.24 (Appendix) A reports the estimated lockdown effects on eight employment outcomes for Quarters 2 to 4.

¹⁵ The share of workers with less than primary education working in agriculture is 59% in 2020, almost twice the corresponding figure of 31% for all workers. The East Asian financial crisis in the late 1990s was also found to affect poor rural Indonesian households less, perhaps because of their ability to produce food (Friedman and Levinsohn, 2002) or to switch more easily from wage work into self-employment (Smith et al., 2002).

Finally, we further explore the geographic distribution of the pandemic effects on monthly wages for all the 63 provinces in Vietnam and graph the point estimates in Figure 6. The impacts ranged from -0.173 to 0.003 and were strongest for Da Nang city, which was under a second lockdown in August 2020, to be followed by some central provinces (Quang Nam, Thua Thien Hue, Quang Tri, and Quang Ngai) that were also under social distancing around the same time. Besides these provinces, provinces in the Red River Delta and the Southeast region (including Hochiminh city, the country's largest economic center) were more strongly affected by the lockdown. These are the two richest regions in Vietnam and house a large number of workers in tourism, transport, and trade industries.¹⁶

5. Effects on low-wage workers and wage inequality

We turn next to estimating the pandemic effects on monthly wages for low-wage workers using the same regression for the heterogeneity analysis in Section 4.3. Specifically, we examine three groups of low-wage workers, who receive wages i) below the minimum wages, ii) in the bottom 10% of the wage distribution, and iii) in the bottom 40% of the wage distribution. To further explore whether the pandemic effects varies across the wage quintiles, we also run the same regression for each wage quintile. We estimate the 10th and 40th percentile thresholds and the quintile thresholds of the wage distribution in Quarter 1 of 2020, which was not affected by the pandemic. We apply these same thresholds to the preceding years and Quarters 2-4 of 2020 so that we can compare workers with similar wages.

¹⁶ We explore some possible reasons for heterogeneous lockdown effects by graphing the point estimate of the effects versus the provincial mean wages and proportions of service workers. We use the one-year lag of these mean wages and shares of service workers (i.e., in 2019) to for pre-pandemic values. Panel A of Figure A.5 (Appendix A) shows that provinces with higher wages are more affected by the pandemic, perhaps because richer provinces tend to have a higher share of workers in the service sector, and this sector is more affected by the lockdown. Panel B of Figure A.5 provides supportive evidence that provinces with a larger share of service workers are more affected by the lockdown.

Summarizing the results, Figure 7 shows that the pandemic reduced the monthly wages for workers below the minimum wages by around 20% in Quarters 2-4 of 2020 (full regression results are shown in Appendix A, Table A.25). The corresponding estimated reductions for workers in the bottom 10% and 40% of the wage distribution are respectively 13% and 14%. While these decreases are smaller than that for the below-minimum wages workers, they are still larger than the estimated reduction of 9% for all workers. More worrisomely, the pandemic seems to have mostly affected wage workers in the lowest wage quintile but not the other wage quintiles. The estimated reduction on the bottom second wage quintile appears negligible at 1%.

The large effects on low wage workers seem contradictory to the results discussed in Section 4.3 in which we find stronger effects on provinces with higher wages (Appendix A, Figure A.5). To examine this issue, we estimate the pandemic effects for workers below the minimum wages versus those above the minimum wages across different industries and regions. We also run similar estimates for workers in the lowest wage quintile versus those in the higher wage quintiles. Tables A.26 and A.27 (Appendix A) show that for nearly all industries and regions, low-wage workers were more strongly affected by the pandemic than other workers.

To further measure the gap between workers' wages and the minimum wages, we employ the Foster-Greer-Thorbecke (FGT) poverty indexes to compute the P_1 and P_2 indexes for workers receiving wages below the minimum wages.¹⁷ Different from Table 3 where we use

¹⁷ The Foster-Greer-Thorbecke indexes are used to measure the poverty (Foster, Greer and Thorbecke, 1984):

$$P_\alpha = \frac{1}{n} \sum_{i=1}^q \left[\frac{z - Y_i}{z} \right]^\alpha$$
, where Y_i is a welfare indicator for person i . In this study, the welfare indicator is monthly wages of workers. In the FGT approach, z is the expenditure poverty line. n is the total number of people, q is the number of workers below z , and α can be interpreted as a measure of inequality aversion. When $\alpha = 0$, we have the headcount index H , which measures the proportion of workers below the poverty line. When $\alpha = 1$ and $\alpha = 2$, we obtain the poverty gap PG , which measures the depth of poverty, and the squared poverty

a regression-based individual-level approach to estimate the pandemic effects on workers' probability of receiving monthly wages below the minimum wages in Quarters 2 to 4, we now employ a population-level approach to estimate the pandemic effects on wage inequality for 2020. Using this approach, we predict the counterfactual wages in the absence of the pandemic that allow us to also estimate the pandemic effects on other wage inequality indexes.

To measure wage inequality, we use different inequality indexes including the Gini and Theil indexes and the 90th/10th and 95th/5th percentile ratios. The pandemic effects on a specific FGT (or wage inequality) index are estimated as

$$\Delta I = I(wage_1) - I(wage_0), \quad (11)$$

where $I(wage_1)$ is an inequality index of the observed wage (i.e., the current post-pandemic wage). Estimation of $I(wage_1)$ is based on the observed wages and straightforward. $I(wage_0)$ is an inequality index of the counterfactual wages, which are predicted in the absence of the pandemic. Let v_1 represent the pandemic effects on (log of) wages (i.e., the interaction terms of the pandemic year and the dummy variable indicating Quarters 2 to 4 in a simpler variant of Equation (6)), we can predict the counterfactual wages as follows

$$wage_0 = e^{\log(wage_1) - \hat{v}_1} \quad (12)$$

We estimate the standard error of $\widehat{wage}_0$ in Equation (12) using bootstraps with 1,000 replications.

Table 5 reports the pandemic effects for 2020 as a whole. The indexes shown in Column (1) are computed using the observed wage data from the 2020 LFS and reflect the pandemic effects. Column (2) presents the indexes which are estimated using the counterfactual wages.

gap P_2 which measures the severity of poverty, respectively. In this study, Y_i is the monthly wage of workers, while z is the minimum wage.

In particular, the first row of Column (1) shows that the proportion of below-minimum wage workers was 10.3% in 2020. If the pandemic had not happened, the proportion of below-minimum wage workers would have been 7.7%. Thus the pandemic increased the proportion of below-minimum wage workers by 2.5 percentage points, which equals a 32% increase of the proportion of below-minimum wage workers in the baseline. The pandemic also increased the P_1 and P_2 indexes of below-minimum wages by 26% and 27%, respectively.

The pandemic similarly worsened wage equality, increasing the Gini index by 4.7%. The Theil L and Theil T indexes were also increased by 10.2% and 7.8%, respectively. The pandemic had stronger effects on the 95th/5th percentile ratio than the 90th/10th percentile ratio, which further highlights the more negative effects on lower-wage workers.

6. Conclusion

We offer an early study on the impacts of the COVID-19 pandemic on employment outcomes in a poorer country setting. We analyze a wide range of employment outcomes from several rounds of Vietnam's LFS in 2015 to 2020. We find that the pandemic increased the unemployment rate and the temporary layoff rate, and decreased the quality of employment (such as having a wage job, or a job with a labor contract and social insurance). Our estimation results remain robust to different model specifications and various robustness tests.

Further heterogeneity analysis suggests that individuals with less than primary education were less affected than those with higher education achievement, possibly due to the former group's tendency to work in the agricultural sector that may offer a better shield in times of crisis. The pandemic had far stronger effects on informal household workers and FDI sector workers than public sector workers. Workers in the transportation and tourism sectors were

most heavily affected. More worrisomely, these negative effects were unequally distributed across the wage quintiles and more strongly affected lower-wage workers. Specifically, the pandemic increased the proportion of below-minimum wage workers by 32% and also worsened various wage equality indexes.

Our findings that below-minimum wage workers were most vulnerable to negative lockdown effects are directly relevant to policy advice. Indeed, while minimum wages were annually increased between 2008 and 2019, these wages were not increased in 2020 as well as 2021. A key argument for not increasing minimum wages is that firms were severely affected by the pandemic and could not afford minimum wage increases (see, e.g., Ha (2021)). At the same time, most government's pandemic measures focused on supporting workers who lost their job or were temporarily laid off (Government of Vietnam, 2020 and 2021); there were no specific measures to help workers below the minimum wages. Our study suggests that although lower-wage workers do not lose their job, they disproportionately suffered income losses during the pandemic. This is further supported with evidence of overall worsening wage inequality for the whole population. Consequently, support programs should also be targeted at these vulnerable workers, especially those in more affected industries such as transportation, tourism, and restaurants and trade.

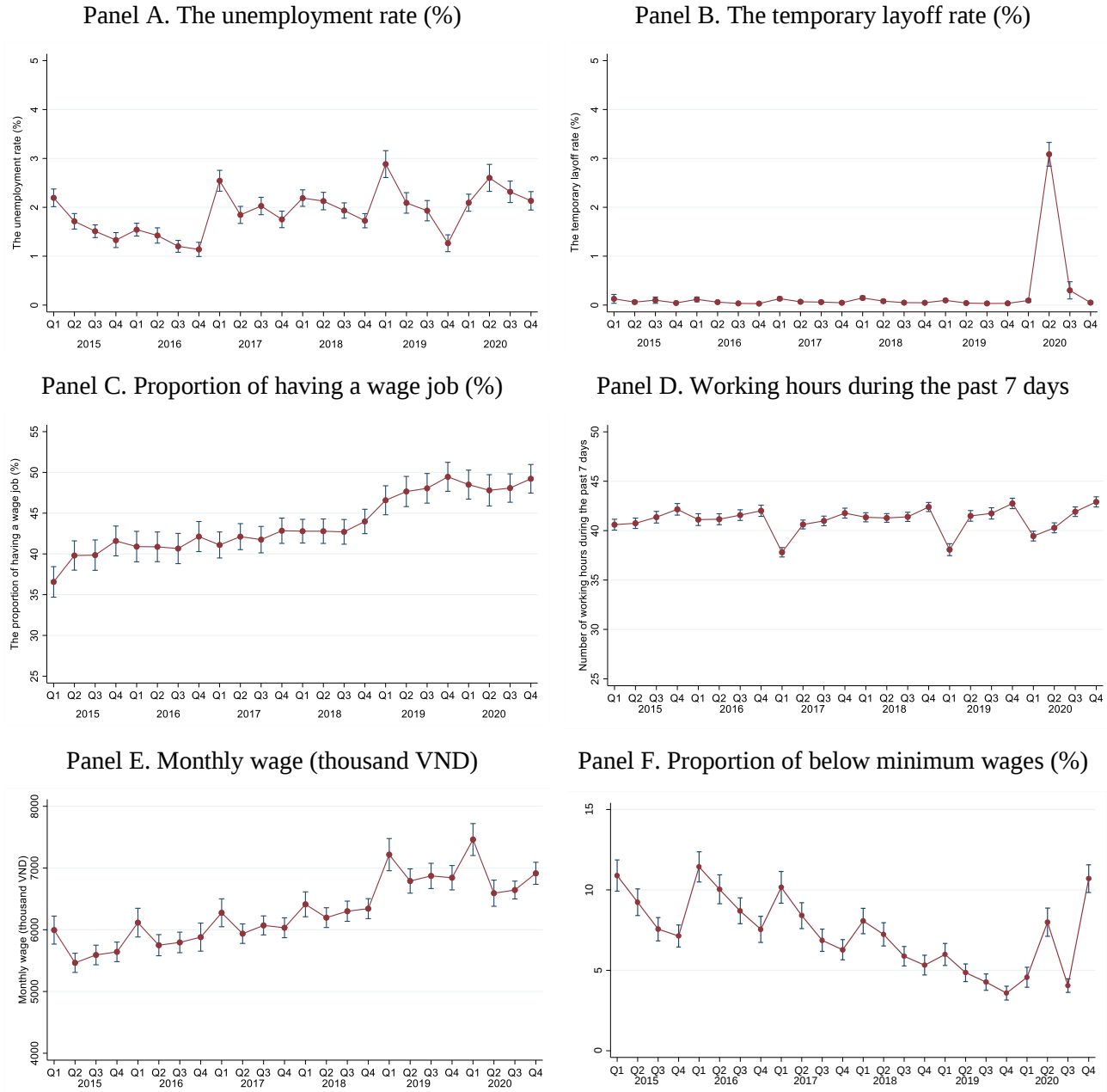
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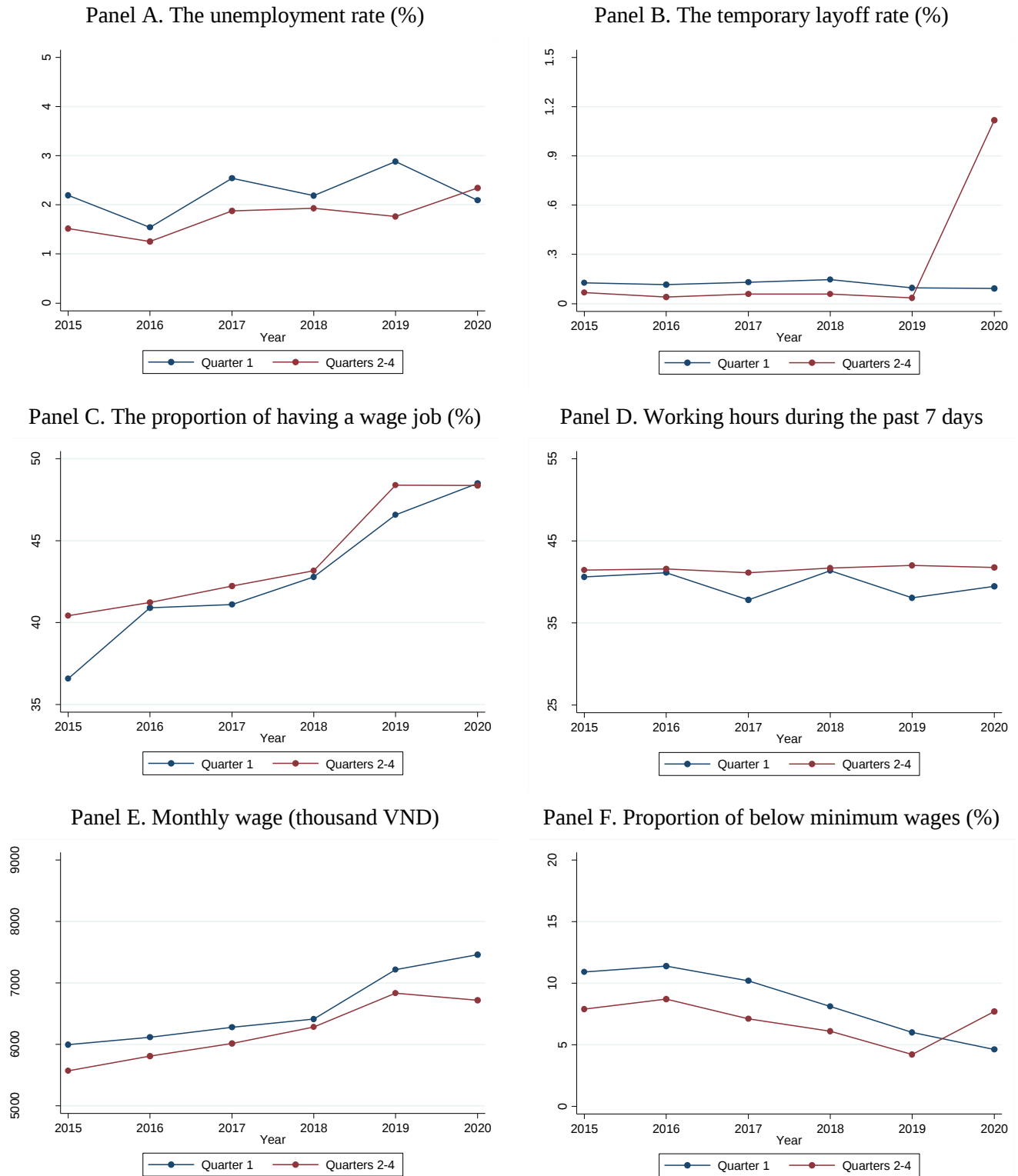
Figure 1. Outcome variables



Note: This figure presents the mean and the 95% confidence interval of the employment variables of quarters during the 2015-2020 period.

Source: authors' estimations from the LFSs.

