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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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ABSTRACT

Despite its low middle-income status, Vietnam has been widely praised for its success in the fight against early waves of the COVID-19 pandemic, with a low mortality rate of approximately 100 deaths out of a population of less than 100 million by the end of 2020. We add to the emerging literature on COVID-19 effects on the labor market for poorer countries by analyzing rich individual-level data from Vietnam's Labor Force Surveys spanning 2015 to 2020. We find post-pandemic increases in unemployment and temporary layoff rates alongside decreases in employment quality. Monthly wages declined even as the proportion of workers receiving below-minimum wages substantially increased, contributing to sharply rising wage inequality. Our findings suggest that more resources should be allocated to protect vulnerable workers, especially as the pandemic continues to cause increasingly severe damage to the global economy.

1. Introduction

The ongoing COVID-19 pandemic has wreaked havoc on rich and poor economies alike around the world. 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 (Huynh, 2020; Trevisan et al., 2020; Hartley et al., 2021). 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 stay-at-home orders were regarded as effective and were strongly supported by the public. As a result, while many countries were still grappling with the outbreak, Vietnam mostly had the pandemic in check in 2020. Tracking data from John Hopkins University suggest that by the end of the year, the country registered an extremely low fatality rate of only 78 deaths, an impressive feat given its population size of slightly more than 96 million.[1]

But did this preliminary 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 sectors were most impacted? In particular, were low-income workers affected at higher rates relative to higher-income workers? We seek answers to these questions in order to provide relevant evidence to policy makers in Vietnam who are eager to capitalize on the country's preliminary medical successes to speed up economic growth, but face the daunting challenge of fighting subsequent pandemic waves as COVID-19 continues to ricochet around the world. The lessons learned from Vietnam's experience are also rel-

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[1] The numbers of COVID-19 cases and deaths increased for Vietnam in 2021 as a result of the Delta variant, as was the case for many countries around the world. However, for this paper, we focus our analysis on the immediate impacts of the outbreak during 2020, due to the availability of survey data.

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evant for other lower-income countries that plan to implement similarly strict lockdown measures.[2]

A cursory look at the Vietnam Labor Force Surveys (LFSs) between 2015 and 2020 offers some indication as to the adverse effects of the pandemic. Plotting the average employment outcomes by quarters, Fig. 1 suggests that the average number of working hours during the last seven days remains similar to those in previous years. Yet, both the unemployment rate and the proportion of workers working for less than the minimum wages in Quarters 2 to 4 in 2020 are higher than figures for the corresponding quarters in previous years.[3] In fact, the temporary layoff rate sharply increased thirtyfold to 3.1 % in Quarter 2 of 2020. The average monthly wages in the second and the fourth quarters of 2020 were also lower than the corresponding figures for 2019.

As a preview of our findings, employing more rigorous analysis using the difference-in-differences (DD) econometric model, 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 contracts, and formal jobs, was also reduced. Compared to the first quarter of 2020, workers' monthly wages decreased by 11 % in the second quarter, 7.2 % in the third quarter, and 8.2 % in the fourth quarter. Informal household workers and foreign direct investment (FDI) sector workers were more affected than public sector workers, and workers in the transportation and tourism sectors were most heavily affected. Most worryingly, the proportion of workers working below minimum wages increased by 32 %, fueling significant increases in wage inequality. Some evidence suggests that provinces with greater openness to the global economy witnessed weaker pandemic effects. Further analysis that exploits both timing and geographical variations with lockdown policies, using the regression discontinuity design (RDD) model in combination with difference-in-differences (RDD-DD) and triple differences (RDD-DDD) models, points to lockdown policies as being the primary channel of pandemic impacts.

Beyond offering the first comprehensive analysis of the impacts of COVID-19 on labor outcomes for Vietnam, our study makes several new contributions to the literature. First, we add to the emerging literature on the impacts of the pandemic on labor outcomes in a lower-income country setting. We analyze large-scale, nationally representative, annual LFS data, which span the five years preceding the year of the pandemic and average more than 600,000 households per survey year. The large samples of official labor data before and after the pandemic offer us a rare opportunity to employ rigorous econometric models for analysis.

Indeed, a large number of studies generally find negative pandemic effects on employment in high-income countries (e.g., Adams-Prassl et al., 2020; Coibion et al., 2020; Gupta et al., 2020; Albanesi and Kim, 2021; Dang and Nguyen, 2021), but far fewer studies exist for poorer countries. Since the differences in labor market institutions and available government budgets can vary widely between richer and poorer countries, the policy responses that are effective in high-income countries may not be applicable for poorer countries.

Furthermore, while some early studies for poorer countries usefully document declines in employment after the pandemic, they mostly rely on smaller phone survey samples (e.g., Egger et al., 2021; Khamis et al., 2021; Mahmud and Riley, 2021; Bundervoet, Dávalos, and Garcia, 2022). Very few studies analyze large-scale official national labor surveys. Phone survey data are prone to various sampling issues, such as low response rates and undercoverage. They also tend to have shorter questionnaires with far fewer variables than the typical household survey, and so typically do not allow for the rigorous and comprehensive analysis that can be implemented with LFS data.[4] To our knowledge, Deshpande (2020) is the only study that analyzes post-pandemic employment using large-scale nationally representative household survey data. Exploring the effects of the pandemic on gender-based differences in employment between April and August 2020, Deshpande (2020) found that women reported higher unemployment levels than men after the first wave of the outbreak, and incomes in the rural sector declined for both genders.

Second, by leveraging large-scale LFS data spanning 2015 to 2020 with new district-level minimum wage data that we manually compile, we are able to more granularly explore the heterogeneous effects of the pandemic on different population subgroups by gender, age, education level, and income level, inter alia. We can also examine disaggregated effects for employment industries and wage quintiles and further map out the effects geographically for different provinces across the country.

Finally, we analyze a wide range of employment indicators, including unemployment, temporary layoffs, labor market participation, employment with labor contract and social insurance, working hours, and monthly wages. We also study the effects of the pandemic on the proportion of below-minimum wage workers and offer new analysis on wage inequality. It has been observed that pandemic-induced labor practices in richer countries (such as home-based work) turn out to be mostly unfavorable to lower-income households and can even exacerbate pre-existing inequalities (Bonacini et al., 2021; Papageorge et al., 2021). Yet, while protecting low-wage workers with minimum wages is among the key labor policies in most countries, to our knowledge, the effects of the pandemic on wage inequality in poorer countries has received little, if any, attention.

This paper consists of six sections. We describe the country background and data in Section 2, followed by a discussion of our estimation methods in Section 3. In Section 4, we test the assumptions underlying our analytical methods (Section 4.1) and provide the estimation results (Section 4.2) and analysis of potential mechanism (Section 4.3), along with various robustness checks (Section 4.4) and heterogeneity analysis (Section 4.5). We offer further analysis on low-wage workers and wage inequality in Section 5 and conclude in Section 6.

[2] While many countries including Australia, New Zealand, and Singapore have relaxed their COVID-19 lockdown measures, other countries such as China and North Korea are continuing to follow even stronger pandemic policies (i.e., a zero-COVID policy). At the time of this writing, China has implemented tight lockdown measures for the whole city of Shanghai and is considering similar lockdown measures for Beijing (Feng and Sebastian, 2022; Wang, 2022). Hong Kong, a major Chinese financial center, also adopted a strong stance on COVID-19 control (Riordan and Ho-him, 2022).

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

[4] In particular, Jain et al. (2020) observe that the response rate in their phone survey was approximately 40%, which is higher than the traditional attrition rate of 20–30%. Egger et al. (2021) acknowledge that by design, the short duration of the phone surveys offer relatively coarse measures of income and welfare and may not adequately capture very poor households, who may live in areas with low connectivity and might not own phones. On the other hand, Miguel and Mobarak (2022) suggest that economic data are not as well-regulated in poorer countries as in richer countries, so phone surveys offer a good method of tracking economic conditions during the pandemic in poorer countries. Other studies restrict analysis to certain population subgroups such as workers in low-income areas of urban India (Dhingra and Machin, 2020) or rely on satellite data analysis on other outcomes such as air quality in Vietnam (e.g., Dang and Trinh, 2022). See also Brodeur et al. (2021), Bloom et al. (2022), and Miguel and Mobarak (2022) for recent review studies on the impacts of the pandemic.

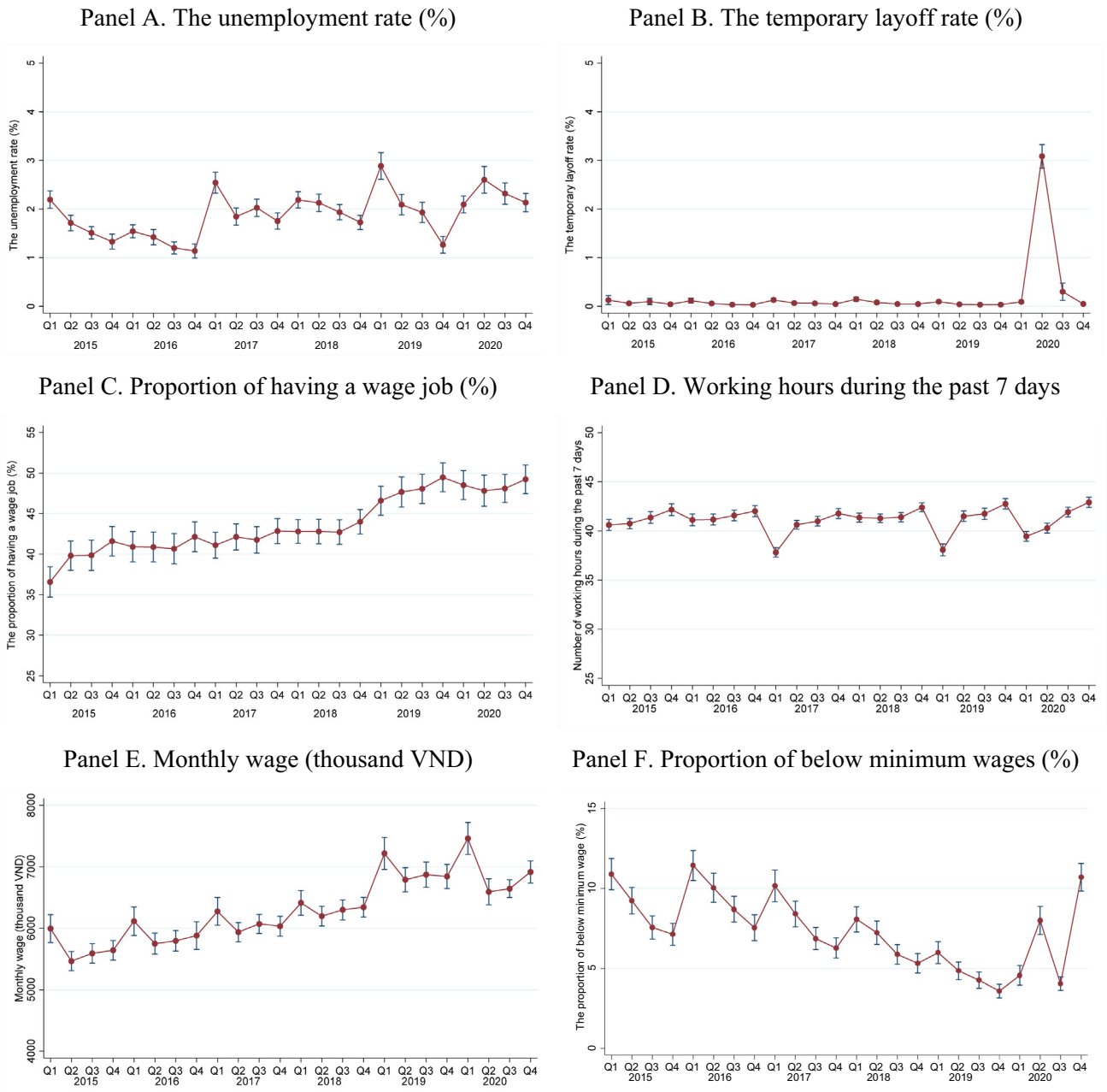

Fig. 1. Outcome variables.

2. Country background and data description

2.1. Country background

The first wave of COVID-19 began in Vietnam in late March 2020, with around 10 infection cases detected per day (MoH, 2020). Despite the low case number, Vietnam closed its international borders on March 22, 2020 and imposed a strict nationwide lockdown in April 2020.[5] The lockdown was implemented in all 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 for 6 weeks, between July 27 and September 4, 2020, and social distancing was imposed within several neighboring provinces during this period.