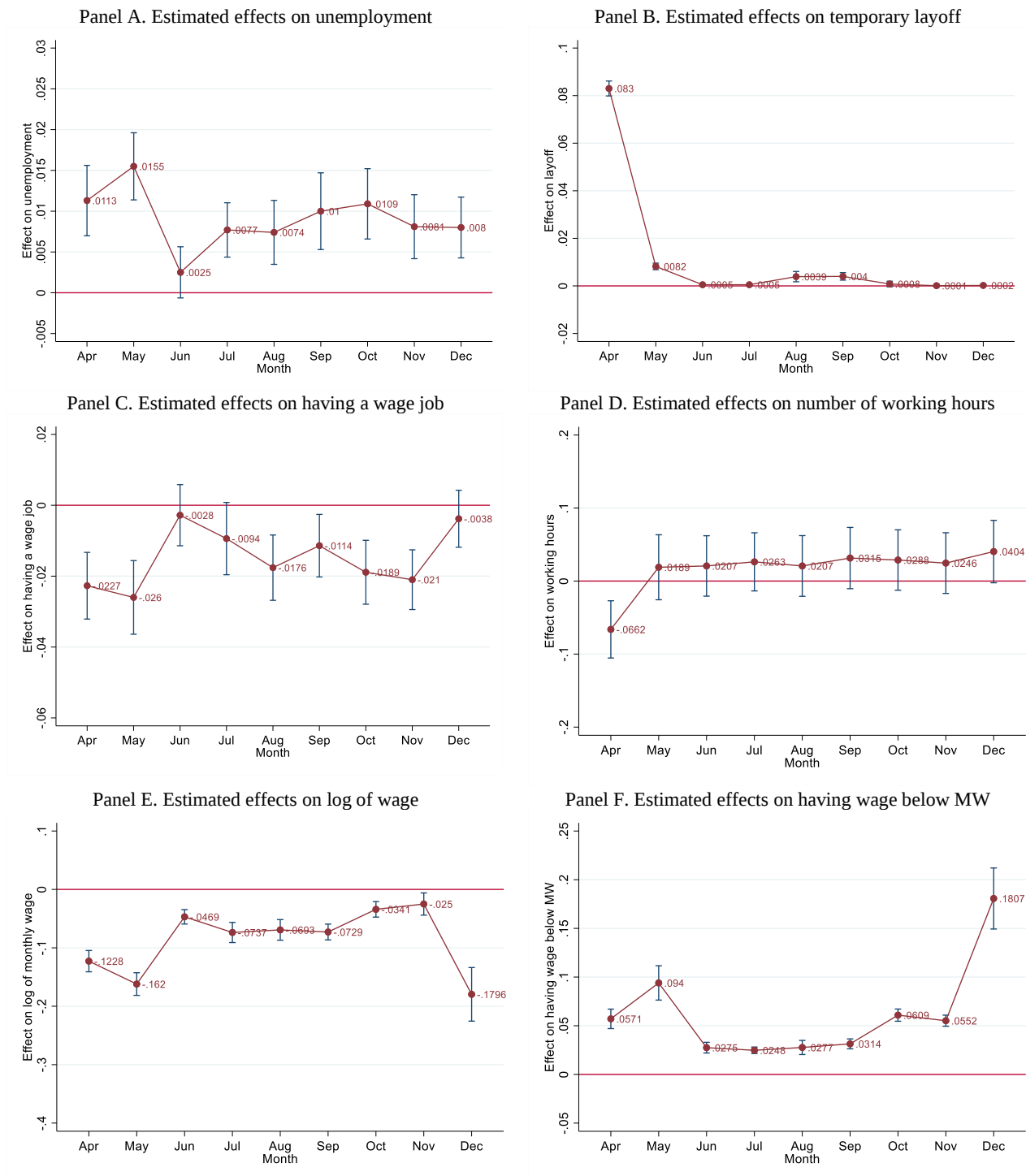
Figure 2. Parallel trend assumptions



Note: This figure examines the parallel trend assumption in the DID model by showing the mean of the outcomes of Quarter 1 and the mean across quarters 2 to 4. Overall, Quarter 1 of 2020 experienced a similar growth rate of the outcome variables as Quarter 1 of previous years, indicating that Quarter 1 of 2020 was not affected by the COVID-19 pandemic. Within-year differences in the outcomes between Quarter 1 and Quarters 2-4 are quite similar before 2020, implying the validity of the parallel assumption in the DID model.

Source: authors' estimations from the LFSs.

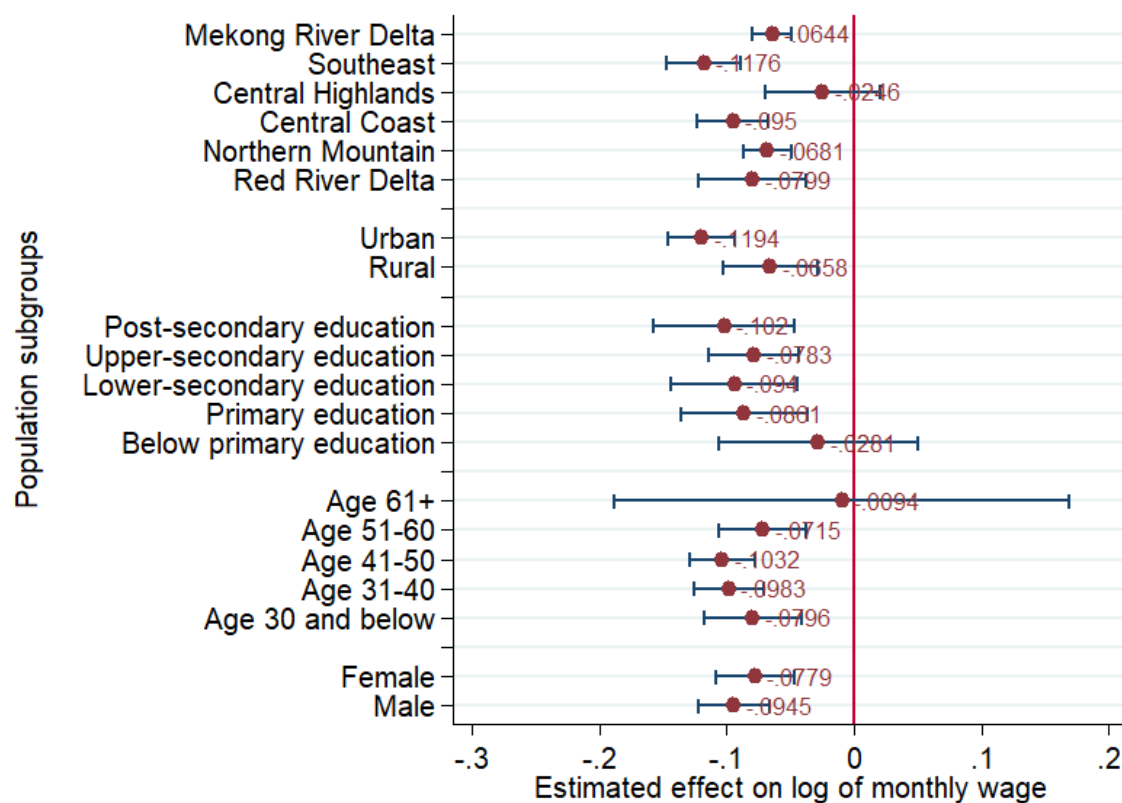
Figure 3: Estimated effects of the COVID-19 pandemic on outcomes over April-December 2020



Note: This figure reports the estimated impacts and their 95% confidence interval of the pandemic-induced lockdown on employment outcomes in April to December 2020 using model (2).

Source: authors' estimations from the LFSs.

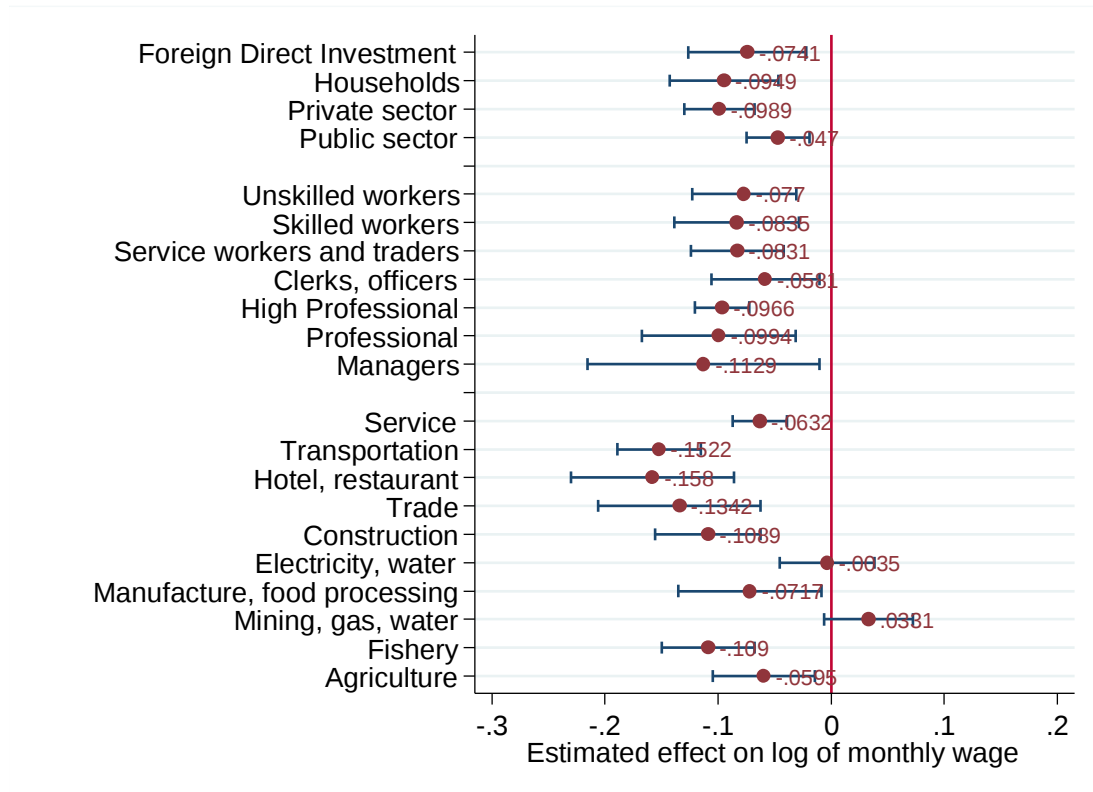
Figure 4: Heterogeneous effects across geographic and demographic characteristics



Note: This figure reports the effects and the 95% confidence interval of the COVID-19 pandemic on log of monthly wages in 2020 by geographic areas and demographic characteristics of workers.

Source: authors' estimations from the LFSs.

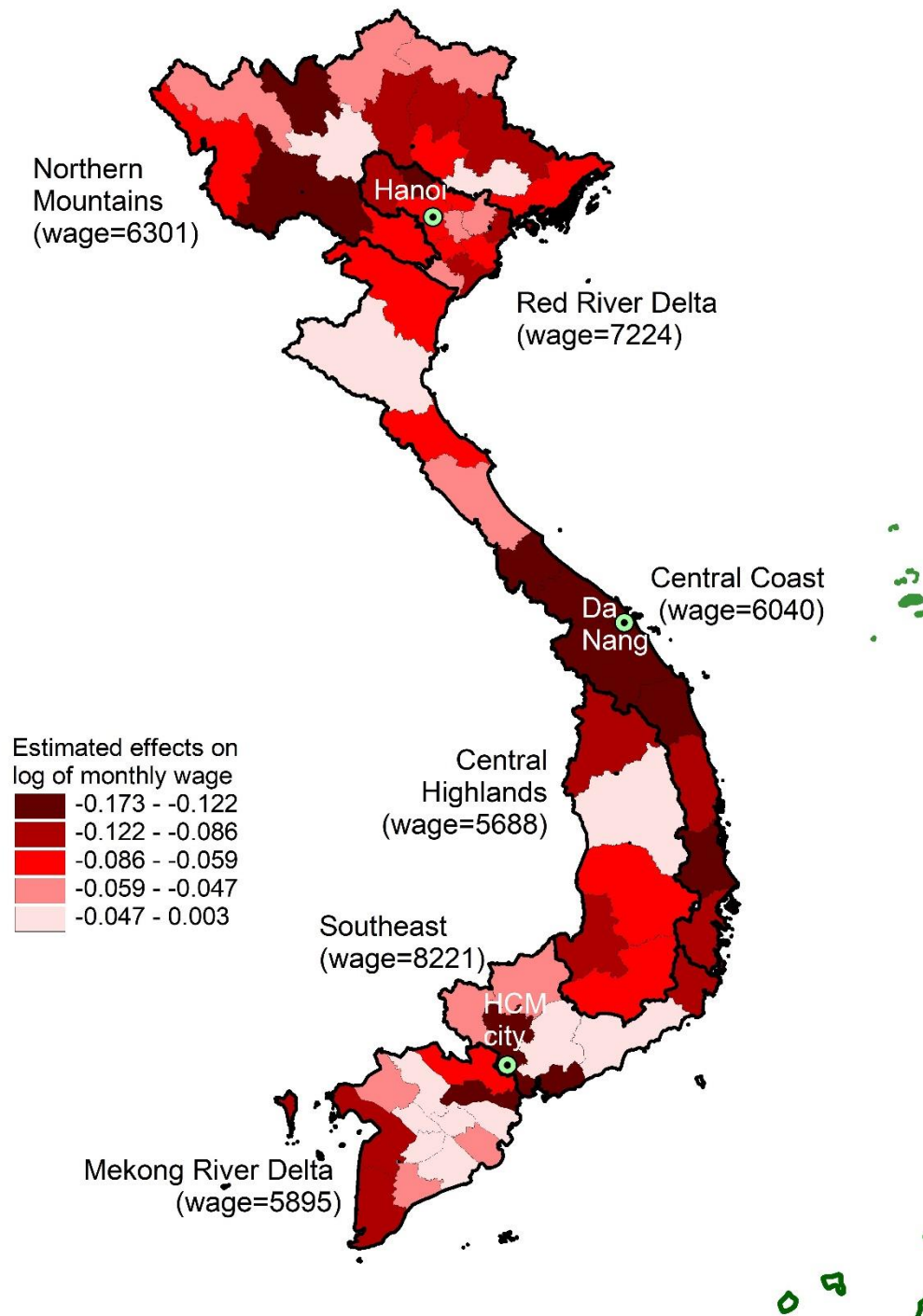
Figure 5: Heterogeneous effects across employment characteristics



Note: This figure reports the effects and the 95% confidence interval of the COVID-19 pandemic on log of monthly wages in 2020 by employment characteristics of workers.

Source: authors' estimations from the LFSs.

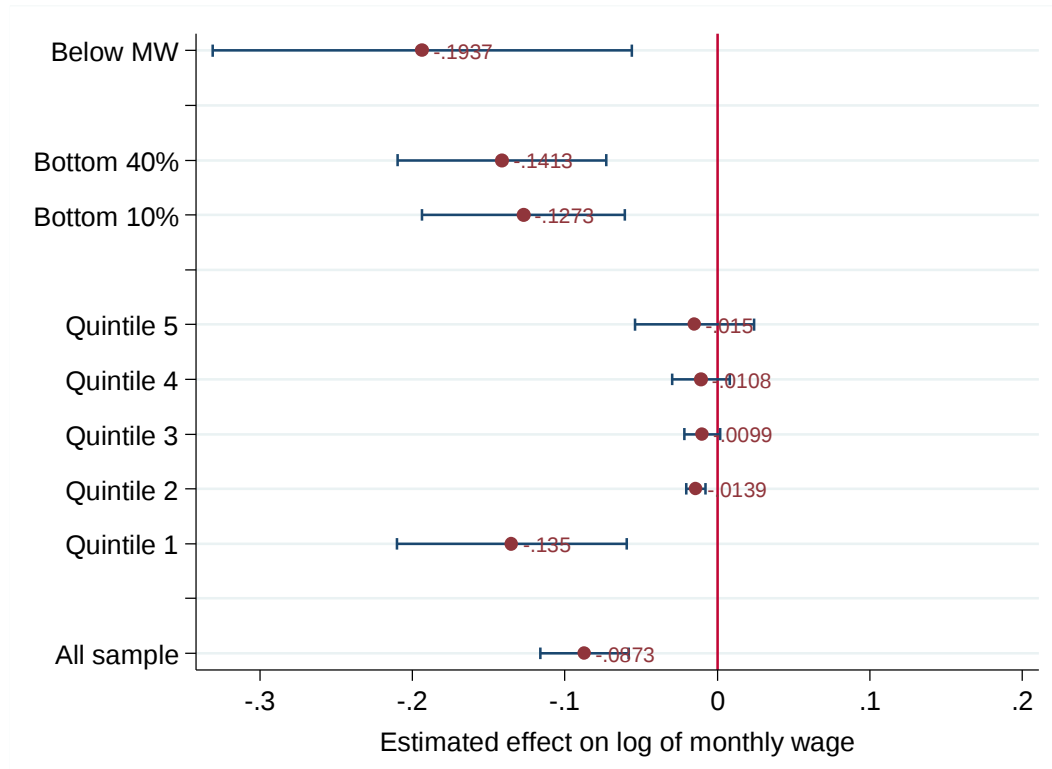
Figure 6: Provincial map of the effects



Note: This figure presents the effects of the COVID-19 pandemic on log of monthly wages in 2020 by provinces. The average monthly wages of regions are reported in parentheses below the region names.

Source: authors' estimations from the LFSs.

Figure 7: Effects on the low-wage workers and workers by wage quintiles



Note: This figures report the effects and the 95% confidence interval of the COVID-19 pandemic on log of monthly wages in 2020 by wage quintiles of workers.

Source: authors' estimations from the LFSs.

Table 1. Outcome variables

Outcomes	2015	2016	2017	2018	2019	2020
	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment rate (%)	1.687 (0.061)	1.328 (0.052)	2.044 (0.070)	1.995 (0.064)	2.047 (0.084)	2.284 (0.087)
Temporary layoff rate (%)	0.083 (0.015)	0.060 (0.008)	0.077 (0.007)	0.081 (0.009)	0.051 (0.005)	0.861 (0.043)
Proportion of workers having a wage job (%)	39.5 (0.9)	41.1 (0.9)	41.9 (0.8)	43.1 (0.7)	47.9 (0.9)	48.4 (0.9)
Proportion of workers having a job with contract (%)	24.8 (1.0)	25.3 (1.0)	25.1 (0.8)	25.6 (0.8)	29.9 (1.1)	30.1 (1.1)
Proportion of workers having a formal job (%)	20.8 (0.9)	21.5 (0.9)	21.6 (0.8)	22.6 (0.8)	26.3 (1.0)	26.7 (1.0)
Number of working hours in the last 7 days	41.2 (0.3)	41.5 (0.3)	40.3 (0.2)	41.6 (0.2)	41.0 (0.3)	41.2 (0.2)
Monthly wage of wage workers (thousand VND/month)	5666.2 (82.3)	5885.4 (93.8)	6077.7 (85.9)	6312.7 (84.0)	6928.3 (106.2)	6907.6 (95.0)
% workers with wage below the minimum wages	8.6 (0.3)	9.4 (0.4)	7.7 (0.3)	6.6 (0.3)	4.6 (0.2)	7.3 (0.3)

Note: standard errors are in parentheses.

Wage is measured in the price of December 2020.

Source: Authors' estimations from LFSs.

Table 2. OLS regressions of employment variables on the first quarter and the COVID year

Explanatory variables	Dependent variables							
	Unemployed (yes=1, no=0)	Temporary layoff (yes=1, no=0)	Having a wage job (yes=1, no=0)	Having job with contract (yes=1, no=0)	Having a formal job (yes=1, no=0)	Log of number of working hours in the last 7 days	Log of monthly wage (wage workers)	Having wage below minimum wages (yes=1, no=0)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Quarter 1 * Years 2019-2020	0.0009 (0.0030)	-0.0002* (0.0001)	-0.0034 (0.0113)	0.0036 (0.0133)	0.0022 (0.0138)	-0.0213 (0.0370)	-0.0002 (0.0494)	-0.0184 (0.0118)
Quarter 1	0.0071** (0.0030)	0.0008*** (0.0001)	-0.0084 (0.0107)	-0.0054 (0.0129)	-0.0027 (0.0134)	-0.0939** (0.0368)	0.0544 (0.0491)	0.0230* (0.0116)
Years 2019-2020	-0.0033 (0.0018)	-0.0001 (0.0000)	0.0344*** (0.0081)	0.0051 (0.0089)	0.0073 (0.0096)	0.0003 (0.0045)	0.1262*** (0.0350)	-0.0231*** (0.0058)
Male (male=1, female=0)	0.0012 (0.0010)	0.0006*** (0.0001)	0.0939*** (0.0047)	-0.0312*** (0.0045)	-0.0393*** (0.0043)	0.0709*** (0.0044)	0.1735*** (0.0057)	-0.0471*** (0.0047)
Age	-0.0055*** (0.0004)	0.0000 (0.0000)	-0.0015* (0.0007)	0.0001 (0.0006)	0.0039*** (0.0006)	0.0223*** (0.0017)	0.0597*** (0.0016)	-0.0200*** (0.0015)
Age squared	0.0001*** (0.0000)	-0.0000 (0.0000)	-0.0001*** (0.0000)	-0.0001*** (0.0000)	-0.0001*** (0.0000)	-0.0003*** (0.0000)	-0.0008*** (0.0000)	0.0003*** (0.0000)
Less than primary education	<i>Reference</i>							
Primary education	-0.0001 (0.0023)	0.0001 (0.0002)	-0.1190** (0.0391)	-0.1172* (0.0585)	-0.1129* (0.0579)	0.0151* (0.0076)	-0.0866 (0.0612)	-0.0052 (0.0105)
Lower-secondary education	-0.0001 (0.0025)	0.0001 (0.0002)	-0.1325** (0.0438)	-0.0881 (0.0655)	-0.0899 (0.0650)	0.0226** (0.0089)	-0.0387 (0.0658)	-0.0198 (0.0109)
Upper-secondary education	0.0034 (0.0029)	-0.0003 (0.0002)	-0.0527 (0.0465)	0.0772 (0.0711)	0.0611 (0.0706)	0.0520*** (0.0096)	0.0289 (0.0683)	-0.0306** (0.0117)
Post-secondary education	0.0153 (0.0093)	-0.0008** (0.0003)	0.1895** (0.0773)	0.4342*** (0.1001)	0.4350*** (0.0973)	0.0241* (0.0128)	0.2768*** (0.0700)	-0.0580*** (0.0149)
Urban (urban=1, rural=0)	0.0086*** (0.0013)	0.0006** (0.0002)	0.0522*** (0.0126)	0.0507*** (0.0156)	0.0462** (0.0151)	0.0672*** (0.0060)	0.0575*** (0.0113)	-0.0020 (0.0026)
District fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.1376*** (0.0096)	-0.0003 (0.0003)	0.6695*** (0.0491)	0.3747*** (0.0739)	0.2538*** (0.0729)	3.3063*** (0.0257)	7.3669*** (0.0852)	0.4453*** (0.0344)
Observations	1,153,759	1,154,065	1,154,065	1,154,065	1,154,065	1,122,414	476,580	265,440
R-squared	0.032	0.003	0.244	0.330	0.325	0.208	0.340	0.094

Note: This table examines whether there is a significant effects of the COVID-19 pandemic on employment in the first quarter of 2020. The effects is estimated by the interaction between the first quarter and the 2020 year.

Robust standard errors in parentheses (corrected for sampling weight and clustered at the district level and year-by-quarter level).

*** p<0.01, ** p<0.05, * p<0.1.

Table 3. DID regressions of employment variables

Explanatory variables	Dependent variables							
	Unemployed (yes=1, no=0)	Temporary layoff (yes=1, no=0)	Having a wage job (yes=1, no=0)	Having job with contract (yes=1, no=0)	Having a formal job (yes=1, no=0)	Log of number of working hours in the last 7 days	Log of monthly wage (wage workers)	Having wage below minimum wages (yes=1, no=0)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Quarter 2 * COVID year	0.0098*** (0.0012)	0.0305*** (0.0004)	-0.0171*** (0.0040)	-0.0099*** (0.0015)	-0.0076*** (0.0015)	-0.0073 (0.0213)	-0.1096*** (0.0027)	0.0553*** (0.0022)
Quarter 3 * COVID year	0.0084*** (0.0011)	0.0028*** (0.0004)	-0.0128*** (0.0041)	-0.0142*** (0.0016)	-0.0124*** (0.0015)	0.0263 (0.0212)	-0.0721*** (0.0024)	0.0278*** (0.0015)
Quarter 4 * COVID year	0.0090*** (0.0014)	0.0004** (0.0002)	-0.0145*** (0.0042)	-0.0113*** (0.0012)	-0.0100*** (0.0011)	0.0313 (0.0217)	-0.0819*** (0.0036)	0.1008*** (0.0027)
Quarter 1	<i>Reference</i>							
Quarter 2	-0.0039*** (0.0012)	-0.0006*** (0.0001)	0.0137*** (0.0044)	0.0032*** (0.0007)	0.0021*** (0.0007)	0.0533** (0.0215)	-0.0216*** (0.0038)	-0.0138*** (0.0016)
Quarter 3	-0.0051*** (0.0011)	-0.0007*** (0.0001)	0.0134*** (0.0045)	0.0038*** (0.0006)	0.0025*** (0.0007)	0.0645*** (0.0213)	-0.0027 (0.0039)	-0.0262*** (0.0018)
Quarter4	-0.0075*** (0.0014)	-0.0008*** (0.0001)	0.0281*** (0.0046)	0.0104*** (0.0008)	0.0087*** (0.0007)	0.0876*** (0.0219)	0.0010 (0.0049)	-0.0321*** (0.0019)
COVID year	-0.0004 (0.0010)	-0.0004** (0.0002)	0.0793*** (0.0081)	0.0293*** (0.0037)	0.0347*** (0.0038)	-0.0267 (0.0191)	0.2746*** (0.0056)	-0.0606*** (0.0028)
Male (male=1, female=0)	0.0003 (0.0008)	0.0003* (0.0001)	0.0948*** (0.0038)	-0.0298*** (0.0037)	-0.0383*** (0.0036)	0.0764*** (0.0035)	0.1770*** (0.0050)	-0.0507*** (0.0039)
Age	-0.0056*** (0.0003)	0.0000** (0.0000)	-0.0014** (0.0006)	-0.0001 (0.0005)	0.0039*** (0.0006)	0.0219*** (0.0010)	0.0590*** (0.0015)	-0.0202*** (0.0010)
Age squared	0.0001*** (0.0000)	-0.0000*** (0.0000)	-0.0001*** (0.0000)	-0.0001*** (0.0000)	-0.0001*** (0.0000)	-0.0003*** (0.0000)	-0.0008*** (0.0000)	0.0003*** (0.0000)
Less than primary education	<i>Reference</i>							
Primary education	0.0002 (0.0016)	0.0001 (0.0001)	-0.1092*** (0.0249)	-0.0998** (0.0371)	-0.0966** (0.0366)	0.0129*** (0.0039)	-0.0478 (0.0429)	-0.0124 (0.0077)
Lower-secondary education	0.0000 (0.0018)	0.0001 (0.0001)	-0.1220*** (0.0280)	-0.0709 (0.0416)	-0.0730* (0.0412)	0.0191*** (0.0045)	0.0016 (0.0462)	-0.0271*** (0.0084)
Upper-secondary education	0.0044* (0.0022)	-0.0001 (0.0003)	-0.0396 (0.0305)	0.0965** (0.0455)	0.0789* (0.0448)	0.0453*** (0.0050)	0.0682 (0.0489)	-0.0375*** (0.0092)
Post-secondary education	0.0177** (0.0066)	-0.0006*** (0.0002)	0.2100*** (0.0485)	0.4620*** (0.0613)	0.4612*** (0.0593)	-0.0097 (0.0087)	0.3262*** (0.0481)	-0.0666*** (0.0113)
Urban (urban=1, rural=0)	0.0084*** (0.0010)	0.0006** (0.0002)	0.0526*** (0.0089)	0.0477*** (0.0107)	0.0427*** (0.0104)	0.0660*** (0.0049)	0.0520*** (0.0082)	0.0003 (0.0024)
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.1439*** (0.0060)	0.0008*** (0.0002)	0.5935*** (0.0318)	0.3305*** (0.0430)	0.2066*** (0.0417)	3.2270*** (0.0277)	7.2432*** (0.0532)	0.4992*** (0.0251)
Observations	2,759,355	2,759,355	2,759,355	2,759,355	2,759,355	2,682,379	1,124,748	645,406
R-squared	0.031	0.011	0.248	0.334	0.328	0.210	0.346	0.089

Note: This table presents estimates of the effects of COVID-19 on employment using the DID method. The effects are estimated by the interaction between the second, third quarter and fourth and the 2020 year.

Robust standard errors in parentheses (corrected for sampling weight and clustered at the district level and year-by-quarter level).

*** p<0.01, ** p<0.05, * p<0.1.

Table 4. RDD regressions of employment variables

Data sample and model	Dependent variables							
	Unemployed (yes=1, no=0)	Temporary layoff (yes=1, no=0)	Having wage job (yes=1, no=0)	Having job with contract (yes=1, no=0)	Having social insurance (yes=1, no=0)	Log of number of working hours in the last 7 days	Log of monthly wage (wage workers)	Having wage below minimum wages (yes=1, no=0)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
RDD estimates using the data sample of LFSs 2019 and 2020	0.0137*** (0.0025)	0.0338*** (0.0095)	-0.0258*** (0.0061)	-0.0193*** (0.0045)	-0.0172*** (0.0042)	-0.0165 (0.0296)	-0.1076*** (0.0233)	0.0180 (0.0147)
RDD-DID estimates using the data sample of LFSs 2017 to 2020	0.0162*** (0.0024)	0.0347*** (0.0096)	-0.0284*** (0.0058)	-0.0207*** (0.0048)	-0.0173*** (0.0040)	-0.0917*** (0.0240)	-0.0745*** (0.0233)	0.0249* (0.0147)
RDD-DID estimates using the data sample of LFSs 2015 to 2020	0.0169*** (0.0022)	0.0346*** (0.0096)	-0.0264*** (0.0058)	-0.0188*** (0.0056)	-0.0159*** (0.0054)	-0.0783*** (0.0188)	-0.0701*** (0.0201)	0.0245* (0.0145)

Note: This table presents estimates of the effects of COVID-19 on employment using the RDD regression. The full regression results are reported in Tables A.3 to A.5 in Appendix.

Robust standard errors in parentheses (corrected for sampling weight and clustered at the district level and year-by-quarter level).

*** p<0.01, ** p<0.05, * p<0.1.

Table 5. Lockdown effects on Foster–Greer–Thorbecke and other wage inequality indexes

FGT and inequality indexes	Index with lockdowns (observed)	Index without lockdowns (estimated)	Difference	Difference (%)
	(1)	(2)	(3)=(1)-(2)	(4)=(3)/(2)
FGT indexes				
P0	10.2756*** (0.0803)	7.7637*** (0.0718)	2.5119*** (0.0444)	32.36*** (0.67)
P1	0.0315*** (0.0003)	0.0249*** (0.0003)	0.0065*** (0.0002)	26.23*** (1.06)
P2	0.0151*** (0.0002)	0.0119*** (0.0002)	0.0032*** (0.0001)	27.12*** (1.23)
Inequality indexes				
Gini index	0.2514*** (0.0008)	0.2402*** (0.0011)	0.0112*** (0.0008)	4.65*** (0.33)
Theil L	0.1179*** (0.0007)	0.1071*** (0.0009)	0.0109*** (0.0006)	10.16*** (0.63)
Theil T	0.1153*** (0.0010)	0.1070*** (0.0012)	0.0083*** (0.0006)	7.78*** (0.60)
p(90)/p(10)	2.8947*** (0.0084)	2.6874*** (0.0338)	0.2073*** (0.0319)	7.73*** (1.29)
p(95)/p(5)	5.0934*** (0.0465)	4.4866*** (0.0341)	0.6068*** (0.0367)	13.53*** (0.84)

Note: This table report the lockdown effects on wage inequality in 2020.

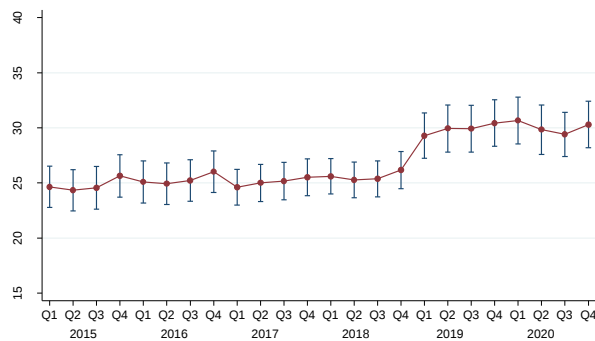
Standard errors are in parentheses. The standard errors are computed using bootstrap with 1,000 replications.

*** p<0.01, ** p<0.05, * p<0.1.

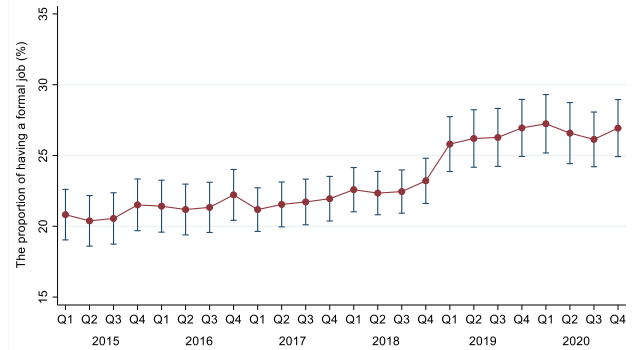
Appendix: Additional Tables and Figures

Figure A.1. The proportion of workers having a job with a labor contract and the proportion of workers having a formal job

Panel A. The proportion of having a job with a labor contract (%)



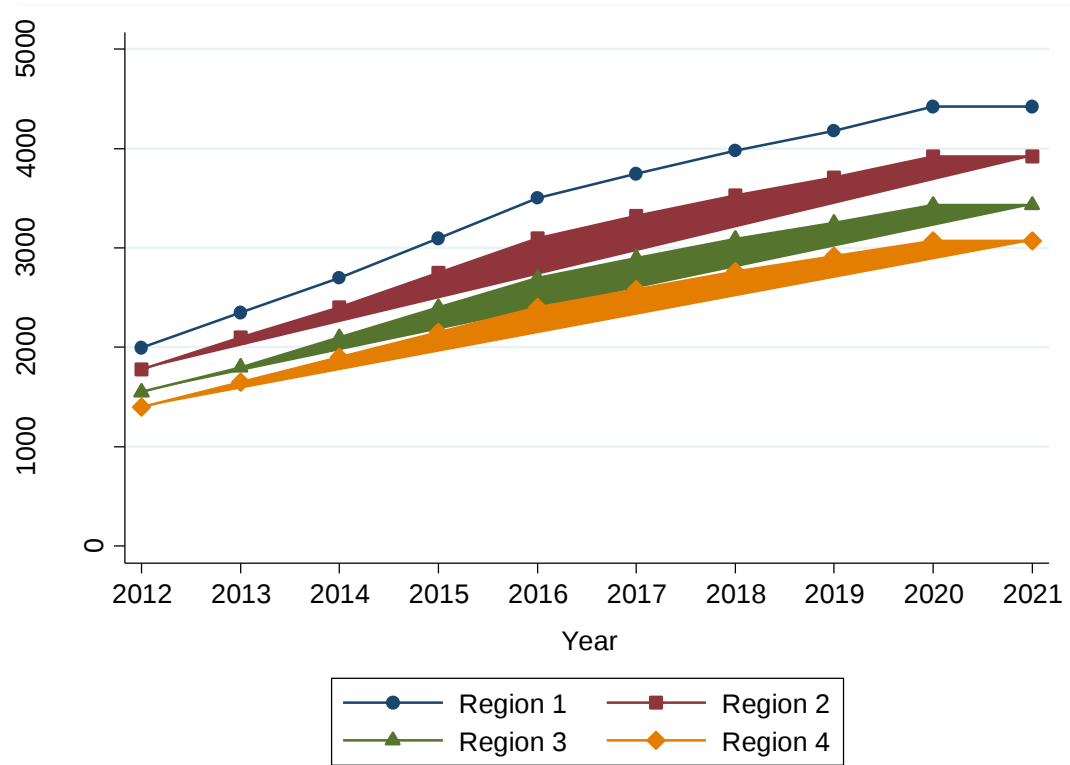
Panel B. The proportion of having a formal job (%)



Note: This figure presents the mean and the 95% confidence interval of the employment variables of quarters during the 2015-2020 period.

Source: authors' estimations from the LFSs.