However, the strong lockdown measures against the pandemic were costly for the economy. Despite achieving an impressive, world-leading GDP growth rate of 2.9 percent in 2020, the country's economic growth in this year was still less than half of rates as high as 6 percent in preceding years (GSO, 2021a). Official statistics from the Government of Vietnam suggests that about 32.1 million people aged 15 and over nationwide were negatively affected by COVID-19 (GSO, 2021b). Various rapid assessment studies based on online or phone surveys implemented between April

[5] According to Directive No. 15/CT-TTg dated March 27, 2020, social isolation was implemented nationwide within 15 days from April 1, 2020, on the principle 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.

and September 2020 – the months immediately following the onset of the pandemic – point to pandemic-induced income losses and further suggest that unemployed and informal workers (i.e., those without labor contracts) were the most significantly affected (UN Women, 2020; Yang, Panagoulias, & Demarchi, 2020; Dang, Giang, and Do, 2021; Do et al., 2021). Consequently, the government has been pursuing the dual targets of both containing the pandemic and maintaining economic growth.

2.2. Data description

We analyze Vietnam Labor Force Surveys (LFSs) conducted between 2015 and 2020. LFS data are the official source of labor statistics in Vietnam, collected annually by the country's General Statistics Office (GSO). The LFSs rely on a two-stage stratified cluster design and contain 126 strata comprising of urban and rural areas in 63 provinces throughout the country.[6] The surveys 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. Aside from collecting basic individual demographic information, the LFSs collect detailed data on employment and wages for people aged 15 and older as well as data on unemployment. Our estimation sample sizes range between 600,000 and 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.[7] As such, for the period 2015–2020, we manually collect minimum wage data from the Government of Vietnam's annual Decrees on minimum wages for each of the approximately 700 districts, 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 Fig. A.3, Appendix A). The nominal minimum wages were not increased in 2021, implying that the real minimum wages decreased slightly in 2021 because of inflation. However, as we analyze the LFS data for the period 2015–2020, the 2021 decrease in the real minimum wage does not pose a concern in this study.

We examine the impacts of the COVID-19 pandemic on a wide range of employment outcomes including unemployment, temporary layoffs, the number of working hours during the last seven days, monthly wages, wages below the minimum wages, and whether workers have a wage job, a job with a contract, or a formal job (that is, a job with social insurance). Table A.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).[8] The proportion of workers with a wage job increased from 39.5 % in 2015 to 48.4 % in 2020. In 2020, wage workers with contracts accounted for 30 % of the workforce, while wage workers with a formal job accounted for 26.7 %.[9]

3. Estimation method

Since the COVID-19 pandemic occurred in late March 2020 and Vietnam subsequently imposed its 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 effects of the pandemic on employment outcomes in Vietnam, using a difference-in-differences (DD) econometric model that compares the differences in outcomes between Quarter 1 and the other quarters in 2020 with those averaged over the preceding five years.

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 follows[11].

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

where $\mathrm{E}\left(Y_{Q1}^{2020}\right)$ and $\mathrm{E}\left(Y_{Q2}^{2020}\right)$ 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. However, 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.

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

where $\mathrm{E}\left(Y_{Q1}^{2015-2019}\right)$ and $\mathrm{E}\left(Y_{Q2}^{2015-2019}\right)$ 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 pre-pandemic outcomes over the 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.

Substituting (2) into (1), we obtain.

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

and after rearranging the terms, we obtain

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

[6] 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.

[7] 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 category are adjusted and issued in annual government decrees (Government of Vietnam, 2014–2019).

[8] 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 is not currently working due to a reason such as being on holiday, sick leave, or maternity leave.

[9] 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). Consequently, we define workers as having a formal job if they contribute to social insurance (together with their employers) through their wage. We deflate wages in all years to the prices in December 2020, using monthly CPIs obtained from the GSO.

[10] The second lockdown implemented in some central provinces beginning in July 2020 further increased these negative effects.

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

Equation (4) is a DD estimator, in which the first differences are between the second quarters and the first quarters (i.e., comparing the terms within the two square brackets), and the second 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.

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

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).

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

where y is an employment outcome for individuals, PY is a dummy variable indicating 2020, the year of the pandemic, and 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 is 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.2 in Appendix A.

As LFSs are collected on a monthly basis, we can further estimate the immediate pandemic impacts on employment outcomes by month. 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.

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

where k indicates the month of the year, k = 4, 5,.., 12. Similarly to Equation (6), we can estimate Equation (7) with the following DD regression.

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

where θ_k are the coefficients of interest.

While Equation (8) can broadly capture the net changes with labor outcomes before and after the pandemic (that is, the total economy-wide effects that are pandemic-induced), it does not pinpoint any specific mechanism that causes these changes. One such key mechanism could be the lockdown policy implemented by the Government of Vietnam.[12] Consequently, to estimate the local effects caused by the pandemic-induced lockdowns, we offer a multi-pronged approach that examines more variations regarding the lockdowns along the time dimension, the geographical dimension, and their combinations.

The first alternative is to use the sharp regression discontinuity design (RDD) model. We use the lockdown date of April 2020 as the cutoff, and we use a bandwidth of 9 months on either side of this cutoff (that is, July 2019 to March 2020 on the left, and April 2020 to December 2020 on the right). Put differently, we take month as the conditioning (assignment) variable. We estimate the following equation

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

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* ≥ 0, and 0 otherwise). The local effects of the April 2020 lockdown are estimated by δ_1.

However, Equation (9) may capture not only the lockdown effects but also the seasonal (or any unobserved macroeconomic) effects in 2020. To examine these seasonal effects, we can estimate the same model in Equation (9) using data from prior to 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 DD estimation strategy with the RDD model in Equation (9) for more robust analysis.[13] Specifically, we estimate the following RDD-DD 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 to December 2020, and 0 for the months before July 2019. The coefficient of interest is λ_1.

For the second alternative, we make use of the fact that a major central city in Vietnam – Da Nang – experienced a second lockdown from July to September 2020. To examine whether this second lockdown affected Da Nang beyond the impacts of the first lockdown from the DD model, we include the interaction between a dummy variable for Da Nang and the treatment variables. Building on Equation (6), we estimate the following triple differences (DDD) model, in which we combine Quarters 2 to 4 into a dummy Q_{24} to measure the combined effect of the pandemic in three quarters.

$$y = \alpha_0 + \alpha_1(PY.Q_{24}) + \alpha_2(PY.Q_{24}.DaNang) + \alpha_3 Q_{24} + \alpha_4 PY + C'X + s_d + r_t + e_{dt} \quad (11)$$

where Q_{24} is a dummy indicating Quarter 2 to 4, and *DaNang* is the dummy variable indicating the city of Da Nang. Note that the variable *DaNang* does not appear on its own in Equation (11), as we already control for the district fixed effects in this equation. The coefficient α_2 on the triple interaction term $PY.Q_{24}.DaNang$ measures the difference in the lockdown effects between Da Nang and other provinces and cities in Vietnam. Put differently, α_2 measures the impacts of the second lockdown on Da Nang.

Finally, we can combine these alternatives to better exploit both the timing and geographical variations related to the lockdowns for identification. We further interact *DaNang* and the treatment variables in Equations (9) and (10) to estimate the following RDD-DD equation.

[12] The COVID-19 pandemic might impact the labor market through two main channels – government-imposed lockdowns and fear of the virus – which could lead 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 first 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 A.3).

[13] A similar RDD-DD 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. Also see Lee and Lemieux (2010) and Cattaneo et al. (2019) for more detailed treatment of the RDD method.

$$y = \pi_0 + \pi_1 LM + \pi_2 LM.DaNang + \pi_3 Month + \pi_4 Month.LM + \Delta' X + \varsigma_d + \phi_t + \xi_{dt} \quad (12)$$

and the RDD-DDD equation

$$y = \rho_0 + \rho_1 LM.COVID + \rho_2 LM.COVID.DaNang + \rho_3 Month.COVID + \rho_4 Month + \rho_5 Month.LM.COVID + \rho_6 LM + \rho_7 Month.LM + \rho_8 COVID + \Gamma' X + \Theta' X.COVID + o_d + \ell_t + m_{dt} \quad (13)$$

π_2 and ρ_2 are respectively the coefficients of interest in Equations (12) and (13). While Equations (11) to (13) estimate the effects of the second lockdown on Da Nang alone (as only this city underwent a second lockdown in Vietnam during 2020), the results can provide supportive evidence for the lockdowns as a key channel for the adverse impacts of the pandemic on employment and wage inequality.

4. Empirical results

4.1. Testing assumptions

Our DD 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, as 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, Fig. 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 wage workers. The only exception is the temporary layoff rate, but this rate is very low, at <0.1 % for all the first quarters studied.

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 A.3) 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 DD strategy as in Equation (6). The regression results, reported in Table A.3, indicate that the lockdown has statistically insignificant effects in Quarter 1 of 2020.

The second assumption is the standard "parallel trend" assumption for the DD 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 Fig. A.2 the employment outcomes of Quarter 1 against those for the remaining three quarters over the six years studied. If the parallel trend assumption is satisfied, we should see parallel lines that represent the outcomes in the pre-pandemic years. Indeed, Fig. A.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 layoffs, and the proportions of workers having a wage job or working below the minimum wages) or diverge (Panel E, monthly wages) in 2020. For workers with a labor contract or formal job, the lines closely track each other during 2015–2019 but intersect in 2020 (Panels G and H). These results support the parallel trend assumption.

4.2. Estimated pandemic impacts

Table 1 reports the DD regressions of employment outcomes using the LFS data from 2015 to 2020 (using Equation (6)). Aside from working hours, the interaction terms between the pandemic year (*PY*) and Quarters 2 to 4 are statistically significant in all the regressions, which suggests that the pandemic negatively impacted employment outcomes for Quarters 2 to 4 of 2020. The estimated impact magnitudes are largely similar.

Specifically, the unemployment rate increased by near1y 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 A.1), this increase in the unemployment rate is equivalent to a 50 % increase, which is higher than the simple (unconditional) 34 % average increase across 39 countries observed by Khamis et al. (2021). The pandemic also significant impacted the temporary layoff rate, raising it by 3 percentage points in Quarter 2 (Column 2). However, these impacts tapered off to 0.3 and 0.04 percentage points respectively in Quarters 3 and 4. Meanwhile, the effects on the number of working hours were statistically insignificant (Column 6). Thus, for people who did not lose their job, working hours appeared to be 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).

Worryingly, the pandemic witnessed the proportion of workers working for less than 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. One key problem in terms of maintaining a minimum wage policy is low compliance in the informal sector. For example, in 2020, the proportion of workers working for less than the minimum wage in the formal and informal sector was 3 % and 13 %, respectively.

To further explore whether there were differential pandemic effects on the probability of working below the minimum wage, we estimate the pandemic effects separately for formal and informal workers. Table A.4 in the Appendix shows that the pandemic effects were larger for the informal sector than the formal sector, likely as a result of weaker compliance with minimum wage policies in the informal sector.

In addition to the main outcomes analyzed in Table 1, we estimate the pandemic impacts on several additional outcomes for robustness checks (Table A.5 in the Appendix). Previously, we defined people with a formal job as those that contribute to social insurance or social security. However, in practice, the social insurance contribution does not correspond to the rates specified by the legal framework (e.g., Lee and Torm, 2017; Thanh and Castel, 2009), and the degree of formality may be evaluated regarding the level of social insurance non-compliance. Thus, in addition to using the outcome 'having a job with a labor contract' as a proxy for a formal job already shown in Table 1, we analyze two additional outcome variables: 'Having a long-term contract' (i.e., con-