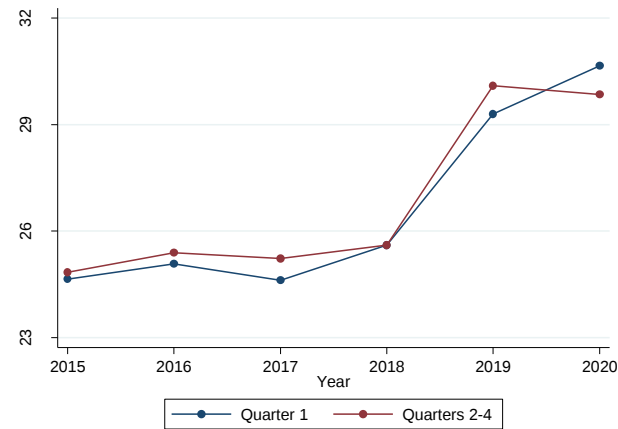
Figure A.2. Evolution of minimum wages



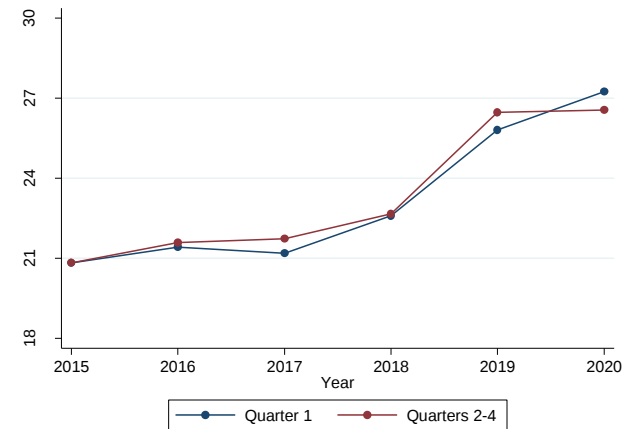
Source: Authors' preparation using data from annual Government of Vietnam's Decrees on Minimum Wages (GoV, 2014-2019)

Figure A.3. Parallel assumptions of the proportion of workers having a job with a labor contract and the proportion of workers having a formal job

Panel A. The proportion of having a job with labor contract (%)



Panel B. The proportion of having a formal job (%)

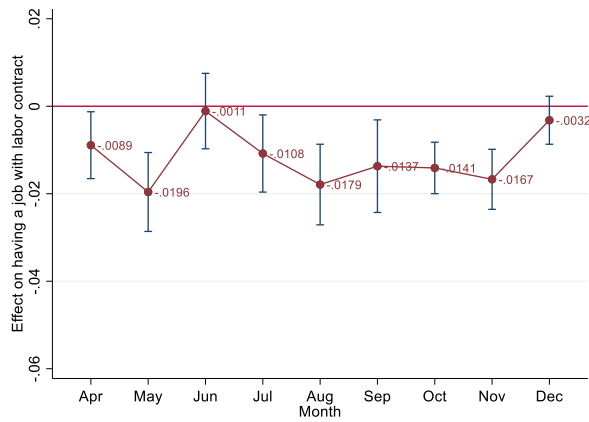


Note: This figure examines the parallel assumption in the DID model by showing the mean of the outcomes of Quarter 1 and the mean across quarters 2 to 4. Overall, Quarter 1 of 2020 experienced a similar growth rate of the outcome variables as Quarter 1 of previous years, indicating that Quarter 1 of 2020 was not affected by the COVID-19 pandemic. Within-year differences in the outcomes between Quarter 1 and Quarters 2-4 are quite similar before 2020, implying the validity of the parallel assumption in the DID model.

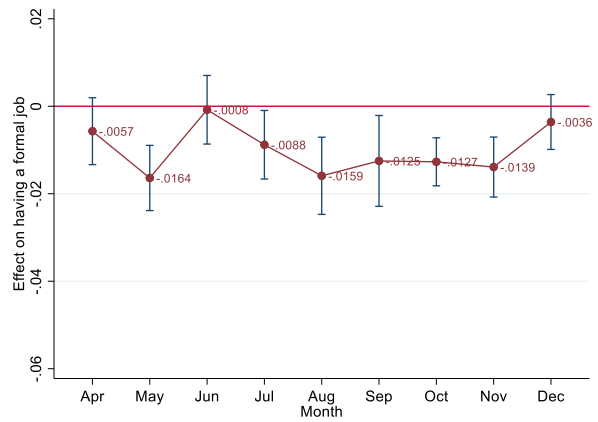
Source: authors' estimations from the LFSs.

Figure A.4: Estimated effects of the lockdowns on the proportion of workers having a job with a labor contract and the proportion of workers having a formal job

Panel C. Estimated effects on having a job with labor contract



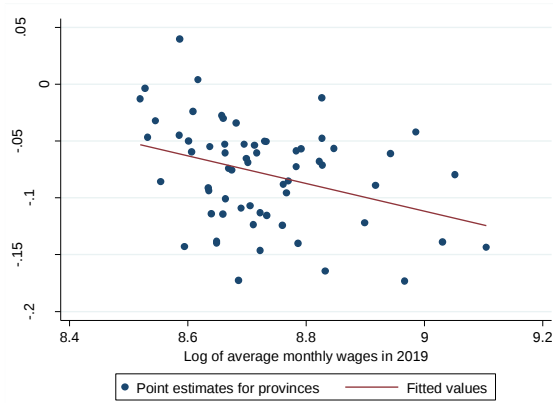
Panel D. Estimated effects on having a formal job



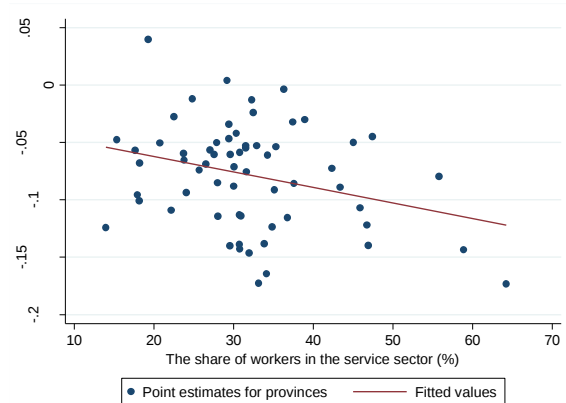
Source: authors' estimations from the LFSs.

Figure A.5. Point estimates of the effects of the COVID-19 pandemic at the provincial level

Panel A. The effects by the log of average monthly mean wages in 2019



Panel B. The effects by the share of workers in the service sector in 2019



Source: authors' estimations from the LFSs.

Table A.1. Summary statistics of explanatory variables

Variables	2015		2016		2017		2018		2019		2020	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Male (male=1, female=0)	0.518	0.500	0.516	0.500	0.519	0.500	0.522	0.500	0.532	0.499	0.530	0.499
Age	40.11	13.52	40.55	13.51	40.31	13.54	40.62	13.43	39.82	13.12	40.28	12.93
Less than primary education	0.140	0.347	0.132	0.339	0.139	0.426	0.135	0.342	0.148	0.355	0.113	0.317
Primary education	0.233	0.423	0.230	0.421	0.226	0.418	0.221	0.415	0.212	0.409	0.213	0.409
Lower-secondary education	0.313	0.464	0.315	0.465	0.309	0.462	0.311	0.463	0.292	0.455	0.305	0.460
Upper-secondary education	0.198	0.398	0.201	0.401	0.203	0.402	0.204	0.403	0.201	0.401	0.216	0.412
Post-secondary education	0.116	0.320	0.121	0.326	0.124	0.153	0.128	0.334	0.147	0.354	0.153	0.360
Urban area (urban=1, rural=0)	0.318	0.466	0.319	0.466	0.322	0.467	0.326	0.469	0.331	0.471	0.337	0.473
Number of observations	465,570		467,931		471,974		468,156		445,595		440,129	

Source: authors' estimations from the LFSs.

Table A.2. OLS regression of employment variables on month dummies

Explanatory variables	Dependent variables							
	Unemployed (yes=1, no=0)	Temporary layoff (yes=1, no=0)	Having a wage job (yes=1, no=0)	Having job with contract (yes=1, no=0)	Having a formal job (yes=1, no=0)	Log of number of working hours in the last 7 days	Log of monthly wage (wage workers)	Having wage below minimum wages (yes=1, no=0)
April * COVID year	0.0113*** (0.0022)	0.0830*** (0.0016)	-0.0227*** (0.0048)	-0.0089** (0.0039)	-0.0057 (0.0039)	-0.0662*** (0.0200)	-0.1228*** (0.0093)	0.0571*** (0.0051)
May * COVID year	0.0155*** (0.0021)	0.0082*** (0.0007)	-0.0260*** (0.0053)	-0.0196*** (0.0046)	-0.0164*** (0.0038)	0.0189 (0.0227)	-0.1620*** (0.0099)	0.0940*** (0.0090)
June * COVID year	0.0025 (0.0016)	0.0005** (0.0002)	-0.0028 (0.0044)	-0.0011 (0.0044)	-0.0008 (0.0040)	0.0207 (0.0211)	-0.0469*** (0.0063)	0.0275*** (0.0028)
Jul * COVID year	0.0077*** (0.0017)	0.0005*** (0.0002)	-0.0094* (0.0052)	-0.0108** (0.0045)	-0.0088** (0.0040)	0.0263 (0.0203)	-0.0737*** (0.0088)	0.0248*** (0.0017)
August * COVID year	0.0074*** (0.0020)	0.0039*** (0.0011)	-0.0176*** (0.0047)	-0.0179*** (0.0047)	-0.0159*** (0.0045)	0.0207 (0.0212)	-0.0693*** (0.0090)	0.0277*** (0.0037)
September * COVID year	0.0100*** (0.0024)	0.0040*** (0.0008)	-0.0114** (0.0045)	-0.0137** (0.0054)	-0.0125** (0.0053)	0.0315 (0.0214)	-0.0729*** (0.0069)	0.0314*** (0.0026)
October * COVID year	0.0109*** (0.0022)	0.0008 (0.0006)	-0.0189*** (0.0046)	-0.0141*** (0.0030)	-0.0127*** (0.0028)	0.0288 (0.0211)	-0.0341*** (0.0068)	0.0609*** (0.0032)
November * COVID year	0.0081*** (0.0020)	0.0001 (0.0003)	-0.0210*** (0.0043)	-0.0167*** (0.0035)	-0.0139*** (0.0035)	0.0246 (0.0212)	-0.0250** (0.0097)	0.0552*** (0.0029)
December * COVID year	0.0080*** (0.0019)	0.0002 (0.0002)	-0.0038 (0.0041)	-0.0032 (0.0028)	-0.0036 (0.0032)	0.0404* (0.0218)	-0.1796*** (0.0234)	0.1807*** (0.0160)
April	-0.0031** (0.0012)	-0.0006*** (0.0002)	0.0174*** (0.0046)	0.0022 (0.0027)	0.0010 (0.0026)	0.0691*** (0.0208)	-0.0336*** (0.0073)	-0.0076** (0.0032)
May	-0.0034*** (0.0011)	-0.0006*** (0.0002)	0.0154*** (0.0054)	0.0052** (0.0025)	0.0046** (0.0022)	0.0063 (0.0239)	-0.0197*** (0.0056)	-0.0116*** (0.0036)
June	-0.0053*** (0.0014)	-0.0006*** (0.0001)	0.0085 (0.0052)	0.0021 (0.0030)	0.0006 (0.0027)	0.0838*** (0.0218)	-0.0113* (0.0059)	-0.0215*** (0.0017)
Jul	-0.0049*** (0.0013)	-0.0009*** (0.0001)	0.0101** (0.0045)	0.0005 (0.0019)	-0.0007 (0.0021)	0.0812*** (0.0214)	-0.0094 (0.0068)	-0.0227*** (0.0018)
August	-0.0042*** (0.0015)	-0.0006*** (0.0001)	0.0161*** (0.0044)	0.0047* (0.0023)	0.0034 (0.0021)	0.0626*** (0.0220)	-0.0051 (0.0062)	-0.0286*** (0.0024)
September	-0.0061*** (0.0016)	-0.0006** (0.0002)	0.0138** (0.0051)	0.0061** (0.0025)	0.0047* (0.0024)	0.0501** (0.0212)	0.0063 (0.0063)	-0.0275*** (0.0021)
October	-0.0079*** (0.0014)	-0.0008*** (0.0001)	0.0236*** (0.0045)	0.0084*** (0.0012)	0.0071*** (0.0011)	0.0895*** (0.0221)	-0.0059 (0.0062)	-0.0279*** (0.0020)
November	-0.0070***	-0.0007***	0.0298***	0.0129***	0.0116***	0.0865***	0.0018	-0.0325***

Explanatory variables	Dependent variables							
	Unemployed (yes=1, no=0)	Temporary layoff (yes=1, no=0)	Having a wage job (yes=1, no=0)	Having job with contract (yes=1, no=0)	Having a formal job (yes=1, no=0)	Log of number of working hours in the last 7 days	Log of monthly wage (wage workers)	Having wage below minimum wages (yes=1, no=0)
December	(0.0018) -0.0075***	(0.0001) -0.0009***	(0.0050) 0.0309***	(0.0021) 0.0098***	(0.0023) 0.0075***	(0.0216) 0.0868***	(0.0066) 0.0071	(0.0022) -0.0359***
Quarter 1	(0.0013)	(0.0001)	(0.0052)	(0.0021)	(0.0019)	(0.0224)	(0.0076)	(0.0020)
COVID year	References -0.0004	-0.0004**	0.0793***	0.0293***	0.0347***	-0.0267	0.2746***	-0.0606***
Control variables	(0.0010) Yes	(0.0002) Yes	(0.0095) Yes	(0.0071) Yes	(0.0070) Yes	(0.0199) Yes	(0.0072) Yes	(0.0050) Yes
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.1439*** (0.0086)	0.0007** (0.0003)	0.5936*** (0.0456)	0.3306*** (0.0523)	0.2066*** (0.0486)	3.2267*** (0.0370)	7.2433*** (0.0600)	0.4992*** (0.0306)
Observations	2,759,355	2,759,355	2,759,355	2,759,355	2,759,355	2,682,379	1,124,748	645,406
R-squared	0.031	0.026	0.248	0.334	0.328	0.212	0.347	0.090

Robust standard errors in parentheses (corrected for sampling weight and clustered at the district level and year-by-quarter level).

*** p<0.01, ** p<0.05, * p<0.1.

Source: authors' estimations from the LFSs.

Table A.3. RDD regression of employment variables using the sample of LFSs 2019 and 2020

Explanatory variables	Unemployed (yes=1, no=0)	Temporary layoff (yes=1, no=0)	Having wage job (yes=1, no=0)	Having job with contract (yes=1, no=0)	Having social insurance (yes=1, no=0)	Log of number of working hours in the last 7 days	Log of monthly wage (wage workers)	Having wage below minimum wages (yes=1, no=0)
Lockdown	0.0137*** (0.0025)	0.0338*** (0.0095)	-0.0258*** (0.0061)	-0.0193*** (0.0045)	-0.0172*** (0.0042)	-0.0165 (0.0296)	-0.1076*** (0.0233)	0.0180 (0.0147)
Month variable	-0.0004 (0.0003)	0.0001 (0.0000)	0.0021** (0.0009)	0.0012* (0.0006)	0.0014** (0.0006)	-0.0057 (0.0038)	0.0052*** (0.0019)	-0.0013** (0.0005)
Month variable * Lockdown	-0.0004 (0.0004)	-0.0059*** (0.0017)	0.0009 (0.0011)	-0.0001 (0.0008)	-0.0007 (0.0008)	0.0179*** (0.0043)	0.0015 (0.0049)	0.0080** (0.0037)
Male (male=1, female=0)	-0.0039*** (0.0011)	-0.0005* (0.0003)	0.0837*** (0.0067)	-0.0438*** (0.0037)	-0.0510*** (0.0039)	0.0807*** (0.0059)	0.1840*** (0.0079)	-0.0312*** (0.0028)
Age	-0.0056*** (0.0003)	-0.0000 (0.0000)	-0.0001 (0.0009)	0.0004 (0.0008)	0.0041*** (0.0008)	0.0236*** (0.0013)	0.0501*** (0.0017)	-0.0132*** (0.0009)
Age squared	0.0001*** (0.0000)	-0.0000 (0.0000)	-0.0001*** (0.0000)	-0.0001*** (0.0000)	-0.0001*** (0.0000)	-0.0004*** (0.0000)	-0.0006*** (0.0000)	0.0002*** (0.0000)
Less than primary education	Reference							
Primary education	-0.0031*** (0.0008)	0.0005 (0.0003)	-0.0528*** (0.0055)	-0.0349*** (0.0080)	-0.0260*** (0.0065)	-0.0063 (0.0045)	0.0082 (0.0132)	-0.0037 (0.0042)
Lower-secondary education	-0.0024** (0.0010)	0.0007* (0.0004)	-0.0586*** (0.0073)	-0.0003 (0.0088)	0.0059 (0.0077)	0.0080* (0.0042)	0.0530*** (0.0136)	-0.0164*** (0.0040)
Upper-secondary education	0.0007 (0.0014)	0.0017** (0.0008)	-0.0023 (0.0089)	0.1545*** (0.0077)	0.1496*** (0.0063)	0.0307*** (0.0051)	0.1112*** (0.0156)	-0.0201*** (0.0043)
Post-secondary education	0.0074*** (0.0016)	-0.0002 (0.0005)	0.2522*** (0.0148)	0.5363*** (0.0166)	0.5437*** (0.0144)	-0.0081 (0.0092)	0.3315*** (0.0188)	-0.0377*** (0.0051)
Urban area (urban=1, rural=0)	0.0087*** (0.0014)	0.0017** (0.0007)	0.0232*** (0.0088)	0.0203*** (0.0076)	0.0157** (0.0069)	0.0605*** (0.0063)	0.0278*** (0.0063)	0.0043 (0.0032)
District fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.1435*** (0.0078)	0.0004 (0.0006)	0.6533*** (0.0283)	0.3242*** (0.0253)	0.2046*** (0.0229)	3.2535*** (0.0373)	7.6415*** (0.0316)	0.2773*** (0.0160)
Observations	662,211	662,220	662,220	662,220	662,220	637,913	290,442	165,391
R-squared	0.035	0.030	0.255	0.375	0.373	0.244	0.351	0.080

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A.4. RDD regression of employment variables using the sample of LFSs 2017 to 2019

Explanatory variables	Unemployed (yes=1, no=0)	Temporary layoff (yes=1, no=0)	Having wage job (yes=1, no=0)	Having job with contract (yes=1, no=0)	Having social insurance (yes=1, no=0)	Log of number of working hours in the last 7 days	Log of monthly wage (wage workers)	Having wage below minimum wages (yes=1, no=0)
Lockdown * Sample 2019-2020	0.0162*** (0.0024)	0.0347*** (0.0096)	-0.0284*** (0.0058)	-0.0207*** (0.0048)	-0.0173*** (0.0040)	-0.0917*** (0.0240)	-0.0745*** (0.0233)	0.0249* (0.0147)
Lockdown	-0.0025* (0.0014)	-0.0007*** (0.0003)	0.0017 (0.0049)	0.0009 (0.0035)	-0.0002 (0.0031)	0.0754*** (0.0144)	-0.0333** (0.0136)	-0.0060* (0.0034)
Month variable	0.0007*** (0.0002)	0.0001*** (0.0000)	-0.0008 (0.0007)	-0.0027*** (0.0006)	-0.0027*** (0.0005)	-0.0139*** (0.0019)	0.0063*** (0.0020)	0.0016*** (0.0005)
Month variable * Lockdown	-0.0016*** (0.0003)	-0.0001*** (0.0000)	0.0032*** (0.0009)	0.0037*** (0.0006)	0.0038*** (0.0006)	0.0185*** (0.0024)	-0.0027 (0.0021)	-0.0041*** (0.0006)
Male (male=1, female=0)	-0.0023*** (0.0008)	0.0002* (0.0001)	0.0891*** (0.0056)	-0.0386*** (0.0034)	-0.0454*** (0.0035)	0.0777*** (0.0047)	0.1804*** (0.0064)	-0.0406*** (0.0031)
Age	-0.0060*** (0.0003)	0.0000 (0.0000)	-0.0001 (0.0008)	0.0003 (0.0007)	0.0041*** (0.0007)	0.0230*** (0.0010)	0.0566*** (0.0014)	-0.0171*** (0.0008)
Age squared	0.0001*** (0.0000)	-0.0000 (0.0000)	-0.0001*** (0.0000)	-0.0001*** (0.0000)	-0.0001*** (0.0000)	-0.0003*** (0.0000)	-0.0007*** (0.0000)	0.0002*** (0.0000)
Less than primary education								
Primary education	-0.0006 (0.0008)	0.0000 (0.0001)	-0.0954*** (0.0071)	-0.0867*** (0.0122)	-0.0810*** (0.0116)	0.0071** (0.0033)	-0.0425*** (0.0146)	-0.0100*** (0.0035)
Lower-secondary education	-0.0004 (0.0010)	0.0000 (0.0001)	-0.1062*** (0.0077)	-0.0580*** (0.0138)	-0.0555*** (0.0133)	0.0160*** (0.0035)	0.0023 (0.0153)	-0.0203*** (0.0034)
Upper-secondary education	0.0041 *** (0.0012)	0.0000 (0.0002)	-0.0386*** (0.0091)	0.1000*** (0.0139)	0.0906*** (0.0134)	0.0429*** (0.0044)	0.0581 *** (0.0161)	-0.0255*** (0.0035)
Post-secondary education	0.0101 *** (0.0019)	-0.0005*** (0.0002)	0.2126*** (0.0167)	0.4732*** (0.0207)	0.4774*** (0.0192)	-0.0057 (0.0071)	0.2906*** (0.0181)	-0.0419*** (0.0044)
Urban area (urban=1, rural=0)	0.0098*** (0.0009)	0.0006*** (0.0002)	0.0386*** (0.0072)	0.0375*** (0.0064)	0.0337*** (0.0061)	0.0665*** (0.0053)	0.0443*** (0.0068)	0.0027 (0.0029)
Interaction between explanatory variables and sample 2019-2020	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample-pair dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.1595*** (0.0064)	0.0010*** (0.0003)	0.6331*** (0.0252)	0.3483*** (0.0268)	0.2314*** (0.0235)	3.2107*** (0.0218)	7.4784*** (0.0289)	0.3940*** (0.0154)
Observations	2,045,740	2,045,871	2,045,871	2,045,871	2,045,871	1,986,745	869,660	512,062
R-squared	0.032	0.017	0.247	0.348	0.343	0.219	0.354	0.091

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A.5. RDD-DID regression of employment variables using the sample of LFSs 2015 to 2020

Explanatory variables	Unemployed (yes=1, no=0)	Temporary layoff (yes=1, no=0)	Having wage job (yes=1, no=0)	Having job with contract (yes=1, no=0)	Having social insurance (yes=1, no=0)	Log of number of working hours in the last 7 days	Log of monthly wage (wage workers)	Having wage below minimum wages (yes=1, no=0)
Lockdown * Sample 2019-2020	0.0169*** (0.0022)	0.0346*** (0.0096)	-0.0264*** (0.0058)	-0.0188*** (0.0056)	-0.0159*** (0.0054)	-0.0783*** (0.0188)	-0.0701*** (0.0201)	0.0245* (0.0145)
Lockdown	-0.0033*** (0.0011)	-0.0007*** (0.0002)	-0.0005 (0.0041)	-0.0009 (0.0021)	-0.0018 (0.0022)	0.0629*** (0.0177)	-0.0371*** (0.0122)	-0.0064 (0.0042)
Month variable	0.0009*** (0.0002)	0.0001*** (0.0000)	0.0009 (0.0006)	0.0003 (0.0003)	0.0006** (0.0003)	-0.0118*** (0.0023)	0.0105*** (0.0017)	0.0019*** (0.0006)
Month variable * Lockdown	-0.0015*** (0.0002)	-0.0002*** (0.0000)	0.0012 (0.0007)	0.0008** (0.0003)	0.0004 (0.0003)	0.0161*** (0.0027)	-0.0069*** (0.0018)	-0.0050*** (0.0007)
Male (male=1, female=0)	0.0003 (0.0007)	0.0004*** (0.0001)	0.0973*** (0.0054)	-0.0291*** (0.0033)	-0.0373*** (0.0034)	0.0770*** (0.0044)	0.1770*** (0.0063)	-0.0494*** (0.0035)
Age	-0.0056*** (0.0002)	0.0000*** (0.0000)	-0.0013* (0.0007)	-0.0003 (0.0007)	0.0037*** (0.0006)	0.0214*** (0.0009)	0.0592*** (0.0014)	-0.0202*** (0.0007)
Age squared	0.0001*** (0.0000)	-0.0000*** (0.0000)	-0.0001*** (0.0000)	-0.0001*** (0.0000)	-0.0001*** (0.0000)	-0.0003*** (0.0000)	-0.0008*** (0.0000)	0.0003*** (0.0000)
Less than primary education	Reference							
Primary education	0.0008 (0.0008)	0.0000 (0.0001)	-0.1273*** (0.0057)	-0.1267*** (0.0113)	-0.1231*** (0.0107)	0.0152*** (0.0032)	-0.0840*** (0.0144)	-0.0071** (0.0035)
Lower-secondary education	0.0008 (0.0009)	0.0000 (0.0001)	-0.1434*** (0.0060)	-0.1016*** (0.0127)	-0.1029*** (0.0123)	0.0208*** (0.0036)	-0.0372** (0.0151)	-0.0205*** (0.0034)
Upper-secondary education	0.0055*** (0.0009)	-0.0003*** (0.0001)	-0.0651*** (0.0068)	0.0623*** (0.0122)	0.0459*** (0.0117)	0.0492*** (0.0038)	0.0245 (0.0151)	-0.0290*** (0.0034)
Post-secondary education	0.0196*** (0.0015)	-0.0005*** (0.0001)	0.1740*** (0.0140)	0.4175*** (0.0178)	0.4182*** (0.0163)	-0.0011 (0.0062)	0.2710*** (0.0175)	-0.0554*** (0.0043)
Urban area (urban=1, rural=0)	0.0080*** (0.0007)	0.0002 (0.0001)	0.0581*** (0.0072)	0.0560*** (0.0069)	0.0514*** (0.0065)	0.0675*** (0.0054)	0.0597*** (0.0065)	-0.0000 (0.0026)
Interaction between explanatory variables and sample 2019-2020	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample-pair dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.1403*** (0.0055)	0.0008*** (0.0003)	0.6436*** (0.0231)	0.3721*** (0.0240)	0.2481*** (0.0198)	3.2329*** (0.0235)	7.3443*** (0.0276)	0.4865*** (0.0167)
Observations	3,450,863	3,451,582	3,451,582	3,451,582	3,451,582	3,359,602	1,422,910	835,210
R-squared	0.031	0.012	0.247	0.331	0.326	0.220	0.348	0.090

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A.6. OLS regression of employment variables without control variables

Explanatory variables	Dependent variables						
	Unemployed (yes=1, no=0)	Temporary layoff (yes=1, no=0)	Having a wage job (yes=1, no=0)	Having job with contract (yes=1, no=0)	Having a formal job (yes=1, no=0)	Log of monthly wage (wage workers)	Having wage below minimum wages (yes=1, no=0)
Quarter 2 * COVID year	0.0094*** (0.0015)	0.0305*** (0.0008)	-0.0176*** (0.0040)	-0.0090*** (0.0024)	-0.0066*** (0.0022)	-0.0983*** (0.0050)	0.0468*** (0.0020)
Quarter 3 * COVID year	0.0077*** (0.0015)	0.0028*** (0.0006)	-0.0135*** (0.0039)	-0.0137*** (0.0026)	-0.0114*** (0.0025)	-0.0674*** (0.0053)	0.0204*** (0.0019)
Quarter 4 * COVID year	0.0087*** (0.0017)	0.0004 (0.0003)	-0.0154*** (0.0039)	-0.0116*** (0.0017)	-0.0101*** (0.0016)	-0.0776*** (0.0049)	0.0941*** (0.0042)
Quarter 1	Reference						
Quarter 2	-0.0043*** (0.0011)	-0.0006*** (0.0001)	0.0105** (0.0043)	0.0006 (0.0005)	-0.0002 (0.0004)	-0.0240*** (0.0053)	-0.0137*** (0.0007)
Quarter 3	-0.0055*** (0.0011)	-0.0007*** (0.0001)	0.0098** (0.0044)	0.0017** (0.0007)	0.0008 (0.0006)	-0.0046 (0.0058)	-0.0261*** (0.0015)
Quarter4	-0.0082*** (0.0014)	-0.0008*** (0.0001)	0.0235*** (0.0048)	0.0086*** (0.0003)	0.0076*** (0.0001)	-0.0026 (0.0062)	-0.0326*** (0.0019)
COVID year	-0.0006 (0.0009)	-0.0004** (0.0002)	0.0933*** (0.0097)	0.0521*** (0.0062)	0.0573*** (0.0060)	0.2801*** (0.0078)	-0.0573*** (0.0039)
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.0214*** (0.0009)	0.0014*** (0.0001)	0.3843*** (0.0082)	0.2460*** (0.0026)	0.2070*** (0.0028)	8.5054*** (0.0044)	0.1047*** (0.0027)
Observations	2,759,355	2,759,355	2,759,355	2,759,355	2,759,355	1,124,748	645,406
R-squared	0.004	0.010	0.081	0.100	0.094	0.147	0.021

Note: Control variables are the same as in Table 1, including gender, age, age squared, education levels and urban dummy.

Robust standard errors in parentheses (corrected for sampling weight and clustered at the district level and year-by-quarter level).

*** p<0.01, ** p<0.05, * p<0.1.

Source: authors' estimations from the LFSs.

Table A.7. OLS regression of employment variables without control variables but with district fixed-effects

Explanatory variables	Dependent variables						
	Unemployed (yes=1, no=0)	Temporary layoff (yes=1, no=0)	Having a wage job (yes=1, no=0)	Having job with contract (yes=1, no=0)	Having a formal job (yes=1, no=0)	Log of monthly wage (wage workers)	Having wage below minimum wages (yes=1, no=0)
Quarter 2 * COVID year	0.0094*** (0.0011)	0.0305*** (0.0004)	-0.0186*** (0.0043)	-0.0104*** (0.0012)	-0.0078*** (0.0011)	-0.1024*** (0.0026)	0.0501*** (0.0022)
Quarter 3 * COVID year	0.0078*** (0.0011)	0.0028*** (0.0004)	-0.0142*** (0.0044)	-0.0141*** (0.0012)	-0.0117*** (0.0011)	-0.0694*** (0.0020)	0.0230*** (0.0015)
Quarter 4 * COVID year	0.0088*** (0.0014)	0.0004** (0.0002)	-0.0156*** (0.0045)	-0.0112*** (0.0011)	-0.0096*** (0.0010)	-0.0788*** (0.0031)	0.0964*** (0.0023)
Quarter 1	Reference						
Quarter 2	-0.0043*** (0.0012)	-0.0006*** (0.0001)	0.0108** (0.0045)	0.0009 (0.0007)	0.0001 (0.0005)	-0.0221*** (0.0041)	-0.0139*** (0.0017)
Quarter 3	-0.0055*** (0.0011)	-0.0007*** (0.0001)	0.0101** (0.0047)	0.0021* (0.0011)	0.0011 (0.0011)	-0.0019 (0.0042)	-0.0262*** (0.0020)
Quarter4	-0.0082*** (0.0014)	-0.0008*** (0.0001)	0.0234*** (0.0049)	0.0085*** (0.0007)	0.0075*** (0.0006)	0.0009 (0.0048)	-0.0325*** (0.0021)
COVID year	-0.0007 (0.0010)	-0.0005** (0.0002)	0.0882*** (0.0084)	0.0473*** (0.0034)	0.0528*** (0.0035)	0.2857*** (0.0063)	-0.0594*** (0.0029)
Control variables	No	No	No	No	No	No	No
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.0214*** (0.0009)	0.0013*** (0.0001)	0.3826*** (0.0080)	0.2441*** (0.0019)	0.2054*** (0.0020)	8.4967*** (0.0052)	0.1056*** (0.0026)
Observations	2,759,355	2,759,355	2,759,355	2,759,355	2,759,355	1,124,748	645,406
R-squared	0.010	0.011	0.121	0.158	0.148	0.216	0.052

Note: Control variables are the same as in Table 1, including gender, age, age squared, education levels and urban dummy.

Robust standard errors in parentheses (corrected for sampling weight and clustered at the district level and year-by-quarter level).

*** p<0.01, ** p<0.05, * p<0.1.

Source: authors' estimations from the LFSS.

Table A.8. OLS regression of employment variables with province fixed-effects

Explanatory variables	Dependent variables						
	Unemployed (yes=1, no=0)	Temporary layoff (yes=1, no=0)	Having a wage job (yes=1, no=0)	Having job with contract (yes=1, no=0)	Having a formal job (yes=1, no=0)	Log of monthly wage (wage workers)	Having wage below minimum wages (yes=1, no=0)
Quarter 2 * COVID year	0.0097*** (0.0018)	0.0305*** (0.0008)	-0.0166*** (0.0034)	-0.0089*** (0.0028)	-0.0068** (0.0029)	-0.1074*** (0.0068)	0.0532*** (0.0037)
Quarter 3 * COVID year	0.0083*** (0.0017)	0.0028*** (0.0006)	-0.0121*** (0.0037)	-0.0137*** (0.0038)	-0.0120*** (0.0038)	-0.0706*** (0.0071)	0.0261*** (0.0015)
Quarter 4 * COVID year	0.0090*** (0.0019)	0.0004 (0.0003)	-0.0141*** (0.0031)	-0.0113*** (0.0022)	-0.0101*** (0.0022)	-0.0808*** (0.0103)	0.0993*** (0.0061)
Quarter 1	Reference						
Quarter 2	-0.0039*** (0.0011)	-0.0006*** (0.0001)	0.0134*** (0.0042)	0.0029*** (0.0009)	0.0018** (0.0008)	-0.0227*** (0.0052)	-0.0137*** (0.0008)
Quarter 3	-0.0051*** (0.0011)	-0.0007*** (0.0001)	0.0129*** (0.0042)	0.0035*** (0.0011)	0.0022** (0.0010)	-0.0043 (0.0056)	-0.0263*** (0.0017)
Quarter4	-0.0075*** (0.0014)	-0.0008*** (0.0001)	0.0280*** (0.0045)	0.0103*** (0.0011)	0.0087*** (0.0012)	-0.0008 (0.0064)	-0.0322*** (0.0018)
COVID year	-0.0005 (0.0010)	-0.0004** (0.0002)	0.0812*** (0.0091)	0.0315*** (0.0071)	0.0369*** (0.0070)	0.2744*** (0.0072)	-0.0593*** (0.0046)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.1411*** (0.0086)	0.0007** (0.0003)	0.5503*** (0.0490)	0.3001*** (0.0506)	0.1829*** (0.0465)	7.1983*** (0.0622)	0.5076*** (0.0320)
Observations	2,759,355	2,759,355	2,759,355	2,759,355	2,759,355	1,124,748	645,406
R-squared	0.025	0.010	0.222	0.311	0.306	0.307	0.060

Note: Control variables are the same as in Table 1, including gender, age, age squared, education levels and urban dummy.

Robust standard errors in parentheses (corrected for sampling weight and clustered at the district level and year-by-quarter level).

*** p<0.01, ** p<0.05, * p<0.1.

Source: authors' estimations from the LFSSs.