Table 1
DD 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 wage (yes = 1, no = 0)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Quarter 2 * COVID year	0.0098***	0.0305***	−0.0171***	−0.0099***	−0.0076***	−0.0073	−0.1096***	0.0553***
	(0.0012)	(0.0004)	(0.0040)	(0.0015)	(0.0015)	(0.0213)	(0.0027)	(0.0022)
Quarter 3 * COVID year	0.0084***	0.0028***	−0.0128***	−0.0142***	−0.0124***	0.0263	−0.0721***	0.0278***
	(0.0011)	(0.0004)	(0.0041)	(0.0016)	(0.0015)	(0.0212)	(0.0024)	(0.0015)
Quarter 4 * COVID year	0.0090***	0.0004**	−0.0145***	−0.0113***	−0.0100***	0.0313	−0.0819***	0.1008***
	(0.0014)	(0.0002)	(0.0042)	(0.0012)	(0.0011)	(0.0217)	(0.0036)	(0.0027)
Quarter 1	*Reference*							
Quarter 2	−0.0039***	−0.0006***	0.0137***	0.0032***	0.0021***	0.0533**	−0.0216***	−0.0138***
	(0.0012)	(0.0001)	(0.0044)	(0.0007)	(0.0007)	(0.0215)	(0.0038)	(0.0016)
Quarter 3	−0.0051***	−0.0007***	0.0134***	0.0038***	0.0025***	0.0645***	−0.0027	−0.0262***
	(0.0011)	(0.0001)	(0.0045)	(0.0006)	(0.0007)	(0.0213)	(0.0039)	(0.0018)
Quarter4	−0.0075***	−0.0008***	0.0281***	0.0104***	0.0087***	0.0876***	0.0010	−0.0321***
	(0.0014)	(0.0001)	(0.0046)	(0.0008)	(0.0007)	(0.0219)	(0.0049)	(0.0019)
COVID year	−0.0004	−0.0004**	0.0793***	0.0293***	0.0347***	−0.0267	0.2746***	−0.0606***
	(0.0010)	(0.0002)	(0.0081)	(0.0037)	(0.0038)	(0.0191)	(0.0056)	(0.0028)
Male (male = 1, female = 0)	0.0003	0.0003*	0.0948***	−0.0298***	−0.0383***	0.0764***	0.1770***	−0.0507***
	(0.0008)	(0.0001)	(0.0038)	(0.0037)	(0.0036)	(0.0035)	(0.0050)	(0.0039)
Age	−0.0056***	0.0000**	−0.0014**	−0.0001	0.0039***	0.0219***	0.0590***	−0.0202***
	(0.0003)	(0.0000)	(0.0006)	(0.0005)	(0.0006)	(0.0010)	(0.0015)	(0.0010)
Age squared	0.0001***	−0.0000***	−0.0001***	−0.0001***	−0.0001***	−0.0003***	−0.0008***	0.0003***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Less than primary education	*Reference*							
Primary education	0.0002	0.0001	−0.1092***	−0.0998**	−0.0966**	0.0129***	−0.0478	−0.0124
	(0.0016)	(0.0001)	(0.0249)	(0.0371)	(0.0366)	(0.0039)	(0.0429)	(0.0077)
Lower-secondary education	0.0000	0.0001	−0.1220***	−0.0709	−0.0730*	0.0191***	0.0016	−0.0271***
	(0.0018)	(0.0001)	(0.0280)	(0.0416)	(0.0412)	(0.0045)	(0.0462)	(0.0084)
Upper-secondary education	0.0044*	−0.0001	−0.0396	0.0965**	0.0789*	0.0453***	0.0682	−0.0375***
	(0.0022)	(0.0003)	(0.0305)	(0.0455)	(0.0448)	(0.0050)	(0.0489)	(0.0092)
Post-secondary education	0.0177**	−0.0006***	0.2100***	0.4620***	0.4612***	−0.0097	0.3262***	−0.0666***
	(0.0066)	(0.0002)	(0.0485)	(0.0613)	(0.0593)	(0.0087)	(0.0481)	(0.0113)
Urban (urban = 1, rural = 0)	0.0084***	0.0006**	0.0526***	0.0477***	0.0427***	0.0660***	0.0520***	0.0003
	(0.0010)	(0.0002)	(0.0089)	(0.0107)	(0.0104)	(0.0049)	(0.0082)	(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***	0.0008***	0.5935***	0.3305***	0.2066***	3.2270***	7.2432***	0.4992***
	(0.0060)	(0.0002)	(0.0318)	(0.0430)	(0.0417)	(0.0277)	(0.0532)	(0.0251)
Observations	2,759,355	2,759,355	2,759,355	2,759,355	2,759,355	2,682,379	1,124,748	1,124,748
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 DD 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.

tract with at least one year) and 'Working for firms and organizations'. Table A.5 in the Appendix shows that the pandemic effects on these two outcome variables remain similar.

In Table 1, we look at the pandemic effects on the total number of working hours and total wages from all jobs. The LFSs contain information on the working hours and wages of the main job and

the secondary job. The proportion of workers who had more than one job, was 11 % in 2015 but decreased to 9 % in 2019 and 8 % in 2020. Table A.5 in the Appendix shows that the COVID-19 pandemic increased the probability of having a secondary job by 0.005 in the second quarter of 2020 but reduced the probability of having a secondary job by 0.026 in the fourth quarter of 2020. Regarding total working hours, we find that the pandemic had no significant effects. When we use the number of working hours of the main job as the outcome, we find that the pandemic had very small and insignificant effects in the second quarter of 2020.

However, the pandemic slightly increased the number of working hours of the main job in the third and fourth quarters. A possible explanation is that after the lockdown in April, the economic recovery enabled workers to work more hours for their main job. The pandemic effects on the monthly wages of the main job were negative and similar to those on total monthly wages. The pandemic had large and negative effects on monthly wages but small and positive effects on the number of working hours. As a result, the pandemic had negative overall effects on hourly wages (Table A.5 in the Appendix), which in turn implies adverse effects on labor productivity.

To zoom in on the pandemic effects by month, we estimate the monthly effects (θ_k s in Equation (8), with the full regression results presented in the Appendix, Table A.6) and plot in Fig. 2 the θ_k s from April to December of 2020. Fig. 2 shows that the negative effects on unemployment were largest in April and May 2020 and that 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 (mostly for April 2020). In contrast, the proportion of workers receiving wages below the minimum wage was higher in April and May 2020.[14] Table A.7 in the Appendix presents the pandemic effects on additional outcomes by month. Overall, the patterns of the monthly effects appear similar to those of the quarterly effects (Table A.6).

4.3. Further analysis of potential mechanism

We further examine the local effects of the national lockdown in Vietnam using the RDD and RDD-DD models. In Table 2, we present the results using different samples and models (and show the full regression results in Appendix A, Tables A.8 to A.10). We first use the 2019 and 2020 LFSs to estimate the effects of the lockdown in April 2020 (using Equation (9)). Next, to control for seasonal effects, we add the LFSs from 2015 to 2018 and employ the RDD-DD model specified in Equation (10). To examine whether the estimates from the RDD-DD model are sensitive to additional 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 labor outcomes are negative and strongly statistically significant.

Table 3, Panel A presents the DDD regression results using Equation (11). The triple interaction term that measures the second lockdown impacts on Da Nang is strongly statistically significant at the 1 % level in most regressions, except for temporary layoffs (where it is marginally statistically at the 10 % level), and the number of working hours. Table 3, Panel B reports the RDD-DD regression results using Equation (12), while Panels C and D of this table present the RDD-DDD regression results using Equation (13). The results are very similar to those in Table A.11. The interaction terms between the treatment variable and Da Nang are statistically significant for most labor outcomes, indicating that the effects of the second lockdown were noticeably more severe in Da Nang than other provinces. These results further confirm that the lockdowns represent a major channel of negative pandemic impacts on labor market outcomes.

4.4. 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.12 and A.13 in Appendix A). We also control for province fixed effects instead of district fixed effects (Table A.14 in Appendix A). The results are very similar to those presented in Table 1.

Second, we examine in Tables A.15 to A.19 (Appendix A) whether our estimates are sensitive to the exclusion (or inclusion) of a specific control year between 2015 and 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.15 reports the results dropping the 2015 LFS, Table A.16 reports the results dropping the 2016 LFS, and so on with Table A.19 finally presenting the results dropping the 2019 LFS. The estimates are qualitatively similar to those in Table 1. Furthermore, we restrict the estimation sample to the 2020 LFS and only one LFS before 2020 (i.e., the reference group includes only one year before 2020). The results, presented in Table A.20 to A.24 (Appendix A) for all the five different single-year reference groups, show negative lockdown effects regardless of the choice of 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.25, 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.26 to A.29 (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.

4.5. Heterogeneity analysis

The large sample of the LFSs allows us to examine the heterogeneous effects of the pandemic on different population sub-groups. However, as 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 the log of monthly wages on a dummy variable indicating

[14] Since the Vietnam LFS surveys do not collect data separately on regular wages, bonuses, or overtime payments, monthly wages include these items. The sudden large effects on monthly wages in December 2020 might result from the phasing out of relief measures and/or a decrease in end-of-year bonuses, 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 shows negative lockdown effects for almost all months in 2020. Another concern is that respondents might intentionally underreport their wages and employment to receive government support (see Government of Vietnam, 2020 and 2021, for information on pandemic aid packages). Yet, this is unlikely to pose a serious issue, as interviewers introduce the objectives of the LFSs before the interview and help ensure that respondents are aware that these surveys are not used to identify government beneficiaries.

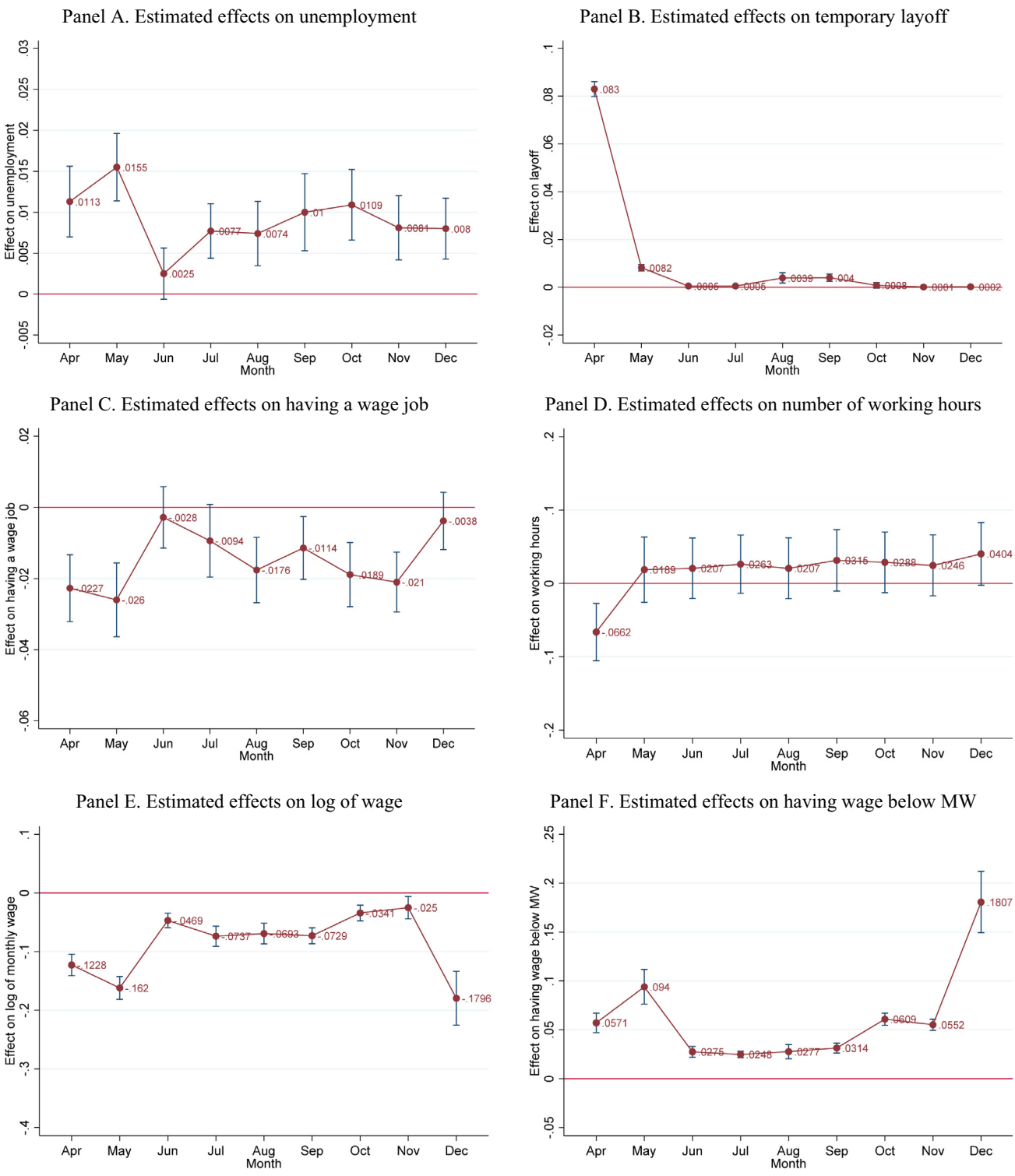

Fig. 2. Estimated effects of the COVID-19 pandemic on outcomes over April-December 2020.

Table 2
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***	0.0338***	−0.0258***	−0.0193***	−0.0172***	−0.0165	−0.1076***	0.0180
	(0.0025)	(0.0095)	(0.0061)	(0.0045)	(0.0042)	(0.0296)	(0.0233)	(0.0147)
RDD-DD estimates using the data sample of LFSs 2017 to 2020	0.0162***	0.0347***	−0.0284***	−0.0207***	−0.0173***	−0.0917***	−0.0745***	0.0249*
	(0.0024)	(0.0096)	(0.0058)	(0.0048)	(0.0040)	(0.0240)	(0.0233)	(0.0147)
RDD-DD estimates using the data sample of LFSs 2015 to 2020	0.0169***	0.0346***	−0.0264***	−0.0188***	−0.0159***	−0.0783***	−0.0701***	0.0245*
	(0.0022)	(0.0096)	(0.0058)	(0.0056)	(0.0054)	(0.0188)	(0.0201)	(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.6 to A.8 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 3
Further regressions of employment variables with interactions with Da Nang city.