Table A.9. OLS regression of employment variables using the sample without year 2015

Explanatory variables	Dependent variables						
	Unemployed (yes=1, no=0)	Temporary layoff (yes=1, no=0)	Having a wage job (yes=1, no=0)	Having job with contract (yes=1, no=0)	Having a formal job (yes=1, no=0)	Log of monthly wage (wage workers)	Having wage below minimum wages (yes=1, no=0)
Quarter 2 * COVID year	0.0097*** (0.0015)	0.0305*** (0.0004)	-0.0117*** (0.0018)	-0.0105*** (0.0016)	-0.0084*** (0.0015)	-0.1108*** (0.0028)	0.0545*** (0.0022)
Quarter 3 * COVID year	0.0080*** (0.0014)	0.0029*** (0.0004)	-0.0073*** (0.0019)	-0.0147*** (0.0016)	-0.0131*** (0.0014)	-0.0714*** (0.0026)	0.0265*** (0.0016)
Quarter 4 * COVID year	0.0089*** (0.0018)	0.0004*** (0.0001)	-0.0082*** (0.0018)	-0.0111*** (0.0011)	-0.0103*** (0.0010)	-0.0791*** (0.0037)	0.0998*** (0.0029)
Quarter 1	Reference						
Quarter 2	-0.0038** (0.0015)	-0.0006*** (0.0001)	0.0083*** (0.0020)	0.0038*** (0.0008)	0.0028*** (0.0008)	-0.0205*** (0.0040)	-0.0129*** (0.0016)
Quarter 3	-0.0047*** (0.0014)	-0.0008*** (0.0001)	0.0080*** (0.0022)	0.0044*** (0.0007)	0.0033*** (0.0007)	-0.0033 (0.0045)	-0.0244*** (0.0018)
Quarter4	-0.0073*** (0.0018)	-0.0008*** (0.0001)	0.0221*** (0.0022)	0.0105*** (0.0008)	0.0093*** (0.0007)	-0.0015 (0.0052)	-0.0307*** (0.0021)
COVID year	0.0029* (0.0015)	-0.0002** (0.0001)	0.0562*** (0.0043)	0.0261*** (0.0038)	0.0300*** (0.0038)	0.2314*** (0.0058)	-0.0677*** (0.0033)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.1430*** (0.0069)	0.0005* (0.0002)	0.6319*** (0.0329)	0.3618*** (0.0471)	0.2403*** (0.0455)	7.3266*** (0.0513)	0.4884*** (0.0263)
Observations	2,293,785	2,293,785	2,293,785	2,293,785	2,293,785	951,421	544,019
R-squared	0.031	0.013	0.244	0.328	0.323	0.345	0.092

Note: Control variables are the same as in Table 1, including gender, age, age squared, education levels and urban dummy.

Robust standard errors in parentheses (corrected for sampling weight and clustered at the district level and year-by-quarter level).

*** p<0.01, ** p<0.05, * p<0.1.

Source: authors' estimations from the LFSSs.

Table A.10. OLS regression of employment variables using the sample without year 2016

Explanatory variables	Dependent variables						
	Unemployed (yes=1, no=0)	Temporary layoff (yes=1, no=0)	Having a wage job (yes=1, no=0)	Having job with contract (yes=1, no=0)	Having a formal job (yes=1, no=0)	Log of monthly wage (wage workers)	Having wage below minimum wages (yes=1, no=0)
Quarter 2 * COVID year	0.0106*** (0.0013)	0.0305*** (0.0004)	-0.0199*** (0.0046)	-0.0104*** (0.0016)	-0.0081*** (0.0015)	-0.1108*** (0.0025)	0.0545*** (0.0023)
Quarter 3 * COVID year	0.0090*** (0.0012)	0.0027*** (0.0004)	-0.0158*** (0.0046)	-0.0139*** (0.0016)	-0.0124*** (0.0015)	-0.0744*** (0.0022)	0.0273*** (0.0019)
Quarter 4 * COVID year	0.0101*** (0.0016)	0.0004*** (0.0001)	-0.0177*** (0.0049)	-0.0115*** (0.0012)	-0.0104*** (0.0011)	-0.0856*** (0.0039)	0.0991*** (0.0028)
Quarter 1	Reference						
Quarter 2	-0.0047*** (0.0013)	-0.0006*** (0.0001)	0.0165*** (0.0049)	0.0037*** (0.0009)	0.0026*** (0.0008)	-0.0204*** (0.0038)	-0.0137*** (0.0020)
Quarter 3	-0.0056*** (0.0012)	-0.0006*** (0.0001)	0.0164*** (0.0049)	0.0036*** (0.0009)	0.0027*** (0.0009)	-0.0003 (0.0038)	-0.0260*** (0.0023)
Quarter4	-0.0085*** (0.0016)	-0.0008*** (0.0001)	0.0314*** (0.0052)	0.0109*** (0.0008)	0.0093*** (0.0007)	0.0050 (0.0048)	-0.0308*** (0.0021)
COVID year	-0.0010 (0.0011)	-0.0004*** (0.0001)	0.0829*** (0.0077)	0.0307*** (0.0040)	0.0359*** (0.0041)	0.2770*** (0.0053)	-0.0605*** (0.0032)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.1510*** (0.0057)	0.0006*** (0.0002)	0.6010*** (0.0354)	0.3507*** (0.0473)	0.2259*** (0.0460)	7.2804*** (0.0532)	0.4751*** (0.0253)
Observations	2,291,424	2,291,424	2,291,424	2,291,424	2,291,424	942,730	537,423
R-squared	0.032	0.012	0.243	0.327	0.319	0.343	0.087

Note: Control variables are the same as in Table 1, including gender, age, age squared, education levels and urban dummy.

Robust standard errors in parentheses (corrected for sampling weight and clustered at the district level and year-by-quarter level).

*** p<0.01, ** p<0.05, * p<0.1.

Source: authors' estimations from the LFSSs.

Table A.11. OLS regression of employment variables using the sample without year 2017

Explanatory variables	Dependent variables						
	Unemployed (yes=1, no=0)	Temporary layoff (yes=1, no=0)	Having a wage job (yes=1, no=0)	Having job with contract (yes=1, no=0)	Having a formal job (yes=1, no=0)	Log of monthly wage (wage workers)	Having wage below minimum wages (yes=1, no=0)
Quarter 2 * COVID year	0.0090*** (0.0013)	0.0305*** (0.0004)	-0.0167*** (0.0051)	-0.0085*** (0.0014)	-0.0060*** (0.0013)	-0.1081*** (0.0028)	0.0544*** (0.0022)
Quarter 3 * COVID year	0.0083*** (0.0014)	0.0028*** (0.0004)	-0.0137** (0.0052)	-0.0135*** (0.0015)	-0.0115*** (0.0014)	-0.0696*** (0.0029)	0.0261*** (0.0018)
Quarter 4 * COVID year	0.0091*** (0.0018)	0.0004** (0.0002)	-0.0158*** (0.0053)	-0.0107*** (0.0011)	-0.0095*** (0.0011)	-0.0816*** (0.0046)	0.0994*** (0.0027)
Quarter 1	Reference						
Quarter 2	-0.0033** (0.0013)	-0.0006*** (0.0002)	0.0134** (0.0055)	0.0019** (0.0007)	0.0006 (0.0005)	-0.0229*** (0.0044)	-0.0133*** (0.0017)
Quarter 3	-0.0051*** (0.0014)	-0.0007*** (0.0002)	0.0140** (0.0055)	0.0027*** (0.0007)	0.0011** (0.0005)	-0.0049 (0.0043)	-0.0250*** (0.0020)
Quarter4	-0.0075*** (0.0018)	-0.0008*** (0.0001)	0.0287*** (0.0058)	0.0087*** (0.0007)	0.0071*** (0.0006)	-0.0000 (0.0057)	-0.0312*** (0.0022)
COVID year	0.0002 (0.0012)	-0.0004** (0.0002)	0.0766*** (0.0085)	0.0245*** (0.0033)	0.0299*** (0.0033)	0.2710*** (0.0058)	-0.0590*** (0.0028)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.1441*** (0.0068)	0.0011*** (0.0002)	0.5272*** (0.0189)	0.2287*** (0.0177)	0.1069*** (0.0171)	7.1219*** (0.0522)	0.5102*** (0.0310)
Observations	2,287,381	2,287,381	2,287,381	2,287,381	2,287,381	933,476	540,930
R-squared	0.029	0.013	0.260	0.376	0.371	0.368	0.089

Note: Control variables are the same as in Table 1, including gender, age, age squared, education levels and urban dummy.

Robust standard errors in parentheses (corrected for sampling weight and clustered at the district level and year-by-quarter level).

*** p<0.01, ** p<0.05, * p<0.1.

Source: authors' estimations from the LFSSs.

Table A.12. OLS regression of employment variables using the sample without year 2018

Explanatory variables	Dependent variables						
	Unemployed (yes=1, no=0)	Temporary layoff (yes=1, no=0)	Having a wage job (yes=1, no=0)	Having job with contract (yes=1, no=0)	Having a formal job (yes=1, no=0)	Log of monthly wage (wage workers)	Having wage below minimum wages (yes=1, no=0)
Quarter 2 * COVID year	0.0107*** (0.0013)	0.0305*** (0.0004)	-0.0196*** (0.0047)	-0.0108*** (0.0017)	-0.0082*** (0.0015)	-0.1071*** (0.0031)	0.0560*** (0.0027)
Quarter 3 * COVID year	0.0092*** (0.0012)	0.0027*** (0.0004)	-0.0152*** (0.0048)	-0.0150*** (0.0016)	-0.0129*** (0.0015)	-0.0701*** (0.0028)	0.0285*** (0.0020)
Quarter 4 * COVID year	0.0099*** (0.0016)	0.0004** (0.0002)	-0.0173*** (0.0049)	-0.0118*** (0.0012)	-0.0102*** (0.0012)	-0.0778*** (0.0035)	0.1020*** (0.0030)
Quarter 1	Reference						
Quarter 2	-0.0049*** (0.0012)	-0.0006*** (0.0001)	0.0162*** (0.0051)	0.0040*** (0.0009)	0.0026*** (0.0008)	-0.0241*** (0.0037)	-0.0147*** (0.0020)
Quarter 3	-0.0059*** (0.0012)	-0.0006*** (0.0002)	0.0158*** (0.0052)	0.0047*** (0.0006)	0.0031*** (0.0008)	-0.0046 (0.0039)	-0.0272*** (0.0021)
Quarter4	-0.0084*** (0.0016)	-0.0008*** (0.0001)	0.0310*** (0.0054)	0.0111*** (0.0008)	0.0090*** (0.0008)	-0.0027 (0.0048)	-0.0335*** (0.0022)
COVID year	-0.0013 (0.0010)	-0.0004** (0.0002)	0.0816*** (0.0080)	0.0309*** (0.0040)	0.0359*** (0.0040)	0.2731*** (0.0058)	-0.0611*** (0.0028)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.1405*** (0.0066)	0.0007** (0.0002)	0.6089*** (0.0350)	0.3552*** (0.0473)	0.2284*** (0.0463)	7.2838*** (0.0541)	0.4947*** (0.0292)
Observations	2,291,199	2,291,199	2,291,199	2,291,199	2,291,199	933,564	532,500
R-squared	0.032	0.013	0.249	0.327	0.321	0.346	0.088

Note: Control variables are the same as in Table 1, including gender, age, age squared, education levels and urban dummy.

Robust standard errors in parentheses (corrected for sampling weight and clustered at the district level and year-by-quarter level).

*** p<0.01, ** p<0.05, * p<0.1.

Source: authors' estimations from the LFSSs.

Table A.13. OLS regression of employment variables using the sample without year 2019

Explanatory variables	Dependent variables						
	Unemployed (yes=1, no=0)	Temporary layoff (yes=1, no=0)	Having a wage job (yes=1, no=0)	Having job with contract (yes=1, no=0)	Having a formal job (yes=1, no=0)	Log of monthly wage (wage workers)	Having wage below minimum wages (yes=1, no=0)
Quarter 2 * COVID year	0.0088*** (0.0009)	0.0305*** (0.0004)	-0.0175*** (0.0051)	-0.0088*** (0.0016)	-0.0071*** (0.0016)	-0.1112*** (0.0034)	0.0566*** (0.0019)
Quarter 3 * COVID year	0.0073*** (0.0008)	0.0028*** (0.0004)	-0.0120** (0.0052)	-0.0135*** (0.0017)	-0.0120*** (0.0017)	-0.0747*** (0.0026)	0.0305*** (0.0014)
Quarter 4 * COVID year	0.0070*** (0.0009)	0.0005** (0.0002)	-0.0134** (0.0054)	-0.0112*** (0.0014)	-0.0097*** (0.0013)	-0.0853*** (0.0036)	0.1034*** (0.0026)
Quarter 1	Reference						
Quarter 2	-0.0030*** (0.0010)	-0.0006*** (0.0001)	0.0140** (0.0055)	0.0021** (0.0008)	0.0015* (0.0008)	-0.0205*** (0.0038)	-0.0142*** (0.0014)
Quarter 3	-0.0041*** (0.0009)	-0.0007*** (0.0002)	0.0125** (0.0056)	0.0032*** (0.0008)	0.0021** (0.0008)	-0.0006 (0.0038)	-0.0281*** (0.0018)
Quarter4	-0.0055*** (0.0009)	-0.0009*** (0.0001)	0.0271*** (0.0059)	0.0103*** (0.0008)	0.0084*** (0.0008)	0.0041 (0.0052)	-0.0340*** (0.0020)
COVID year	0.0005 (0.0011)	-0.0005** (0.0002)	0.0786*** (0.0089)	0.0292*** (0.0039)	0.0349*** (0.0039)	0.2762*** (0.0051)	-0.0620*** (0.0024)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.1394*** (0.0062)	0.0008*** (0.0003)	0.6056*** (0.0364)	0.3393*** (0.0509)	0.2165*** (0.0491)	7.2118*** (0.0613)	0.5332*** (0.0229)
Observations	2,313,760	2,313,760	2,313,760	2,313,760	2,313,760	929,234	528,451
R-squared	0.032	0.013	0.246	0.326	0.319	0.333	0.092

Note: Control variables are the same as in Table 1, including gender, age, age squared, education levels and urban dummy.

Robust standard errors in parentheses (corrected for sampling weight and clustered at the district level and year-by-quarter level).

*** p<0.01, ** p<0.05, * p<0.1.

Source: authors' estimations from the LFSSs.

Table A.14. OLS regression of employment variables using the sample of years 2015 and 2020

Explanatory variables	Dependent variables						
	Unemployed (yes=1, no=0)	Temporary layoff (yes=1, no=0)	Having a wage job (yes=1, no=0)	Having job with contract (yes=1, no=0)	Having a formal job (yes=1, no=0)	Log of monthly wage (wage workers)	Having wage below minimum wages (yes=1, no=0)
Quarter 2 * COVID year	0.0102*** (0.0004)	0.0306*** (0.0006)	-0.0396*** (0.0012)	-0.0070*** (0.0012)	-0.0043** (0.0013)	-0.1059*** (0.0032)	0.0575*** (0.0032)
Quarter 3 * COVID year	0.0097*** (0.0004)	0.0024*** (0.0005)	-0.0355*** (0.0012)	-0.0117*** (0.0012)	-0.0094*** (0.0012)	-0.0764*** (0.0028)	0.0321*** (0.0019)
Quarter 4 * COVID year	0.0095*** (0.0006)	0.0004 (0.0002)	-0.0402*** (0.0012)	-0.0117*** (0.0012)	-0.0087*** (0.0012)	-0.0958*** (0.0021)	0.1037*** (0.0019)
Quarter 1	Reference						
Quarter 2	-0.0045*** (0.0003)	-0.0007** (0.0003)	0.0361*** (0.0010)	0.0002 (0.0004)	-0.0013*** (0.0003)	-0.0249*** (0.0019)	-0.0175*** (0.0028)
Quarter 3	-0.0065*** (0.0004)	-0.0003 (0.0003)	0.0357*** (0.0018)	0.0006 (0.0013)	-0.0012 (0.0017)	0.0018 (0.0031)	-0.0327*** (0.0026)
Quarter4	-0.0079*** (0.0006)	-0.0009** (0.0003)	0.0527*** (0.0011)	0.0091*** (0.0009)	0.0057*** (0.0007)	0.0133*** (0.0028)	-0.0368*** (0.0018)
COVID year	-0.0008 (0.0006)	-0.0004 (0.0003)	0.0910*** (0.0034)	0.0226*** (0.0034)	0.0278*** (0.0035)	0.2744*** (0.0042)	-0.0612*** (0.0029)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.1414*** (0.0068)	0.0013** (0.0006)	0.5021*** (0.0209)	0.1978*** (0.0169)	0.0739*** (0.0171)	7.0537*** (0.0687)	0.5502*** (0.0409)
Observations	905,699	905,699	905,699	905,699	905,699	364,760	203,085
R-squared	0.034	0.022	0.268	0.377	0.368	0.352	0.089

Note: Control variables are the same as in Table 1, including gender, age, age squared, education levels and urban dummy.

Robust standard errors in parentheses (corrected for sampling weight and clustered at the district level and year-by-quarter level).

*** p<0.01, ** p<0.05, * p<0.1.

Source: authors' estimations from the LFSSs.

Table A.15. OLS regression of employment variables using the sample of years 2016 and 2020

Explanatory variables	Dependent variables						
	Unemployed (yes=1, no=0)	Temporary layoff (yes=1, no=0)	Having a wage job (yes=1, no=0)	Having job with contract (yes=1, no=0)	Having a formal job (yes=1, no=0)	Log of monthly wage (wage workers)	Having wage below minimum wages (yes=1, no=0)
Quarter 2 * COVID year	0.0067*** (0.0004)	0.0305*** (0.0005)	-0.0062*** (0.0013)	-0.0077*** (0.0015)	-0.0059*** (0.0016)	-0.1033*** (0.0041)	0.0566*** (0.0023)
Quarter 3 * COVID year	0.0061*** (0.0004)	0.0029*** (0.0004)	-0.0012 (0.0014)	-0.0157*** (0.0018)	-0.0129*** (0.0018)	-0.0611*** (0.0033)	0.0287*** (0.0015)
Quarter 4 * COVID year	0.0048*** (0.0004)	0.0004** (0.0001)	-0.0020 (0.0012)	-0.0104*** (0.0011)	-0.0088*** (0.0010)	-0.0655*** (0.0027)	0.1065*** (0.0026)
Quarter 1	Reference						
Quarter 2	-0.0010** (0.0004)	-0.0006*** (0.0001)	0.0027** (0.0010)	0.0010 (0.0007)	0.0002 (0.0007)	-0.0278*** (0.0024)	-0.0137*** (0.0019)
Quarter 3	-0.0030*** (0.0003)	-0.0008*** (0.0001)	0.0015 (0.0017)	0.0048*** (0.0009)	0.0023** (0.0009)	-0.0135*** (0.0032)	-0.0268*** (0.0020)
Quarter4	-0.0034*** (0.0004)	-0.0009*** (0.0001)	0.0149*** (0.0008)	0.0081*** (0.0008)	0.0060*** (0.0007)	-0.0167*** (0.0036)	-0.0371*** (0.0023)
COVID year	0.0053*** (0.0005)	-0.0003* (0.0001)	0.0468*** (0.0033)	0.0216*** (0.0035)	0.0254*** (0.0035)	0.2205*** (0.0038)	-0.0680*** (0.0024)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.1198*** (0.0066)	0.0014** (0.0004)	0.5646*** (0.0156)	0.2202*** (0.0174)	0.1028*** (0.0166)	7.1190*** (0.0626)	0.5773*** (0.0389)
Observations	908,060	908,060	908,060	908,060	908,060	373,451	209,681
R-squared	0.030	0.023	0.268	0.380	0.379	0.365	0.102

Note: Control variables are the same as in Table 1, including gender, age, age squared, education levels and urban dummy.

Robust standard errors in parentheses (corrected for sampling weight and clustered at the district level and year-by-quarter level).

*** p<0.01, ** p<0.05, * p<0.1.

Source: authors' estimations from the LFSSs.

Table A.16. OLS regression of employment variables using the sample of years 2017 and 2020

Explanatory variables	Dependent variables						
	Unemployed (yes=1, no=0)	Temporary layoff (yes=1, no=0)	Having a wage job (yes=1, no=0)	Having job with contract (yes=1, no=0)	Having a formal job (yes=1, no=0)	Log of monthly wage (wage workers)	Having wage below minimum wages (yes=1, no=0)
Quarter 2 * COVID year	0.0124*** (0.0004)	0.0306*** (0.0005)	-0.0164*** (0.0013)	-0.0123*** (0.0012)	-0.0109*** (0.0012)	-0.1150*** (0.0045)	0.0562*** (0.0023)
Quarter 3 * COVID year	0.0086*** (0.0005)	0.0028*** (0.0004)	-0.0092*** (0.0012)	-0.0159*** (0.0015)	-0.0153*** (0.0014)	-0.0820*** (0.0031)	0.0331*** (0.0015)
Quarter 4 * COVID year	0.0082*** (0.0004)	0.0004*** (0.0001)	-0.0063*** (0.0012)	-0.0100*** (0.0014)	-0.0088*** (0.0014)	-0.0817*** (0.0022)	0.1038*** (0.0025)
Quarter 1	Reference						
Quarter 2	-0.0064*** (0.0005)	-0.0007*** (0.0001)	0.0129*** (0.0009)	0.0055*** (0.0008)	0.0052*** (0.0009)	-0.0161*** (0.0020)	-0.0153*** (0.0018)
Quarter 3	-0.0053*** (0.0007)	-0.0007*** (0.0001)	0.0107*** (0.0018)	0.0067*** (0.0016)	0.0064*** (0.0017)	0.0068 (0.0037)	-0.0311*** (0.0024)
Quarter4	-0.0067*** (0.0007)	-0.0008*** (0.0001)	0.0217*** (0.0012)	0.0114*** (0.0010)	0.0097*** (0.0009)	0.0018 (0.0031)	-0.0351*** (0.0018)
COVID year	-0.0162*** (0.0041)	-0.0005*** (0.0001)	0.0751*** (0.0153)	0.0353* (0.0156)	0.0342* (0.0146)	0.1571*** (0.0097)	-0.0489*** (0.0024)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.1582*** (0.0088)	0.0000 (0.0003)	0.7634*** (0.0264)	0.5574*** (0.0311)	0.4329*** (0.0290)	7.5542*** (0.0385)	0.4538*** (0.0316)
Observations	912,103	912,103	912,103	912,103	912,103	382,705	206,174
R-squared	0.055	0.021	0.248	0.281	0.273	0.312	0.100

Note: Control variables are the same as in Table 1, including gender, age, age squared, education levels and urban dummy.

Robust standard errors in parentheses (corrected for sampling weight and clustered at the district level and year-by-quarter level).

*** p<0.01, ** p<0.05, * p<0.1.

Source: authors' estimations from the LFSSs.

Table A.17. OLS regression of employment variables using the sample of years 2018 and 2020

Explanatory variables	Dependent variables						
	Unemployed (yes=1, no=0)	Temporary layoff (yes=1, no=0)	Having a wage job (yes=1, no=0)	Having job with contract (yes=1, no=0)	Having a formal job (yes=1, no=0)	Log of monthly wage (wage workers)	Having wage below minimum wages (yes=1, no=0)
Quarter 2 * COVID year	0.0061*** (0.0004)	0.0306*** (0.0005)	-0.0071*** (0.0012)	-0.0057*** (0.0010)	-0.0049*** (0.0011)	-0.1178*** (0.0029)	0.0508*** (0.0015)
Quarter 3 * COVID year	0.0052*** (0.0004)	0.0031*** (0.0004)	-0.0035** (0.0011)	-0.0105*** (0.0014)	-0.0102*** (0.0013)	-0.0781*** (0.0021)	0.0238*** (0.0012)
Quarter 4 * COVID year	0.0055*** (0.0003)	0.0006*** (0.0001)	-0.0036** (0.0012)	-0.0091*** (0.0013)	-0.0094*** (0.0011)	-0.0968*** (0.0026)	0.0954*** (0.0026)
Quarter 1	Reference						
Quarter 2	-0.0001 (0.0004)	-0.0006*** (0.0001)	0.0038*** (0.0011)	-0.0007 (0.0007)	-0.0003 (0.0008)	-0.0134*** (0.0024)	-0.0093*** (0.0008)
Quarter 3	-0.0018** (0.0006)	-0.0009*** (0.0001)	0.0038 (0.0021)	-0.0005 (0.0015)	-0.0001 (0.0015)	0.0033 (0.0034)	-0.0216*** (0.0019)
Quarter4	-0.0038*** (0.0004)	-0.0010*** (0.0001)	0.0167*** (0.0015)	0.0069*** (0.0012)	0.0070*** (0.0011)	0.0145*** (0.0031)	-0.0263*** (0.0016)
COVID year	-0.0012** (0.0005)	-0.0006*** (0.0001)	0.0261*** (0.0022)	0.0157*** (0.0023)	0.0136*** (0.0023)	0.1318*** (0.0032)	-0.0341*** (0.0021)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.1646*** (0.0082)	0.0016*** (0.0001)	0.5658*** (0.0159)	0.2166*** (0.0165)	0.1125*** (0.0164)	7.2190*** (0.0519)	0.4714*** (0.0277)
Observations	908,285	908,285	908,285	908,285	908,285	382,617	214,603
R-squared	0.032	0.021	0.254	0.379	0.374	0.356	0.105

Note: Control variables are the same as in Table 1, including gender, age, age squared, education levels and urban dummy.

Robust standard errors in parentheses (corrected for sampling weight and clustered at the district level and year-by-quarter level).

*** p<0.01, ** p<0.05, * p<0.1.

Source: authors' estimations from the LFSSs.

Table A.18. OLS regression of employment variables using the sample of years 2019 and 2020

Explanatory variables	Dependent variables						
	Unemployed (yes=1, no=0)	Temporary layoff (yes=1, no=0)	Having a wage job (yes=1, no=0)	Having job with contract (yes=1, no=0)	Having a formal job (yes=1, no=0)	Log of monthly wage (wage workers)	Having wage below minimum wages (yes=1, no=0)
Quarter 2 * COVID year	0.0133*** (0.0005)	0.0305*** (0.0005)	-0.0147*** (0.0013)	-0.0132*** (0.0016)	-0.0089*** (0.0015)	-0.1041*** (0.0035)	0.0508*** (0.0012)
Quarter 3 * COVID year	0.0124*** (0.0009)	0.0027*** (0.0004)	-0.0158*** (0.0011)	-0.0164*** (0.0013)	-0.0137*** (0.0014)	-0.0631*** (0.0026)	0.0183*** (0.0007)
Quarter 4 * COVID year	0.0167*** (0.0008)	0.0002 (0.0001)	-0.0187*** (0.0012)	-0.0118*** (0.0008)	-0.0113*** (0.0008)	-0.0700*** (0.0026)	0.0913*** (0.0016)
Quarter 1	Reference						
Quarter 2	-0.0074*** (0.0006)	-0.0006*** (0.0000)	0.0117*** (0.0011)	0.0066*** (0.0008)	0.0037*** (0.0009)	-0.0261*** (0.0032)	-0.0114*** (0.0011)
Quarter 3	-0.0089*** (0.0009)	-0.0006*** (0.0000)	0.0163*** (0.0020)	0.0057** (0.0018)	0.0037* (0.0018)	-0.0105** (0.0041)	-0.0182*** (0.0017)
Quarter4	-0.0149*** (0.0009)	-0.0006*** (0.0000)	0.0319*** (0.0016)	0.0104*** (0.0015)	0.0096*** (0.0014)	-0.0104** (0.0043)	-0.0244*** (0.0014)
COVID year	-0.0070*** (0.0008)	-0.0000 (0.0001)	0.0183*** (0.0023)	0.0059** (0.0022)	0.0059** (0.0020)	0.0419*** (0.0028)	-0.0188*** (0.0017)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.1666*** (0.0093)	0.0004 (0.0004)	0.6016*** (0.0179)	0.3056*** (0.0206)	0.1820*** (0.0200)	7.6018*** (0.0388)	0.3252*** (0.0188)
Observations	885,724	885,724	885,724	885,724	885,724	386,947	218,652
R-squared	0.036	0.023	0.254	0.373	0.371	0.355	0.083

Note: Control variables are the same as in Table 1, including gender, age, age squared, education levels and urban dummy.

Robust standard errors in parentheses (corrected for sampling weight and clustered at the district level and year-by-quarter level).

*** p<0.01, ** p<0.05, * p<0.1.

Source: authors' estimations from the LFSSs.

Table A.19. OLS regression of employment variables using the 2015 year as the treatment year (placebo test)

Explanatory variables	Dependent variables						
	Unemployed (yes=1, no=0)	Temporary layoff (yes=1, no=0)	Having a wage job (yes=1, no=0)	Having job with contract (yes=1, no=0)	Having a formal job (yes=1, no=0)	Log of monthly wage (wage workers)	Having wage below minimum wages (yes=1, no=0)
Quarter 2 * Year 2016	-0.0007 (0.0012)	-0.0001 (0.0005)	0.0283*** (0.0039)	-0.0027 (0.0032)	-0.0033 (0.0033)	-0.0060 (0.0076)	-0.0059 (0.0053)
Quarter 3 * Year 2016	-0.0018 (0.0011)	0.0005 (0.0005)	0.0289*** (0.0039)	-0.0020 (0.0032)	-0.0029 (0.0033)	0.0036 (0.0075)	-0.0097* (0.0050)
Quarter 4 * Year 2016	-0.0006 (0.0012)	-0.0000 (0.0004)	0.0323*** (0.0039)	0.0008 (0.0033)	-0.0015 (0.0034)	0.0145* (0.0075)	-0.0075 (0.0049)
Quarter 1	Reference						
Quarter 2	-0.0038*** (0.0006)	-0.0006*** (0.0001)	0.0082*** (0.0018)	0.0037** (0.0017)	0.0027* (0.0016)	-0.0205*** (0.0035)	-0.0128*** (0.0019)
Quarter 3	-0.0047*** (0.0006)	-0.0008*** (0.0001)	0.0078*** (0.0019)	0.0042** (0.0017)	0.0031* (0.0017)	-0.0033 (0.0035)	-0.0244*** (0.0018)
Quarter4	-0.0073*** (0.0005)	-0.0008*** (0.0001)	0.0218*** (0.0019)	0.0102*** (0.0017)	0.0090*** (0.0016)	-0.0015 (0.0035)	-0.0307*** (0.0018)
Year 2015	-0.0024** (0.0010)	0.0002 (0.0004)	-0.0832*** (0.0032)	-0.0217*** (0.0026)	-0.0251*** (0.0027)	-0.2292*** (0.0066)	0.0429*** (0.0042)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.1462*** (0.0021)	0.0004* (0.0002)	0.6606*** (0.0053)	0.3566*** (0.0057)	0.2365*** (0.0056)	7.4617*** (0.0107)	0.4678*** (0.0073)
Observations	2,318,436	2,319,226	2,319,226	2,319,226	2,319,226	933,315	543,707
R-squared	0.031	0.002	0.248	0.334	0.327	0.350	0.092

Note: Control variables are the same as in Table 1, including gender, age, age squared, education levels and urban dummy.

Robust standard errors in parentheses (corrected for sampling weight and clustered at the district level and year-by-quarter level).

*** p<0.01, ** p<0.05, * p<0.1.

Source: authors' estimations from the LFSSs.

Table A.20. OLS regression of employment variables using the 2016 year as the treatment year (placebo test)

Explanatory variables	Dependent variables						
	Unemployed (yes=1, no=0)	Temporary layoff (yes=1, no=0)	Having a wage job (yes=1, no=0)	Having job with contract (yes=1, no=0)	Having a formal job (yes=1, no=0)	Log of monthly wage (wage workers)	Having wage below minimum wages (yes=1, no=0)
Quarter 2 * Year 2016	-0.0007 (0.0012)	-0.0001 (0.0005)	0.0283*** (0.0039)	-0.0027 (0.0032)	-0.0033 (0.0033)	-0.0060 (0.0076)	-0.0059 (0.0053)
Quarter 3 * Year 2016	-0.0018 (0.0011)	0.0005 (0.0005)	0.0289*** (0.0039)	-0.0020 (0.0032)	-0.0029 (0.0033)	0.0036 (0.0075)	-0.0097* (0.0050)
Quarter 4 * Year 2016	-0.0006 (0.0012)	-0.0000 (0.0004)	0.0323*** (0.0039)	0.0008 (0.0033)	-0.0015 (0.0034)	0.0145* (0.0075)	-0.0075 (0.0049)
Quarter 1	Reference						
Quarter 2	-0.0038*** (0.0006)	-0.0006*** (0.0001)	0.0082*** (0.0018)	0.0037** (0.0017)	0.0027* (0.0016)	-0.0205*** (0.0035)	-0.0128*** (0.0019)
Quarter 3	-0.0047*** (0.0006)	-0.0008*** (0.0001)	0.0078*** (0.0019)	0.0042** (0.0017)	0.0031* (0.0017)	-0.0033 (0.0035)	-0.0244*** (0.0018)
Quarter4	-0.0073*** (0.0005)	-0.0008*** (0.0001)	0.0218*** (0.0019)	0.0102*** (0.0017)	0.0090*** (0.0016)	-0.0015 (0.0035)	-0.0307*** (0.0018)
Year 2016	-0.0039*** (0.0009)	-0.0001 (0.0004)	0.0426*** (0.0031)	0.0034 (0.0025)	0.0041 (0.0027)	0.0464*** (0.0064)	0.0014 (0.0043)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.1438*** (0.0021)	0.0006 (0.0005)	0.5774*** (0.0056)	0.3350*** (0.0056)	0.2114*** (0.0055)	7.2325*** (0.0110)	0.5108*** (0.0083)
Observations	2,319,226	2,319,226	2,319,226	2,319,226	2,319,226	933,315	543,707
R-squared	0.031	0.002	0.248	0.334	0.327	0.350	0.092

Note: Control variables are the same as in Table 1, including gender, age, age squared, education levels and urban dummy.

Robust standard errors in parentheses (corrected for sampling weight and clustered at the district level and year-by-quarter level).

*** p<0.01, ** p<0.05, * p<0.1.

Source: authors' estimations from the LFSSs.

Table A.21. OLS regression of employment variables using the 2017 year as the treatment year (placebo test)

Explanatory variables	Dependent variables						
	Unemployed (yes=1, no=0)	Temporary layoff (yes=1, no=0)	Having a wage job (yes=1, no=0)	Having job with contract (yes=1, no=0)	Having a formal job (yes=1, no=0)	Log of monthly wage (wage workers)	Having wage below minimum wages (yes=1, no=0)
Quarter 2 * Year 2017	0.0038*** (0.0011)	0.0001 (0.0003)	-0.0136*** (0.0039)	-0.0024 (0.0034)	-0.0021 (0.0035)	-0.0070 (0.0076)	-0.0003 (0.0047)
Quarter 3 * Year 2017	0.0028*** (0.0009)	-0.0002 (0.0003)	-0.0148*** (0.0040)	0.0017 (0.0035)	0.0002 (0.0036)	-0.0126* (0.0074)	-0.0013 (0.0045)
Quarter 4 * Year 2017	0.0053*** (0.0010)	-0.0000 (0.0003)	-0.0159*** (0.0039)	-0.0015 (0.0032)	-0.0020 (0.0032)	-0.0204*** (0.0075)	-0.0070 (0.0045)
Quarter 1	Reference						
Quarter 2	-0.0047*** (0.0006)	-0.0006*** (0.0001)	0.0164*** (0.0018)	0.0036** (0.0016)	0.0025 (0.0016)	-0.0202*** (0.0035)	-0.0137*** (0.0020)
Quarter 3	-0.0056*** (0.0006)	-0.0006*** (0.0002)	0.0163*** (0.0019)	0.0035** (0.0017)	0.0025 (0.0016)	-0.0002 (0.0035)	-0.0259*** (0.0019)
Quarter4	-0.0085*** (0.0006)	-0.0008*** (0.0001)	0.0313*** (0.0019)	0.0107*** (0.0017)	0.0091*** (0.0017)	0.0051 (0.0035)	-0.0307*** (0.0018)
Year 2017	0.0055*** (0.0005)	-0.0001 (0.0002)	0.0528*** (0.0018)	0.0504*** (0.0015)	0.0544*** (0.0015)	0.1752*** (0.0032)	-0.0231*** (0.0020)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.1438*** (0.0020)	0.0007** (0.0003)	0.5932*** (0.0052)	0.3341*** (0.0054)	0.2097*** (0.0053)	7.2331*** (0.0104)	0.5053*** (0.0076)
Observations	2,319,226	2,319,226	2,319,226	2,319,226	2,319,226	933,315	543,707
R-squared	0.031	0.002	0.248	0.334	0.327	0.350	0.092

Note: Control variables are the same as in Table 1, including gender, age, age squared, education levels and urban dummy.