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)
Panel A. DDD estimates using the data sample of LFSs 2019 and 2020								
Quarter 2–4 * COVID year	0.0084***	0.0102	−0.0138**	−0.0109***	−0.0093***	0.0181	−0.0855***	0.0621***
	(0.0015)	(0.0081)	(0.0056)	(0.0018)	(0.0017)	(0.0272)	(0.0150)	(0.0171)
Quarter 2–4 * COVID year * Da Nang	0.0523***	0.0673*	−0.0798***	−0.0725***	−0.0633***	−0.0254	−0.1310***	0.0456
	(0.0064)	(0.0371)	(0.0196)	(0.0158)	(0.0143)	(0.0154)	(0.0438)	(0.0295)
Panel B. RDD-DD estimates using the data sample of LFSs 2019 and 2020								
Treatment variable	0.0131***	0.0331***	−0.0255***	−0.0189***	−0.0168***	−0.0163	−0.1061***	0.0173
	(0.0025)	(0.0095)	(0.0061)	(0.0045)	(0.0042)	(0.0296)	(0.0236)	(0.0148)
Treatment variable * Da Nang	0.0578***	0.0670*	−0.0283	−0.0368***	−0.0399***	−0.0163	−0.1076	0.0592
	(0.0125)	(0.0340)	(0.0174)	(0.0091)	(0.0149)	(0.0348)	(0.0651)	(0.0410)
Panel C. RDD-DDD estimates using the data sample of LFSs 2017 to 2020								
Treatment variable	0.0164***	0.0339***	−0.0258***	−0.0181***	−0.0152***	−0.0783***	−0.0693***	0.0252*
	(0.0022)	(0.0096)	(0.0073)	(0.0053)	(0.0049)	(0.0191)	(0.0205)	(0.0147)
Treatment variable * Da Nang	0.0532***	0.0674**	−0.0783***	−0.0725***	−0.0618***	−0.0393*	−0.1185**	0.0442
	(0.0117)	(0.0337)	(0.0225)	(0.0162)	(0.0155)	(0.0235)	(0.0566)	(0.0421)
Panel D. RDD-DDD estimates using the data sample of LFSs 2015 to 2020								
Treatment variable	0.0156***	0.0339***	−0.0278***	−0.0200***	−0.0168***	−0.0914***	−0.0729***	0.0244
	(0.0023)	(0.0096)	(0.0058)	(0.0048)	(0.0041)	(0.0240)	(0.0236)	(0.0148)
Treatment variable * Da Nang	0.0539***	0.0672**	−0.0575***	−0.0568***	−0.0454***	−0.0304	−0.1149**	0.0413
	(0.0118)	(0.0336)	(0.0202)	(0.0120)	(0.0122)	(0.0266)	(0.0566)	(0.0421)

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.6 to A.8 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.

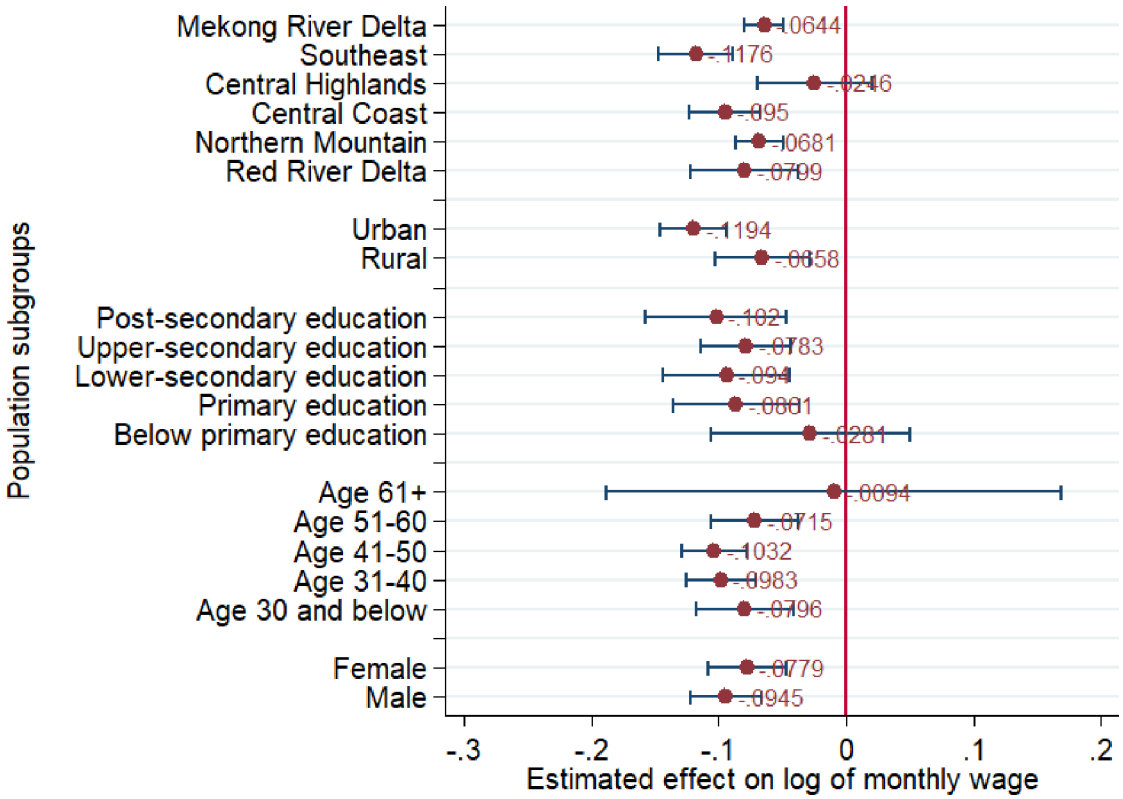

Fig. 3. Heterogeneous effects across geographic and demographic characteristics.

Quarters 2 to 4, a dummy variable for 2020, the interaction term between these two variables, and other control variables for different population subgroups.[15]

Fig. 3 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 levels of education. This may possibly be due to the fact that these workers primarily work in the agricultural sector, which was less affected by the pandemic, including subsequent lockdown measures.[16] Regarding gender, there were no statistically significant differences in terms of the effects of the pandemic on men relative to women, nor for the different regions. There were somewhat smaller pandemic effects for rural workers relative to urban workers, but the difference was not statistically significant.

Fig. A.5 reports the heterogeneous effects of the pandemic across employment sectors. The pandemic had the smallest effects on public sector workers, reducing their monthly wages by 4.7 %. However, 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 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, as these industries were allowed to operate during the lockdown in order to provide essential goods for the basic functions of the economy.

In addition to heterogeneous effects across individuals, there could be distributive effects across regions if different regions faced different negative supply and demand shocks from the global economy. To explore this issue, we construct three different, but related, provincial trade openness indexes. The first index and second index are respectively the ratio of a province's import and export values to its GDP in 2018. The third index is the ratio of a province's total trade (i.e., the sum of import and export values) to its GDP in 2018 (pre-COVID year).[17] We use a similar specification as Equation (11), where we include the triple interaction terms between the term ($PY.Q_{24}$) and the province indexes (instead of the Da Nang province dummy variable), to examine whether the pandemic effects on the labor market in Quarters 2 to 4 vary across provinces with different levels of openness to the global economy. The estimation results are shown for the import index, the export index, and the total trade index in Appendix A, Tables A.31, A.32, and A.33 respectively.

In these tables, the triple interaction terms are negative in the regressions for unemployment and are positive in the regressions for having 'a wage job', 'a job with labor contract', and 'a formal job'. These results indicate that the pandemic effects are smaller for provinces with more trade openness, which is consistent with macro-economic figures. Indeed, although the global economy was affected heavily by the COVID-19 pandemic, Vietnam achieved high export growth rates in the third and fourth quarters in 2020 (GSO, 2021c). The trade balance of Vietnam almost doubled from USD 10.9 billion in 2019 to USD 19.1 billion in 2020 (GSO, 2021c). Thus, provinces with more trade openness experienced higher levels of economic growth and were less affected by the pandemic.

[15] Table A.30 (Appendix) reports the estimated lockdown effects on eight employment outcomes for Quarters 2 to 4.

[16] 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 than higher-income households, 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).

[17] Data on the import and export values for provinces were obtained from Ministry of Trade and Industry, available at https://thongke.idea.gov.vn. The data on GDP for provinces are available from the General Statistics Office of Vietnam at: https://gso.gov.vn.

Finally, we further explore the geographic distribution of the pandemic effects on monthly wages for all 63 provinces in Vietnam and graph the point estimates in Fig. A.6. The impacts ranged from −0.173 to 0.003 and were strongest for Da Nang, which was under a second lockdown in August 2020. Provinces in the Red River Delta and the Southeast region (including Ho Chi Minh 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 the tourism, transport, and trade industries.[18]

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 vary 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 to 4 of 2020 so that we can compare workers with similar wages.

Summarizing the results, Fig. 4 shows that the pandemic reduced the monthly wages for workers below the minimum wages by around 20 % in Quarters 2 to 4 of 2020 (the full regression results are shown in Appendix A, Table A.34). 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 the decrease for below-minimum wage workers, they are still larger than the estimated reduction of 9 % for all workers. More alarmingly, 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 second lowest wage quintile appears negligible at 1 %.

To further examine the larger effects on low wage workers, 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 higher wage quintiles. Tables A.35 and A.36 (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.[19] In contrast to Table 1, where we use 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. This enables us to estimate the pandemic effects on other wage inequality indexes.

To measure wage inequality, we use various 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

$$\Delta I = I(wage_1) - I(wage_0), \tag{14}$$

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 υ_1 represent the pandemic effects on the 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)), and we can predict the counterfactual wages as follows

$$wage_0 = e^{log(wage_1) - \widehat{\upsilon_1}} \tag{15}$$

We estimate the standard error of $\widehat{wage}_0$ in Equation (15) using bootstraps with 1,000 replications.

Table 4 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. 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 occurred, 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. Discussion and conclusion

We offer an early study on the impacts of the COVID-19 pandemic on employment outcomes in a lower-income country setting. We analyze a wide range of employment outcomes from several rounds of Vietnam's LFS between 2015 and 2020. We find that the pandemic increased the unemployment rate and the temporary layoff rate while decreasing 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. Additional analysis points to the lockdowns as the main channel of negative pandemic impacts.

Further heterogeneity analysis suggests that individuals with less than primary education were less affected than those with higher education levels, possibly due to the former group's tendency to work in the agricultural sector, which may offer a better shield in times of crisis. The pandemic had far stronger effects on

[18] We explore some possible reasons for heterogeneous lockdown effects by graphing the point estimates 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) for pre-pandemic values. Panel A of Figure A.7 (Appendix A) shows that provinces with higher wages were more negatively 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.7 provides supportive evidence that provinces with a larger share of service workers were more affected by the lockdown.

[19] The Foster-Greer-Thorbecke index is defined as $P_\alpha = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{z-Y_i}{z}\right]^\alpha$ (Foster, Greer and Thorbecke, 1984). Y_i is a welfare indicator for person i, z is the expenditure poverty line, n is the total number of people, q is the number of workers below z, and αcan be interpreted as a measure of inequality aversion. When α= 0, we have the headcount index H, which measures the proportion of workers below the poverty line. When α= 1 and α= 2, we obtain the poverty gap PG, which measures the depth of poverty, and the squared poverty 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.

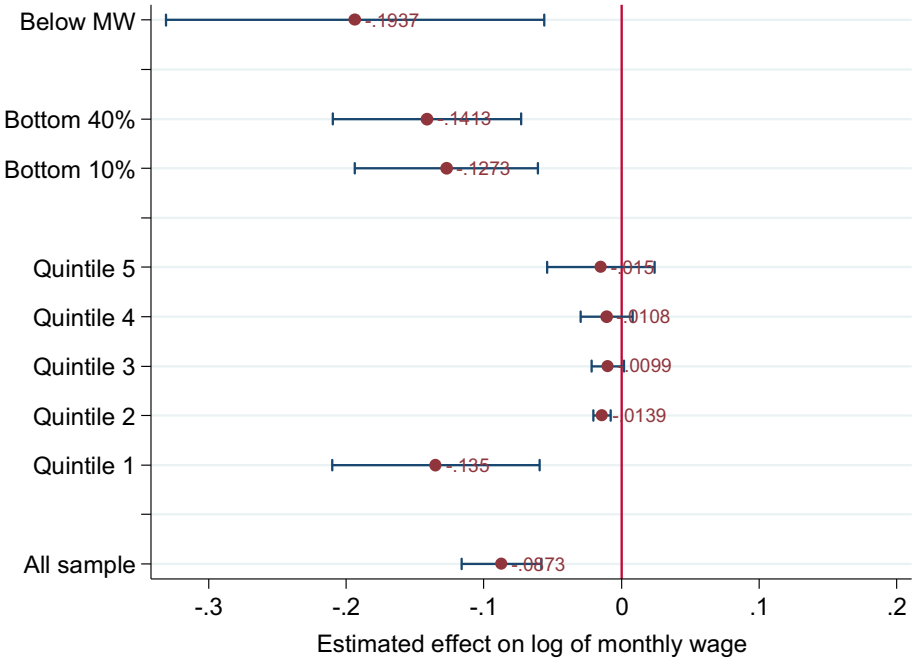

Fig. 4. Effects on the low-wage workers and workers by wage quintiles.