Robust standard errors in parentheses (corrected for sampling weight and clustered at the district level and year-by-quarter level).

*** p<0.01, ** p<0.05, * p<0.1.

Source: authors' estimations from the LFSSs.

Table A.22. OLS regression of employment variables using the 2018 year as the treatment year (placebo test)

Explanatory variables	Dependent variables						
	Unemployed (yes=1, no=0)	Temporary layoff (yes=1, no=0)	Having a wage job (yes=1, no=0)	Having job with contract (yes=1, no=0)	Having a formal job (yes=1, no=0)	Log of monthly wage (wage workers)	Having wage below minimum wages (yes=1, no=0)
Quarter 2 * Year 2018	0.0047*** (0.0012)	-0.0000 (0.0003)	-0.0121*** (0.0041)	-0.0041 (0.0033)	-0.0023 (0.0032)	0.0115 (0.0071)	0.0047 (0.0041)
Quarter 3 * Year 2018	0.0039*** (0.0011)	-0.0004 (0.0003)	-0.0115*** (0.0041)	-0.0039 (0.0032)	-0.0020 (0.0032)	0.0094 (0.0070)	0.0052 (0.0039)
Quarter 4 * Year 2018	0.0044*** (0.0011)	-0.0002 (0.0003)	-0.0140*** (0.0041)	-0.0030 (0.0033)	-0.0009 (0.0033)	0.0187*** (0.0072)	0.0075* (0.0039)
Quarter 1	Reference						
Quarter 2	-0.0049*** (0.0006)	-0.0006*** (0.0001)	0.0162*** (0.0018)	0.0040** (0.0016)	0.0026 (0.0017)	-0.0240*** (0.0036)	-0.0149*** (0.0021)
Quarter 3	-0.0059*** (0.0006)	-0.0006*** (0.0002)	0.0157*** (0.0018)	0.0046*** (0.0017)	0.0029* (0.0017)	-0.0046 (0.0036)	-0.0273*** (0.0020)
Quarter4	-0.0084*** (0.0006)	-0.0008*** (0.0001)	0.0310*** (0.0019)	0.0110*** (0.0017)	0.0089*** (0.0016)	-0.0028 (0.0036)	-0.0337*** (0.0019)
Year 2018	0.0006 (0.0009)	0.0002 (0.0003)	0.0562*** (0.0031)	0.0139*** (0.0024)	0.0208*** (0.0025)	0.1400*** (0.0061)	-0.0277*** (0.0034)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.1439*** (0.0020)	0.0007** (0.0003)	0.5935*** (0.0052)	0.3336*** (0.0054)	0.2096*** (0.0053)	7.2373*** (0.0104)	0.5069*** (0.0076)
Observations	2,319,226	2,319,226	2,319,226	2,319,226	2,319,226	933,315	543,707
R-squared	0.031	0.002	0.248	0.334	0.327	0.350	0.092

Note: Control variables are the same as in Table 1, including gender, age, age squared, education levels and urban dummy.

Robust standard errors in parentheses (corrected for sampling weight and clustered at the district level and year-by-quarter level).

*** p<0.01, ** p<0.05, * p<0.1.

Source: authors' estimations from the LFSSs.

Table A.23. OLS regression of employment variables using the 2019 year as the treatment year (placebo test)

Explanatory variables	Dependent variables						
	Unemployed (yes=1, no=0)	Temporary layoff (yes=1, no=0)	Having a wage job (yes=1, no=0)	Having job with contract (yes=1, no=0)	Having a formal job (yes=1, no=0)	Log of monthly wage (wage workers)	Having wage below minimum wages (yes=1, no=0)
Quarter 2 * Year 2019	-0.0045*** (0.0015)	0.0001 (0.0002)	-0.0015 (0.0043)	0.0054 (0.0040)	0.0031 (0.0040)	-0.0055 (0.0083)	0.0030 (0.0038)
Quarter 3 * Year 2019	-0.0051*** (0.0015)	0.0001 (0.0002)	0.0041 (0.0044)	0.0032 (0.0041)	0.0024 (0.0040)	-0.0095 (0.0084)	0.0095*** (0.0037)
Quarter 4 * Year 2019	-0.0098*** (0.0015)	0.0003 (0.0002)	0.0050 (0.0045)	0.0007 (0.0041)	0.0017 (0.0039)	-0.0141* (0.0083)	0.0095*** (0.0036)
Quarter 1	Reference						
Quarter 2	-0.0030*** (0.0005)	-0.0006*** (0.0001)	0.0140*** (0.0018)	0.0021 (0.0015)	0.0015 (0.0015)	-0.0203*** (0.0034)	-0.0144*** (0.0021)
Quarter 3	-0.0040*** (0.0005)	-0.0007*** (0.0002)	0.0125*** (0.0018)	0.0031** (0.0016)	0.0021 (0.0016)	-0.0005 (0.0033)	-0.0283*** (0.0020)
Quarter4	-0.0055*** (0.0005)	-0.0009*** (0.0001)	0.0271*** (0.0018)	0.0102*** (0.0015)	0.0084*** (0.0016)	0.0043 (0.0034)	-0.0342*** (0.0020)
Year 2019	0.0079*** (0.0013)	-0.0004* (0.0002)	0.0590*** (0.0032)	0.0203*** (0.0028)	0.0252*** (0.0028)	0.2334*** (0.0070)	-0.0428*** (0.0032)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.1422*** (0.0020)	0.0007** (0.0003)	0.5958*** (0.0052)	0.3347*** (0.0054)	0.2102*** (0.0052)	7.2335*** (0.0103)	0.5071*** (0.0076)
Observations	2,319,226	2,319,226	2,319,226	2,319,226	2,319,226	933,315	543,707
R-squared	0.031	0.002	0.248	0.334	0.327	0.350	0.092

Note: Control variables are the same as in Table 1, including gender, age, age squared, education levels and urban dummy.

Robust standard errors in parentheses (corrected for sampling weight and clustered at the district level and year-by-quarter level).

*** p<0.01, ** p<0.05, * p<0.1.

Source: authors' estimations from the LFSSs.

Table A.24. OLS regression of employment variables on quarters 2-4

Explanatory variables	Dependent variables							
	Unemployed (yes=1, no=0)	Temporary layoff (yes=1, no=0)	Having a wage job (yes=1, no=0)	Having job with contract (yes=1, no=0)	Having a formal job (yes=1, no=0)	Log of number of working hours in the last 7 days	Log of monthly wage (wage workers)	Having wage below minimum wages (yes=1, no=0)
Quarter 2-4 * COVID year	0.0090*** (0.0016)	0.0110 (0.0080)	-0.0147** (0.0056)	-0.0118*** (0.0018)	-0.0100*** (0.0017)	0.0179 (0.0271)	-0.0873*** (0.0148)	0.0626*** (0.0174)
Quarter 2-4	-0.0055*** (0.0012)	-0.0007*** (0.0001)	0.0184*** (0.0047)	0.0059*** (0.0010)	0.0044*** (0.0009)	0.0685*** (0.0211)	-0.0077 (0.0047)	-0.0244*** (0.0026)
COVID year	-0.0004 (0.0012)	-0.0004** (0.0002)	0.0793*** (0.0087)	0.0293*** (0.0041)	0.0347*** (0.0041)	-0.0268 (0.0203)	0.2745*** (0.0080)	-0.0606*** (0.0045)
Male (male=1, female=0)	0.0003 (0.0008)	0.0003* (0.0001)	0.0947*** (0.0038)	-0.0298*** (0.0037)	-0.0383*** (0.0036)	0.0763*** (0.0035)	0.1770*** (0.0050)	-0.0506*** (0.0038)
Age	-0.0056*** (0.0003)	0.0000* (0.0000)	-0.0014** (0.0006)	-0.0001 (0.0005)	0.0039*** (0.0006)	0.0220*** (0.0010)	0.0591*** (0.0015)	-0.0202*** (0.0010)
Age squared	0.0001*** (0.0000)	-0.0000** (0.0000)	-0.0001*** (0.0000)	-0.0001*** (0.0000)	-0.0001*** (0.0000)	-0.0003*** (0.0000)	-0.0008*** (0.0000)	0.0003*** (0.0000)
Less than primary education	Reference							
Primary education	0.0002 (0.0016)	0.0001 (0.0001)	-0.1092*** (0.0249)	-0.0998** (0.0372)	-0.0966** (0.0366)	0.0129*** (0.0040)	-0.0478 (0.0429)	-0.0123 (0.0078)
Lower-secondary education	0.0000 (0.0018)	0.0001 (0.0001)	-0.1220*** (0.0280)	-0.0709 (0.0416)	-0.0730* (0.0412)	0.0192*** (0.0045)	0.0016 (0.0462)	-0.0270*** (0.0084)
Upper-secondary education	0.0044* (0.0022)	-0.0001 (0.0003)	-0.0395 (0.0306)	0.0965** (0.0455)	0.0789* (0.0448)	0.0455*** (0.0050)	0.0682 (0.0490)	-0.0375*** (0.0093)
Post-secondary education	0.0177** (0.0066)	-0.0007*** (0.0002)	0.2100*** (0.0486)	0.4621*** (0.0613)	0.4613*** (0.0594)	-0.0093 (0.0086)	0.3262*** (0.0482)	-0.0668*** (0.0113)
Urban area (urban=1, rural=0)	0.0084*** (0.0010)	0.0006** (0.0002)	0.0526*** (0.0089)	0.0477*** (0.0107)	0.0427*** (0.0104)	0.0660*** (0.0049)	0.0519*** (0.0083)	0.0004 (0.0024)
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.1440*** (0.0060)	0.0008*** (0.0002)	0.5930*** (0.0319)	0.3303*** (0.0430)	0.2064*** (0.0417)	3.2261*** (0.0287)	7.2429*** (0.0537)	0.4994*** (0.0254)
Observations	2,759,355	2,759,355	2,759,355	2,759,355	2,759,355	2,682,379	1,124,748	645,406
R-squared	0.031	0.005	0.247	0.334	0.328	0.209	0.346	0.088

Note: Control variables are the same as in Table 1, including gender, age, age squared, education levels and urban dummy.

Robust standard errors in parentheses (corrected for sampling weight and clustered at the district level and year-by-quarter level).

*** p<0.01, ** p<0.05, * p<0.1.

Source: authors' estimations from the LFSs.

Table A.25. OLS regression of log of wage for different wage groups

Explanatory variables	Groups of workers with different wage levels							
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Bottom 10%	Bottom 40%	Below minimum wages
Quarter 2-4 * COVID year	-0.1350*** (0.0385)	-0.0139*** (0.0032)	-0.0099 (0.0060)	-0.0108 (0.0097)	-0.0150 (0.0199)	-0.1273*** (0.0339)	-0.1413*** (0.0350)	-0.1937** (0.0702)
Quarter 2-4	0.0329*** (0.0034)	-0.0018 (0.0029)	-0.0072*** (0.0015)	-0.0058* (0.0033)	-0.0759*** (0.0064)	0.0250*** (0.0057)	0.0323*** (0.0031)	-0.0049 (0.0058)
COVID year	0.1022*** (0.0072)	-0.0217*** (0.0028)	-0.0003 (0.0014)	0.0320*** (0.0033)	0.0200*** (0.0056)	0.0370*** (0.0086)	0.1709*** (0.0069)	0.2181*** (0.0099)
Male (male=1, female=0)	0.0739*** (0.0047)	0.0063*** (0.0010)	0.0026*** (0.0005)	0.0080*** (0.0007)	0.0501*** (0.0045)	0.0526*** (0.0058)	0.0977*** (0.0047)	-0.0118 (0.0079)
Age	0.0339*** (0.0011)	0.0018*** (0.0001)	0.0008*** (0.0001)	0.0013*** (0.0002)	0.0072*** (0.0016)	0.0284*** (0.0012)	0.0405*** (0.0013)	0.0121*** (0.0014)
Age squared	-0.0005*** (0.0000)	-0.0000*** (0.0000)	-0.0000*** (0.0000)	-0.0000*** (0.0000)	-0.0001*** (0.0000)	-0.0004*** (0.0000)	-0.0006*** (0.0000)	-0.0002*** (0.0000)
Less than primary education	Reference							
Primary education	0.0589*** (0.0078)	-0.0010 (0.0019)	-0.0008 (0.0010)	-0.0121*** (0.0022)	-0.0573*** (0.0163)	0.0486*** (0.0058)	0.0532*** (0.0127)	0.0314*** (0.0076)
Lower-secondary education	0.0802*** (0.0092)	0.0019 (0.0022)	-0.0006 (0.0012)	-0.0104*** (0.0027)	-0.0533*** (0.0150)	0.0591*** (0.0063)	0.0837*** (0.0142)	0.0370*** (0.0083)
Upper-secondary education	0.0622*** (0.0111)	0.0047** (0.0022)	0.0014 (0.0014)	-0.0026 (0.0029)	-0.0257 (0.0168)	0.0295*** (0.0083)	0.0844*** (0.0163)	0.0086 (0.0098)
Post-secondary education	0.0982*** (0.0133)	0.0110*** (0.0024)	0.0052*** (0.0013)	0.0109*** (0.0030)	0.0664*** (0.0182)	0.0631*** (0.0113)	0.1443*** (0.0186)	-0.0097 (0.0161)
Urban area (urban=1, rural=0)	0.0227*** (0.0051)	0.0034*** (0.0008)	0.0008 (0.0006)	0.0015 (0.0011)	-0.0042 (0.0046)	0.0257*** (0.0057)	0.0239*** (0.0051)	0.0170** (0.0077)
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	7.4627*** (0.0257)	8.5720*** (0.0044)	8.7577*** (0.0021)	8.9119*** (0.0062)	9.2160*** (0.0417)	7.4063*** (0.0235)	7.4470*** (0.0325)	7.5715*** (0.0283)
Observations	416,405	221,476	158,396	185,865	142,605	240,272	637,881	50,203
R-squared	0.183	0.070	0.086	0.068	0.105	0.156	0.222	0.344

Note: Control variables are the same as in Table 1, including gender, age, age squared, education levels and urban dummy.

Robust standard errors in parentheses (corrected for sampling weight and clustered at the district level and year-by-quarter level).

*** p<0.01, ** p<0.05, * p<0.1.

Source: authors' estimations from the LFSs.

Table A.26. Effects of the COVID-19 pandemic on different groups of workers by industries

Explanatory variables	Industries of employment								
	Agriculture	Fishery	Mining, electricity, water	Manufacture, processing	Construction	Trade	Hotel, restaurant	Transportation	Service
Effects on workers below minimum wages	-0.0403 (0.0357)	-0.1101* (0.0534)	-0.0331 (0.0329)	-0.1138*** (0.0248)	-0.1442*** (0.0309)	-0.3687* (0.1961)	-0.2739** (0.1184)	-0.2463*** (0.0588)	-0.0971*** (0.0294)
Effects on workers not below minimum wages	0.0219 (0.0189)	-0.0125 (0.0327)	0.0867*** (0.0110)	0.0011 (0.0236)	-0.0188* (0.0093)	0.0576 (0.0695)	0.0565 (0.0751)	-0.0361 (0.0314)	-0.0194*** (0.0066)
Effects on workers in wage quintile 1	-0.0312 (0.0417)	-0.2405*** (0.0597)	-0.0532 (0.1249)	-0.0596 (0.0353)	-0.1273*** (0.0336)	-0.5564*** (0.1326)	-0.3454*** (0.1166)	-0.3456*** (0.0680)	-0.1020*** (0.0219)
Effects on workers in wage quintiles 2 to 5	-0.0289*** (0.0066)	0.0036 (0.0228)	0.0415** (0.0153)	-0.0170 (0.0239)	-0.0390*** (0.0057)	0.0713 (0.0684)	0.0361 (0.0802)	-0.0693*** (0.0218)	-0.0122 (0.0084)

Note: Control variables are the same as in Table 1, including gender, age, age squared, education levels and urban dummy, district and year fixed-effects.

Robust standard errors in parentheses (corrected for sampling weight and clustered at the district level and year-by-quarter level).

*** p<0.01, ** p<0.05, * p<0.1.

Source: authors' estimations from the LFSs.

Table A.27. Effects of the COVID-19 pandemic on different groups of workers by regions

Explanatory variables	Areas and regions							
	Rural	Urban	Red River Delta	Northern Mountain	Central Coast	Highland	Southeast	Mekong River Delta
Effects on workers below minimum wages	-0.1138*** (0.0289)	-0.1759*** (0.0584)	-0.0799*** (0.0214)	-0.0681*** (0.0095)	-0.0950*** (0.0144)	-0.0246 (0.0228)	-0.1176*** (0.0149)	-0.0644*** (0.0076)
Effects on workers not below minimum wages	0.0164 (0.0238)	-0.0257 (0.0158)	0.0179 (0.0230)	0.0103 (0.0112)	0.0206 (0.0144)	-0.0086 (0.0108)	-0.0349 (0.0227)	-0.0007 (0.0218)
Effects on workers in wage quintile 1	-0.1464** (0.0655)	-0.2415*** (0.0743)	-0.1960** (0.0934)	-0.2438*** (0.0531)	-0.2558*** (0.0460)	-0.0040 (0.0577)	-0.1025 (0.0938)	-0.1320* (0.0712)
Effects on workers in wage quintiles 2 to 5	-0.0066 (0.0208)	-0.0309* (0.0157)	0.0040 (0.0232)	-0.0049 (0.0204)	-0.0036 (0.0077)	-0.0295*** (0.0086)	-0.0486** (0.0212)	-0.0196 (0.0214)
Note: Control variables are the same as in Table 1, including gender, age, age squared, education levels and urban dummy, district and year fixed-effects. Robust standard errors in parentheses (corrected for sampling weight and clustered at the district level and year-by-quarter level).								
*** p<0.01, ** p<0.05, * p<0.1.								
Source: authors' estimations from the LFSs.								