Table 4
Lockdown effects on Foster–Greer–Thorbecke and other wage inequality indexes.

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

informal household workers and FDI sector workers than public sector workers. Workers in the transportation and tourism sectors were most heavily affected. The pandemic effects were smaller in provinces with greater openness to the global economy (as measured by the share of exports and imports in provinces' GDP).

Unfortunately, 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 pandemic effects are directly relevant for informing policy. Indeed, while minimum wages were annually increased between 2008 and 2019, these wages were not increased in 2020 (nor in 2021). This could effectively have resulted in decreasing real wages for 2020, which may have further led to lower living standards for low-wage workers. While raising the minimum wages in Vietnam is a complicated process involving various stakeholders, a key argument put forward by the Ministry of Labor, War Invalids, and Social Affairs for not increasing the minimum wages in 2021 is that firms were severely affected by the pandemic and could not afford minimum wage increases (Duc Binh, 2020; Ha, 2021).[20]

[20] Hansen, Rand, and Torm (2016) point out that the minimum wages form the basis (base wage) for calculating wage scales for public sector workers, pensions, allowances for veterans, and other social transfers, along with social, unemployment, and health insurances and redundancy allowances for the workers of state-owned enterprises (SOEs). Consequently, the minimum wages heavily depend on the Government budget.

At the same time, most government pandemic relief measures focused on supporting workers who lost their jobs or were temporarily laid off (Government of Vietnam, 2020; 2021); there were no specific measures to help workers below the minimum wages, particularly in the informal sector. Furthermore, the list of the poor and near-poor households to receive the cited government support was determined at the end of 2019.[21] Low-wage workers who lost their jobs and were not in the list of the poor and near-poor households could not receive the government support.

Our study suggests that although lower-wage workers did not lose their jobs, they disproportionately suffered income losses during the pandemic. This is further supported by the evidence of overall increases in wage inequality across the whole population. Consequently, support programs should include these vulnerable workers, especially those in the more negatively impacted industries such as transportation, tourism, restaurants, and trade. These findings are relevant for other lower-income countries that either have implemented or are considering similar pandemic measures as undertaken in Vietnam.

CRediT authorship contribution statement

Hai-Anh H. Dang: Conceptualization, Methodology, Writing - original draft, Writing - review & editing. **Cuong Viet Nguyen:** Conceptualization, Methodology, Data curation, Writing – original draft. **Calogero Carletto:** Conceptualization, Funding acquisition.

Data availability

Data will be made available on request.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A

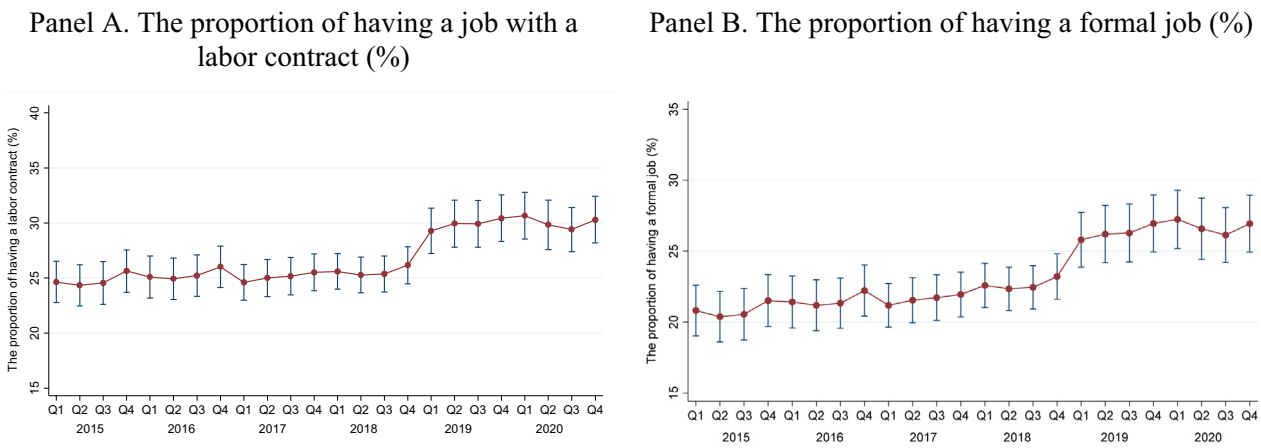
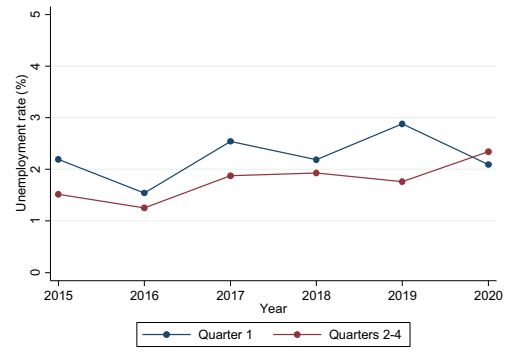


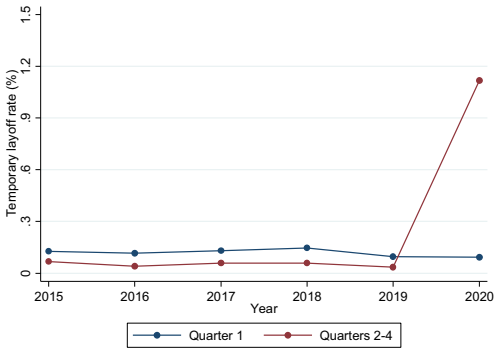
Fig. A1. The proportion of workers having a job with a labor contract and the proportion of workers having a formal job.

[21] MOLISA (2016) provides further details on the procedures to identify poor and near-poor households for the period 2016–2020.

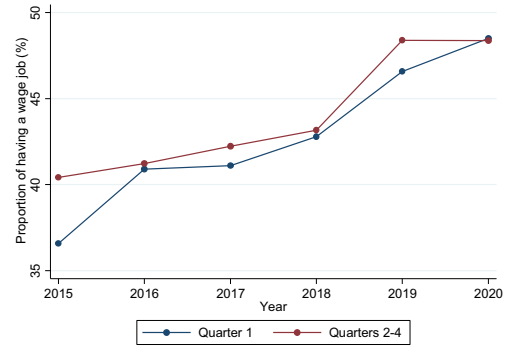
Panel A. The unemployment rate (%)



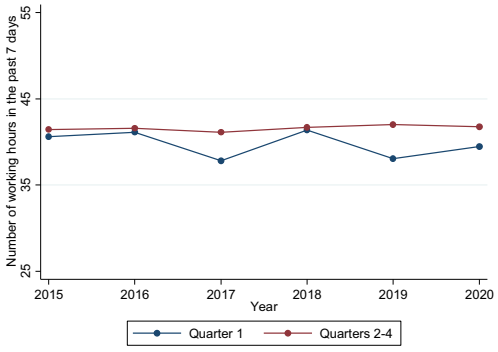
Panel B. The temporary layoff rate (%)



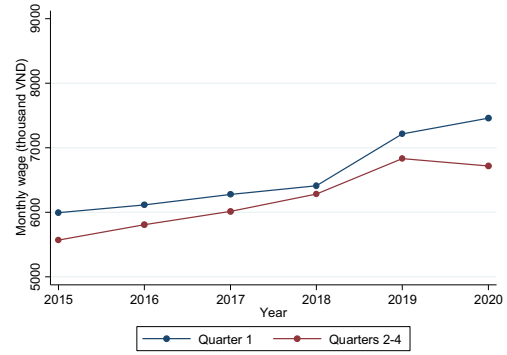
Panel C. The proportion of having a wage job (%)



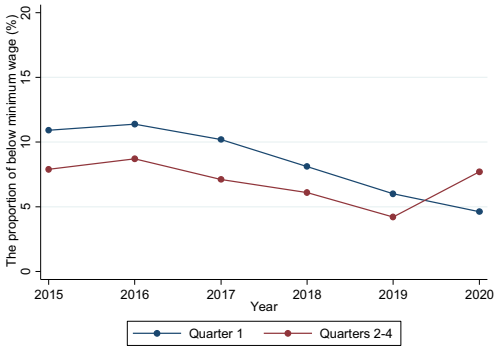
Panel D. Working hours during the past 7 days



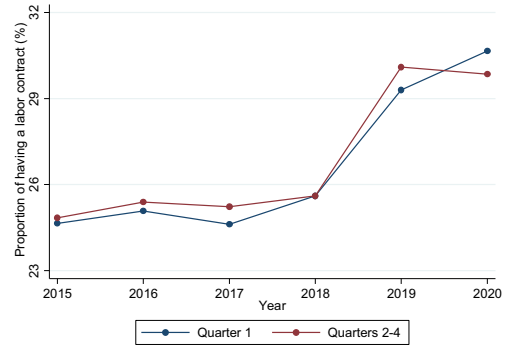
Panel E. Monthly wage (thousand VND)



Panel F. Proportion of below minimum wages (%)



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



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

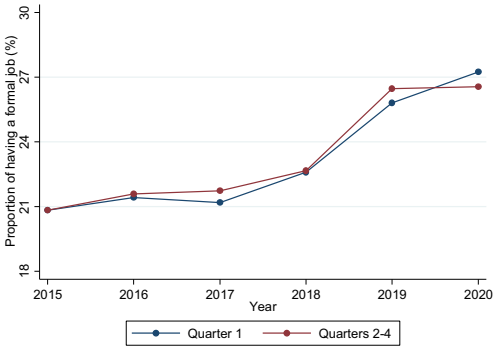


Fig. A2. Parallel trend assumptions.

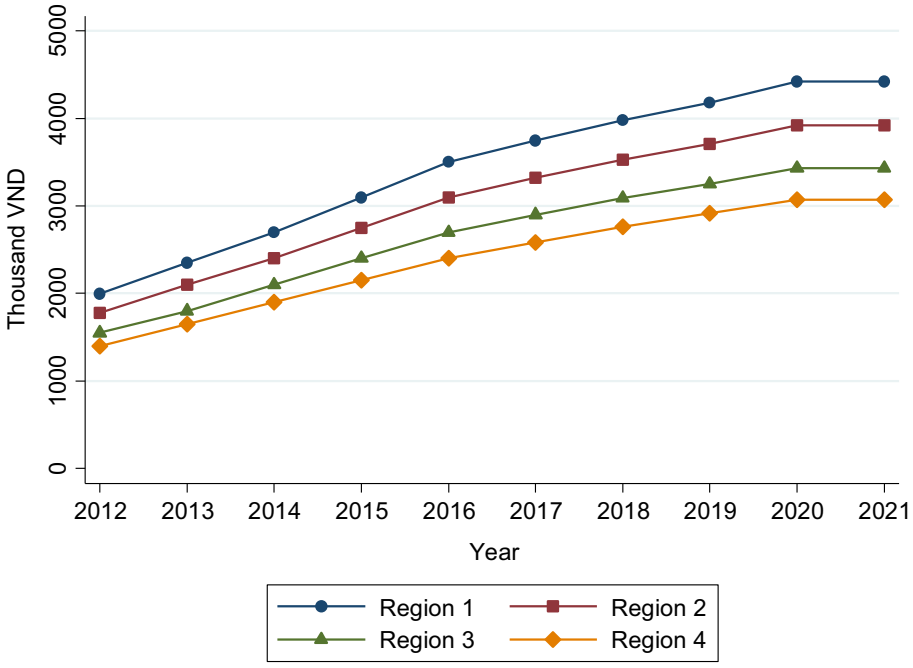


Fig. A3. Evolution of minimum wages.

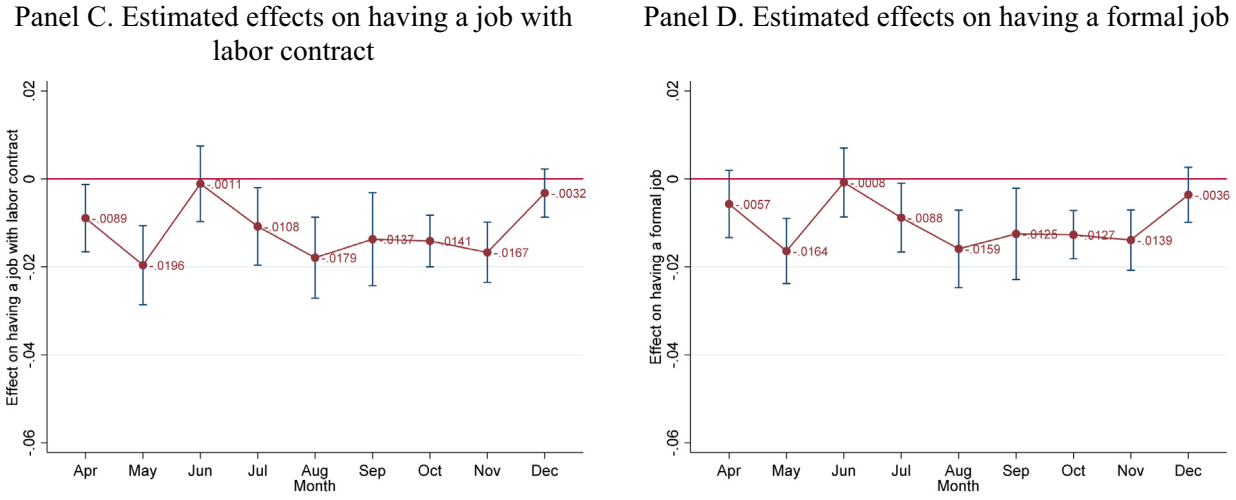


Fig. A4. Estimated effects of the lockdowns on the proportion of workers having a job with a labor contract and the proportion of workers having a formal job.

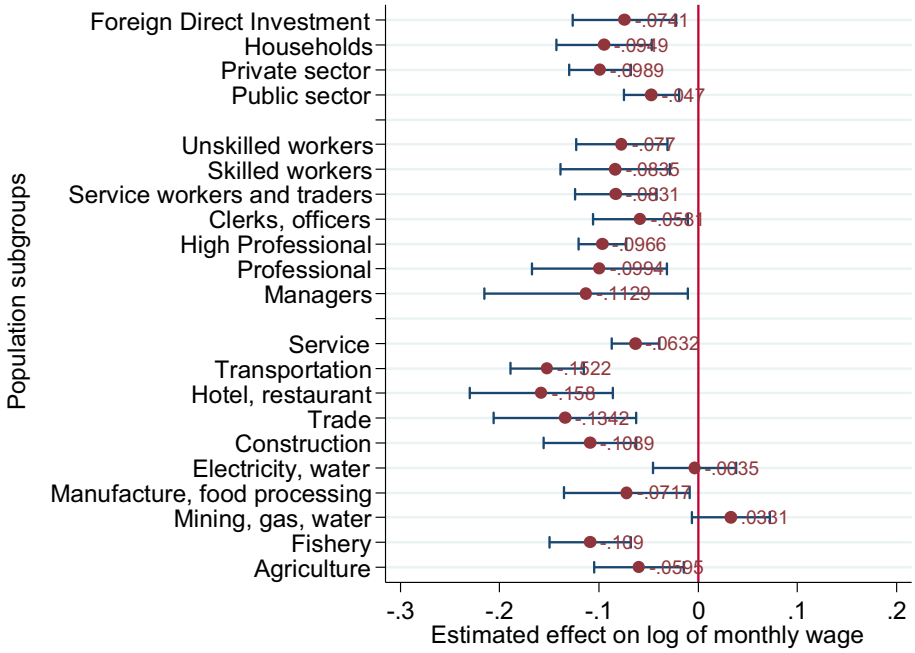


Fig. A5. Heterogeneous effects across employment characteristics.

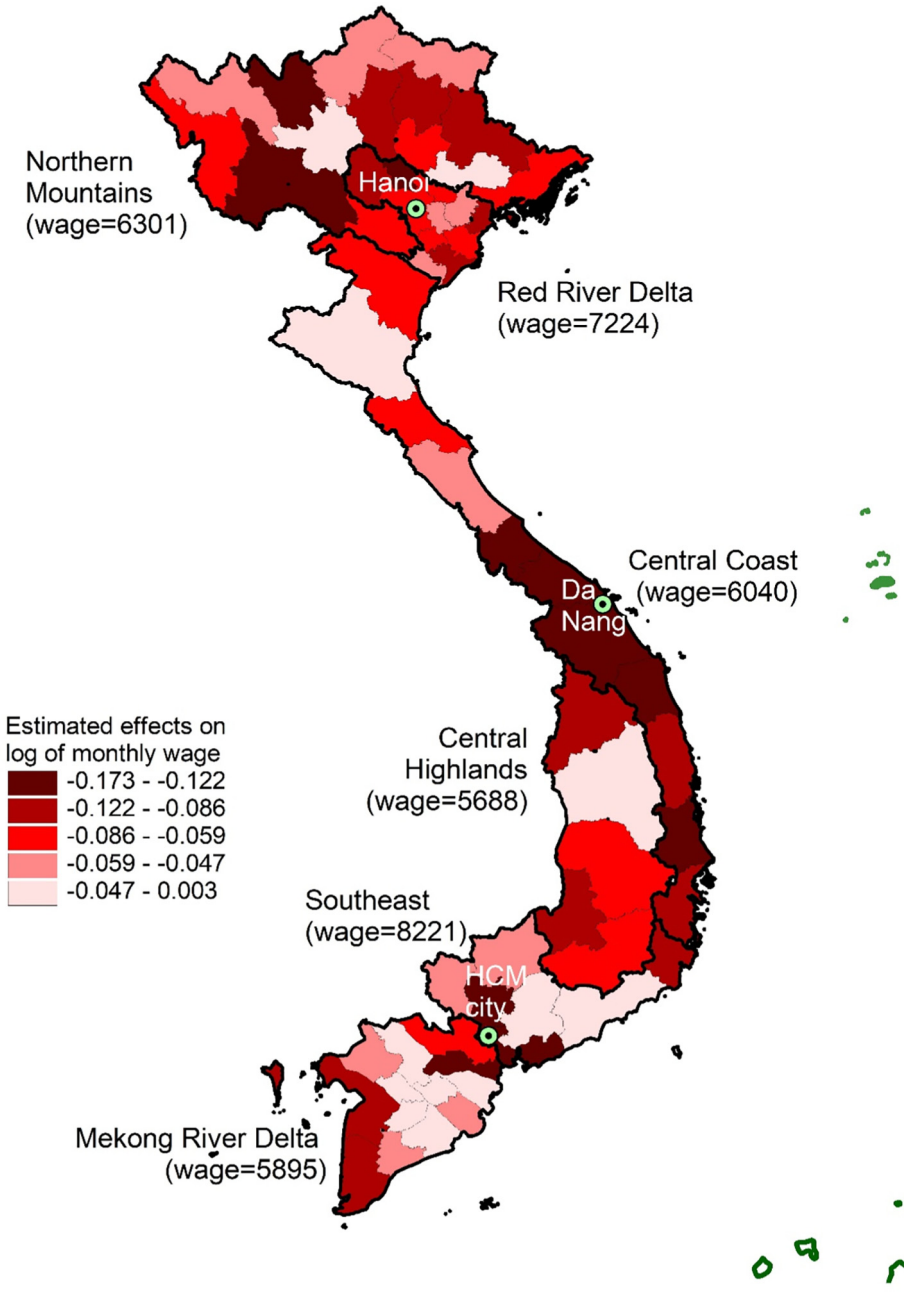


Fig. A6. Provincial map of the effects.

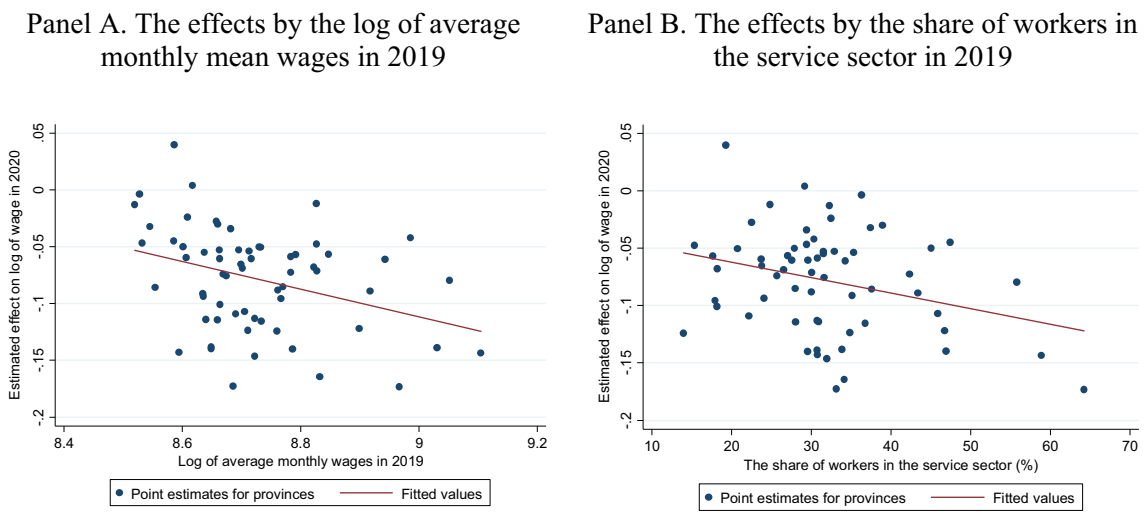


Fig. A7. Point estimates of the effects of the COVID-19 pandemic at the provincial level.

Table A1
Summary statistics of outcome variables.

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

Note: standard errors are in parentheses.
Wage is measured in the price of December 2020.
Source: Authors' estimations from LFSs.

Table A2
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 A3
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	−0.0002*	−0.0034	0.0036	0.0022	−0.0213	−0.0002	−0.0184
	(0.0030)	(0.0001)	(0.0113)	(0.0133)	(0.0138)	(0.0370)	(0.0494)	(0.0118)
Quarter 1	0.0071**	0.0008***	−0.0084	−0.0054	−0.0027	−0.0939**	0.0544	0.0230*
	(0.0030)	(0.0001)	(0.0107)	(0.0129)	(0.0134)	(0.0368)	(0.0491)	(0.0116)
Years 2019–2020	−0.0033	−0.0001	0.0344***	0.0051	0.0073	0.0003	0.1262***	−0.0231***
	(0.0018)	(0.0000)	(0.0081)	(0.0089)	(0.0096)	(0.0045)	(0.0350)	(0.0058)
Male (male = 1, female = 0)	0.0012	0.0006***	0.0939***	−0.0312***	−0.0393***	0.0709***	0.1735***	−0.0471***
	(0.0010)	(0.0001)	(0.0047)	(0.0045)	(0.0043)	(0.0044)	(0.0057)	(0.0047)
Age	−0.0055***	0.0000	−0.0015*	0.0001	0.0039***	0.0223***	0.0597***	−0.0200***
	(0.0004)	(0.0000)	(0.0007)	(0.0006)	(0.0006)	(0.0017)	(0.0016)	(0.0015)
Age squared	0.0001***	−0.0000	−0.0001***	−0.0001***	−0.0001***	−0.0003***	−0.0008***	0.0003***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Less than primary education	*Reference*							
Primary education	−0.0001	0.0001	−0.1190**	−0.1172*	−0.1129*	0.0151*	−0.0866	−0.0052
	(0.0023)	(0.0002)	(0.0391)	(0.0585)	(0.0579)	(0.0076)	(0.0612)	(0.0105)
Lower-secondary education	−0.0001	0.0001	−0.1325**	−0.0881	−0.0899	0.0226**	−0.0387	−0.0198
	(0.0025)	(0.0002)	(0.0438)	(0.0655)	(0.0650)	(0.0089)	(0.0658)	(0.0109)
Upper-secondary education	0.0034	−0.0003	−0.0527	0.0772	0.0611	0.0520***	0.0289	−0.0306**
	(0.0029)	(0.0002)	(0.0465)	(0.0711)	(0.0706)	(0.0096)	(0.0683)	(0.0117)
Post-secondary education	0.0153	−0.0008**	0.1895**	0.4342***	0.4350***	0.0241*	0.2768***	−0.0580***
	(0.0093)	(0.0003)	(0.0773)	(0.1001)	(0.0973)	(0.0128)	(0.0700)	(0.0149)
Urban (urban = 1, rural = 0)	0.0086***	0.0006**	0.0522***	0.0507***	0.0462**	0.0672***	0.0575***	−0.0020
	(0.0013)	(0.0002)	(0.0126)	(0.0156)	(0.0151)	(0.0060)	(0.0113)	(0.0026)
District fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.1376***	−0.0003	0.6695***	0.3747***	0.2538***	3.3063***	7.3669***	0.4453***
	(0.0096)	(0.0003)	(0.0491)	(0.0739)	(0.0729)	(0.0257)	(0.0852)	(0.0344)
Observations	1,153,759	1,154,065	1,154,065	1,154,065	1,154,065	1,122,414	476,580	476,580
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 A4
DD regressions of receiving below-minimum wages for formal and informal workers.

Explanatory variables	Full sample		Informal sector		Formal sector	
	Below minimum wages (yes = 1, no = 0) (1)	Below minimum wages (main job) (yes = 1, no = 0) (2)	Below minimum wages (yes = 1, no = 0) (3)	Below minimum wages (main job) (yes = 1, no = 0) (4)	Below minimum wages (yes = 1, no = 0) (5)	Below minimum wages (main job) (yes = 1, no = 0) (6)
Quarter 2 * COVID year	0.0553***	0.0660***	0.0832***	0.1065***	0.0309***	0.0354***
	(0.0022)	(0.0022)	(0.0027)	(0.0030)	(0.0026)	(0.0021)
Quarter 3 * COVID year	0.0278***	0.0415***	0.0415***	0.0700***	0.0100***	0.0179***
	(0.0015)	(0.0020)	(0.0018)	(0.0031)	(0.0025)	(0.0020)
Quarter 4 * COVID year	0.1008***	0.1062***	0.1305***	0.1377***	0.0683***	0.0793***
	(0.0027)	(0.0024)	(0.0032)	(0.0039)	(0.0024)	(0.0017)
Quarter 1	*Reference*					
Quarter 2	−0.0138***	−0.0083***	−0.0235***	−0.0159***	−0.0053***	−0.0036**
	(0.0016)	(0.0019)	(0.0018)	(0.0029)	(0.0019)	(0.0014)
Quarter 3	−0.0262***	−0.0213***	−0.0405***	−0.0368***	−0.0112***	−0.0090***
	(0.0018)	(0.0021)	(0.0027)	(0.0034)	(0.0022)	(0.0016)
Quarter4	−0.0321***	−0.0266***	−0.0487***	−0.0459***	−0.0133***	−0.0104***
	(0.0019)	(0.0022)	(0.0024)	(0.0035)	(0.0018)	(0.0014)
COVID year	−0.0606***	−0.0781***	−0.0922***	−0.1336***	−0.0224***	−0.0298***
	(0.0028)	(0.0029)	(0.0038)	(0.0052)	(0.0034)	(0.0026)
Male (male = 1, female = 0)	−0.0507***	−0.0619***	−0.1341***	−0.1691***	−0.0040**	−0.0014
	(0.0039)	(0.0036)	(0.0066)	(0.0063)	(0.0015)	(0.0011)
Age	−0.0202***	−0.0256***	−0.0236***	−0.0274***	−0.0071***	−0.0097***
	(0.0010)	(0.0009)	(0.0011)	(0.0008)	(0.0005)	(0.0007)
Age squared	0.0003***	0.0004***	0.0003***	0.0004***	0.0001***	0.0001***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Less than primary education	*Reference*					
Primary education	−0.0124	0.0058	−0.0289***	−0.0278***	0.0058**	0.0267***
	(0.0077)	(0.0137)	(0.0045)	(0.0040)	(0.0027)	(0.0051)
Lower-secondary education	−0.0271***	−0.0130	−0.0385***	−0.0358***	0.0031	0.0209***
	(0.0084)	(0.0150)	(0.0048)	(0.0045)	(0.0031)	(0.0052)
Upper-secondary education	−0.0375***	−0.0381**	−0.0367***	−0.0342***	0.0047	0.0155***
	(0.0092)	(0.0160)	(0.0050)	(0.0049)	(0.0031)	(0.0052)
Post-secondary education	−0.0666***	−0.0993***	−0.0553***	−0.0865***	−0.0104**	−0.0129**
	(0.0113)	(0.0178)	(0.0082)	(0.0091)	(0.0042)	(0.0058)
Urban (urban = 1, rural = 0)	0.0003	−0.0148***	0.0011	−0.0043	0.0013	−0.0082***
	(0.0024)	(0.0038)	(0.0035)	(0.0040)	(0.0016)	(0.0015)
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
District fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.4992***	0.6286***	0.6876***	0.8224***	0.1584***	0.2082***
	(0.0251)	(0.0246)	(0.0279)	(0.0228)	(0.0130)	(0.0147)
Observations	1,110,764	1,110,764	531,635	531,635	579,116	579,116
R-squared	0.089	0.113	0.128	0.145	0.033	0.037

Note: This table presents estimates of the effects of COVID-19 on employment using the DD 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 A5
DD regressions of additional employment variables.

Explanatory variables	Dependent variables						
	Having job with long-term contract (yes = 1, no = 0)	Working for firms and organizations (yes = 1, no = 0)	Having a secondary job (yes = 1, no = 0)	Log of number of working hours of the main job (last 7 days)	Log of monthly wages of the main job	Log of hourly wages of the main job	Log of hourly wages of all jobs
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Quarter 2 * COVID year	−0.0099***	−0.0077***	0.0050**	0.0031	−0.1098***	−0.1237***	−0.1192***
	(0.0015)	(0.0015)	(0.0020)	(0.0205)	(0.0031)	(0.0218)	(0.0223)
Quarter 3 * COVID year	−0.0156***	−0.0117***	0.0025	0.0392*	−0.0714***	−0.1175***	−0.1091***
	(0.0017)	(0.0015)	(0.0022)	(0.0205)	(0.0025)	(0.0216)	(0.0222)
Quarter 4 * COVID year	−0.0109***	−0.0099***	−0.0258***	0.0400*	−0.0824***	−0.1287***	−0.1247***
	(0.0012)	(0.0012)	(0.0026)	(0.0211)	(0.0036)	(0.0221)	(0.0227)
Quarter 1	*Reference*						
Quarter 2	0.0019***	0.0034***	−0.0031	0.0518**	−0.0220***	−0.0539**	−0.0549**
	(0.0006)	(0.0008)	(0.0024)	(0.0206)	(0.0041)	(0.0217)	(0.0223)
Quarter 3	0.0015**	0.0032***	−0.0041	0.0610***	−0.0017	−0.0613***	−0.0635***
	(0.0006)	(0.0006)	(0.0025)	(0.0206)	(0.0042)	(0.0218)	(0.0224)
Quarter4	0.0079***	0.0099***	−0.0070**	0.0804***	0.0030	−0.0882***	−0.0904***
	(0.0007)	(0.0007)	(0.0027)	(0.0212)	(0.0051)	(0.0224)	(0.0231)
COVID year	0.0258***	0.0304***	−0.0232***	−0.0510**	0.2833***	0.3222***	0.3212***
	(0.0038)	(0.0035)	(0.0035)	(0.0183)	(0.0058)	(0.0213)	(0.0215)
Male (male = 1, female = 0)	−0.0284***	−0.0241***	0.0055	0.0655***	0.1776***	0.1472***	0.1467***
	(0.0036)	(0.0038)	(0.0035)	(0.0031)	(0.0050)	(0.0048)	(0.0048)
Age	0.0034***	−0.0005	0.0135***	0.0274***	0.0572***	0.0512***	0.0520***
	(0.0005)	(0.0006)	(0.0006)	(0.0011)	(0.0014)	(0.0013)	(0.0012)
Age squared	−0.0001***	−0.0001***	−0.0001***	−0.0004***	−0.0007***	−0.0006***	−0.0006***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Less than primary education	*Reference*						
Primary education	−0.0966**	−0.0985**	0.0165***	0.0216***	−0.0499	−0.1024*	−0.1002*
	(0.0364)	(0.0365)	(0.0026)	(0.0044)	(0.0430)	(0.0503)	(0.0500)
Lower-secondary education	−0.0720*	−0.0714*	0.0171***	0.0288***	−0.0025	−0.0647	−0.0635
	(0.0408)	(0.0407)	(0.0030)	(0.0048)	(0.0462)	(0.0547)	(0.0542)
Upper-secondary education	0.0813*	0.0917*	−0.0140***	0.0385***	0.0657	0.0325	0.0304
	(0.0446)	(0.0445)	(0.0031)	(0.0054)	(0.0489)	(0.0581)	(0.0577)
Post-secondary education	0.4419***	0.4552***	−0.0251***	−0.0275***	0.3259***	0.3830***	0.3789***
	(0.0609)	(0.0599)	(0.0044)	(0.0092)	(0.0484)	(0.0575)	(0.0575)
Urban (urban = 1, rural = 0)	0.0465***	0.0510***	−0.0538***	0.0295***	0.0602***	0.0701***	0.0644***
	(0.0103)	(0.0108)	(0.0034)	(0.0043)	(0.0089)	(0.0086)	(0.0088)
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.2175***	0.3479***	−0.1884***	3.1911***	7.2652***	2.1339***	2.1241***
	(0.0424)	(0.0419)	(0.0141)	(0.0301)	(0.0509)	(0.0695)	(0.0679)
Observations	2,759,263	2,759,263	2,759,263	2,685,240	1,124,495	1,110,806	1,109,228
R-squared	0.318	0.326	0.153	0.165	0.352	0.341	0.339

Note: This table presents estimates of the effects of COVID-19 on employment using the DD 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 A6
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***	0.0830***	−0.0227***	−0.0089**	−0.0057	−0.0662***	−0.1228***	0.0571***
	(0.0022)	(0.0016)	(0.0048)	(0.0039)	(0.0039)	(0.0200)	(0.0093)	(0.0051)
May * COVID year	0.0155***	0.0082***	−0.0260***	−0.0196***	−0.0164***	0.0189	−0.1620***	0.0940***
	(0.0021)	(0.0007)	(0.0053)	(0.0046)	(0.0038)	(0.0227)	(0.0099)	(0.0090)
June * COVID year	0.0025	0.0005**	−0.0028	−0.0011	−0.0008	0.0207	−0.0469***	0.0275***
	(0.0016)	(0.0002)	(0.0044)	(0.0044)	(0.0040)	(0.0211)	(0.0063)	(0.0028)
Jul * COVID year	0.0077***	0.0005***	−0.0094*	−0.0108**	−0.0088**	0.0263	−0.0737***	0.0248***
	(0.0017)	(0.0002)	(0.0052)	(0.0045)	(0.0040)	(0.0203)	(0.0088)	(0.0017)
August * COVID year	0.0074***	0.0039***	−0.0176***	−0.0179***	−0.0159***	0.0207	−0.0693***	0.0277***
	(0.0020)	(0.0011)	(0.0047)	(0.0047)	(0.0045)	(0.0212)	(0.0090)	(0.0037)
September * COVID year	0.0100***	0.0040***	−0.0114**	−0.0137**	−0.0125**	0.0315	−0.0729***	0.0314***
	(0.0024)	(0.0008)	(0.0045)	(0.0054)	(0.0053)	(0.0214)	(0.0069)	(0.0026)
October * COVID year	0.0109***	0.0008	−0.0189***	−0.0141***	−0.0127***	0.0288	−0.0341***	0.0609***
	(0.0022)	(0.0006)	(0.0046)	(0.0030)	(0.0028)	(0.0211)	(0.0068)	(0.0032)
November * COVID year	0.0081***	0.0001	−0.0210***	−0.0167***	−0.0139***	0.0246	−0.0250**	0.0552***
	(0.0020)	(0.0003)	(0.0043)	(0.0035)	(0.0035)	(0.0212)	(0.0097)	(0.0029)
December * COVID year	0.0080***	0.0002	−0.0038	−0.0032	−0.0036	0.0404*	−0.1796***	0.1807***
	(0.0019)	(0.0002)	(0.0041)	(0.0028)	(0.0032)	(0.0218)	(0.0234)	(0.0160)
April	−0.0031**	−0.0006***	0.0174***	0.0022	0.0010	0.0691***	−0.0336***	−0.0076**
	(0.0012)	(0.0002)	(0.0046)	(0.0027)	(0.0026)	(0.0208)	(0.0073)	(0.0032)
May	−0.0034***	−0.0006***	0.0154***	0.0052**	0.0046**	0.0063	−0.0197***	−0.0116***
	(0.0011)	(0.0002)	(0.0054)	(0.0025)	(0.0022)	(0.0239)	(0.0056)	(0.0036)
June	−0.0053***	−0.0006***	0.0085	0.0021	0.0006	0.0838***	−0.0113*	−0.0215***
	(0.0014)	(0.0001)	(0.0052)	(0.0030)	(0.0027)	(0.0218)	(0.0059)	(0.0017)
Jul	−0.0049***	−0.0009***	0.0101**	0.0005	−0.0007	0.0812***	−0.0094	−0.0227***
	(0.0013)	(0.0001)	(0.0045)	(0.0019)	(0.0021)	(0.0214)	(0.0068)	(0.0018)
August	−0.0042***	−0.0006***	0.0161***	0.0047*	0.0034	0.0626***	−0.0051	−0.0286***
	(0.0015)	(0.0001)	(0.0044)	(0.0023)	(0.0021)	(0.0220)	(0.0062)	(0.0024)
September	−0.0061***	−0.0006**	0.0138**	0.0061**	0.0047*	0.0501**	0.0063	−0.0275***
	(0.0016)	(0.0002)	(0.0051)	(0.0025)	(0.0024)	(0.0212)	(0.0063)	(0.0021)
October	−0.0079***	−0.0008***	0.0236***	0.0084***	0.0071***	0.0895***	−0.0059	−0.0279***
	(0.0014)	(0.0001)	(0.0045)	(0.0012)	(0.0011)	(0.0221)	(0.0062)	(0.0020)
November	−0.0070***	−0.0007***	0.0298***	0.0129***	0.0116***	0.0865***	0.0018	−0.0325***
	(0.0018)	(0.0001)	(0.0050)	(0.0021)	(0.0023)	(0.0216)	(0.0066)	(0.0022)
December	−0.0075***	−0.0009***	0.0309***	0.0098***	0.0075***	0.0868***	0.0071	−0.0359***
	(0.0013)	(0.0001)	(0.0052)	(0.0021)	(0.0019)	(0.0224)	(0.0076)	(0.0020)
Quarter 1	References							
COVID year	−0.0004	−0.0004**	0.0793***	0.0293***	0.0347***	−0.0267	0.2746***	−0.0606***
	(0.0010)	(0.0002)	(0.0095)	(0.0071)	(0.0070)	(0.0199)	(0.0072)	(0.0050)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	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***	0.0007**	0.5936***	0.3306***	0.2066***	3.2267***	7.2433***	0.4992***
	(0.0086)	(0.0003)	(0.0456)	(0.0523)	(0.0486)	(0.0370)	(0.0600)	(0.0306)
Observations	2,759,355	2,759,355	2,759,355	2,759,355	2,759,355	2,682,379	1,124,748	1,124,748
R-squared	0.031	0.026	0.248	0.334	0.328	0.212	0.347	0.090

Note: 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 A7
OLS regression of additional employment variables on month dummies.

Explanatory variables	Dependent variables						
	Having job with long-term contract (yes = 1, no = 0)	Working for firms and organizations (yes = 1, no = 0)	Having a secondary job (yes = 1, no = 0)	Log of number of working hours of the main job (last 7 days)	Log of monthly wages of the main job	Log of hourly wages of the main job	Log of hourly wages of all jobs
April * COVID year	−0.0076**	−0.0078*	0.0053	−0.0586***	−0.1211***	−0.0466**	−0.0430*
	(0.0033)	(0.0043)	(0.0038)	(0.0194)	(0.0095)	(0.0217)	(0.0221)
May * COVID year	−0.0189***	−0.0147***	0.0047	0.0290	−0.1641***	−0.2293***	−0.2256***
	(0.0040)	(0.0036)	(0.0029)	(0.0219)	(0.0097)	(0.0334)	(0.0343)
June * COVID year	−0.0031	−0.0005	0.0051	0.0342	−0.0472***	−0.0938***	−0.0878***
	(0.0040)	(0.0041)	(0.0040)	(0.0205)	(0.0066)	(0.0208)	(0.0210)
Jul * COVID year	−0.0125***	−0.0097*	0.0050	0.0409**	−0.0720***	−0.1221***	−0.1112***
	(0.0040)	(0.0048)	(0.0030)	(0.0195)	(0.0084)	(0.0222)	(0.0231)
August * COVID year	−0.0190***	−0.0146***	0.0002	0.0295	−0.0682***	−0.0947***	−0.0863***
	(0.0055)	(0.0037)	(0.0027)	(0.0204)	(0.0093)	(0.0232)	(0.0242)
September * COVID year	−0.0154**	−0.0106**	0.0021	0.0468**	−0.0737***	−0.1343***	−0.1286***
	(0.0059)	(0.0046)	(0.0024)	(0.0205)	(0.0065)	(0.0231)	(0.0238)
October * COVID year	−0.0145***	−0.0147***	−0.0264***	0.0400*	−0.0377***	−0.0811***	−0.0793***
	(0.0037)	(0.0036)	(0.0044)	(0.0205)	(0.0058)	(0.0223)	(0.0228)
November * COVID year	−0.0144***	−0.0158***	−0.0362***	0.0291	−0.0248**	−0.0657**	−0.0619**
	(0.0039)	(0.0028)	(0.0064)	(0.0207)	(0.0098)	(0.0252)	(0.0258)
December * COVID year	−0.0038	0.0007	−0.0149***	0.0509**	−0.1779***	−0.2318***	−0.2253***
	(0.0028)	(0.0027)	(0.0028)	(0.0211)	(0.0230)	(0.0342)	(0.0349)
April	0.0001	0.0033	−0.0001	0.0686***	−0.0350***	−0.1053***	−0.1079***
	(0.0025)	(0.0028)	(0.0025)	(0.0200)	(0.0077)	(0.0242)	(0.0247)
May	0.0035	0.0040	−0.0057**	0.0041	−0.0187***	0.0351	0.0346
	(0.0021)	(0.0024)	(0.0023)	(0.0231)	(0.0060)	(0.0319)	(0.0328)
June	0.0022	0.0029	−0.0036	0.0821***	−0.0121*	−0.0913***	−0.0913***
	(0.0029)	(0.0030)	(0.0027)	(0.0212)	(0.0062)	(0.0238)	(0.0241)
Jul	−0.0008	0.0011	−0.0018	0.0788***	−0.0091	−0.0885***	−0.0912***
	(0.0017)	(0.0017)	(0.0032)	(0.0206)	(0.0072)	(0.0235)	(0.0241)
August	0.0028	0.0043*	−0.0032	0.0607***	−0.0045	−0.0747***	−0.0780***
	(0.0019)	(0.0022)	(0.0026)	(0.0213)	(0.0065)	(0.0236)	(0.0242)
September	0.0024	0.0041*	−0.0071***	0.0437**	0.0086	−0.0211	−0.0218
	(0.0019)	(0.0021)	(0.0024)	(0.0206)	(0.0068)	(0.0217)	(0.0225)
October	0.0056***	0.0091***	−0.0020	0.0859***	−0.0053	−0.0979***	−0.0992***
	(0.0015)	(0.0011)	(0.0026)	(0.0214)	(0.0065)	(0.0240)	(0.0245)
November	0.0107***	0.0119***	−0.0084***	0.0791***	0.0039	−0.0864***	−0.0891***
	(0.0021)	(0.0018)	(0.0024)	(0.0212)	(0.0069)	(0.0237)	(0.0242)
December	0.0074***	0.0086***	−0.0107***	0.0763***	0.0102	−0.0803***	−0.0830***
	(0.0024)	(0.0020)	(0.0026)	(0.0217)	(0.0081)	(0.0254)	(0.0261)
Quarter 1	Reference						
COVID year	0.0258***	0.0304***	−0.0232***	−0.0510**	0.2834***	0.3223***	0.3213***
	(0.0064)	(0.0060)	(0.0046)	(0.0184)	(0.0071)	(0.0229)	(0.0231)
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	0.2175***	0.3479***	−0.1885***	3.1907***	7.2653***	2.1343***	2.1245***
	(0.0489)	(0.0511)	(0.0382)	(0.0452)	(0.0571)	(0.0704)	(0.0688)
Observations	2,759,263	2,759,263	2,759,263	2,685,240	1,124,495	1,110,806	1,109,228
R-squared	0.318	0.326	0.154	0.167	0.353	0.345	0.343

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 A8
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***	0.0338***	−0.0258***	−0.0193***	−0.0172***	−0.0165	−0.1076***	0.0180
	(0.0025)	(0.0095)	(0.0061)	(0.0045)	(0.0042)	(0.0296)	(0.0233)	(0.0147)
Month variable	−0.0004	0.0001	0.0021**	0.0012*	0.0014**	−0.0057	0.0052***	−0.0013**
	(0.0003)	(0.0000)	(0.0009)	(0.0006)	(0.0006)	(0.0038)	(0.0019)	(0.0005)
Month variable * Lockdown	−0.0004	−0.0059***	0.0009	−0.0001	−0.0007	0.0179***	0.0015	0.0080**
	(0.0004)	(0.0017)	(0.0011)	(0.0008)	(0.0008)	(0.0043)	(0.0049)	(0.0037)
Male (male = 1, female = 0)	−0.0039***	−0.0005*	0.0837***	−0.0438***	−0.0510***	0.0807***	0.1840***	−0.0312***
	(0.0011)	(0.0003)	(0.0067)	(0.0037)	(0.0039)	(0.0059)	(0.0079)	(0.0028)
Age	−0.0056***	−0.0000	−0.0001	0.0004	0.0041***	0.0236***	0.0501***	−0.0132***
	(0.0003)	(0.0000)	(0.0009)	(0.0008)	(0.0008)	(0.0013)	(0.0017)	(0.0009)
Age squared	0.0001***	−0.0000	−0.0001***	−0.0001***	−0.0001***	−0.0004***	−0.0006***	0.0002***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Less than primary education	Reference							
Primary education	−0.0031***	0.0005	−0.0528***	−0.0349***	−0.0260***	−0.0063	0.0082	−0.0037
	(0.0008)	(0.0003)	(0.0055)	(0.0080)	(0.0065)	(0.0045)	(0.0132)	(0.0042)
Lower-secondary education	−0.0024**	0.0007*	−0.0586***	−0.0003	0.0059	0.0080*	0.0530***	−0.0164***
	(0.0010)	(0.0004)	(0.0073)	(0.0088)	(0.0077)	(0.0042)	(0.0136)	(0.0040)
Upper-secondary education	0.0007	0.0017**	−0.0023	0.1545***	0.1496***	0.0307***	0.1112***	−0.0201***
	(0.0014)	(0.0008)	(0.0089)	(0.0077)	(0.0063)	(0.0051)	(0.0156)	(0.0043)
Post-secondary education	0.0074***	−0.0002	0.2522***	0.5363***	0.5437***	−0.0081	0.3315***	−0.0377***
	(0.0016)	(0.0005)	(0.0148)	(0.0166)	(0.0144)	(0.0092)	(0.0188)	(0.0051)
Urban area (urban = 1, rural = 0)	0.0087***	0.0017**	0.0232***	0.0203***	0.0157**	0.0605***	0.0278***	0.0043
	(0.0014)	(0.0007)	(0.0088)	(0.0076)	(0.0069)	(0.0063)	(0.0063)	(0.0032)
District fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.1435***	0.0004	0.6533***	0.3242***	0.2046***	3.2535***	7.6415***	0.2773***
	(0.0078)	(0.0006)	(0.0283)	(0.0253)	(0.0229)	(0.0373)	(0.0316)	(0.0160)
Observations	662,211	662,220	662,220	662,220	662,220	637,913	290,442	290,442
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 A9
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***	0.0347***	−0.0284***	−0.0207***	−0.0173***	−0.0917***	−0.0745***	0.0249*
	(0.0024)	(0.0096)	(0.0058)	(0.0048)	(0.0040)	(0.0240)	(0.0233)	(0.0147)
Lockdown	−0.0025*	−0.0007***	0.0017	0.0009	−0.0002	0.0754***	−0.0333**	−0.0060*
	(0.0014)	(0.0003)	(0.0049)	(0.0035)	(0.0031)	(0.0144)	(0.0136)	(0.0034)
Month variable	0.0007***	0.0001***	−0.0008	−0.0027***	−0.0027***	−0.0139***	0.0063***	0.0016***
	(0.0002)	(0.0000)	(0.0007)	(0.0006)	(0.0005)	(0.0019)	(0.0020)	(0.0005)
Month variable * Lockdown	−0.0016***	−0.0001***	0.0032***	0.0037***	0.0038***	0.0185***	−0.0027	−0.0041***
	(0.0003)	(0.0000)	(0.0009)	(0.0006)	(0.0006)	(0.0024)	(0.0021)	(0.0006)
Male (male = 1, female = 0)	−0.0023***	0.0002*	0.0891***	−0.0386***	−0.0454***	0.0777***	0.1804***	−0.0406***
	(0.0008)	(0.0001)	(0.0056)	(0.0034)	(0.0035)	(0.0047)	(0.0064)	(0.0031)
Age	−0.0060***	0.0000	−0.0001	0.0003	0.0041***	0.0230***	0.0566***	−0.0171***
	(0.0003)	(0.0000)	(0.0008)	(0.0007)	(0.0007)	(0.0010)	(0.0014)	(0.0008)
Age squared	0.0001***	−0.0000	−0.0001***	−0.0001***	−0.0001***	−0.0003***	−0.0007***	0.0002***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Less than primary education								
Primary education	−0.0006	0.0000	−0.0954***	−0.0867***	−0.0810***	0.0071**	−0.0425***	−0.0100***
	(0.0008)	(0.0001)	(0.0071)	(0.0122)	(0.0116)	(0.0033)	(0.0146)	(0.0035)
Lower-secondary education	−0.0004	0.0000	−0.1062***	−0.0580***	−0.0555***	0.0160***	0.0023	−0.0203***
	(0.0010)	(0.0001)	(0.0077)	(0.0138)	(0.0133)	(0.0035)	(0.0153)	(0.0034)
Upper-secondary education	0.0041***	0.0000	−0.0386***	0.1000***	0.0906***	0.0429***	0.0581***	−0.0255***
	(0.0012)	(0.0002)	(0.0091)	(0.0139)	(0.0134)	(0.0044)	(0.0161)	(0.0035)
Post-secondary education	0.0101***	−0.0005***	0.2126***	0.4732***	0.4774***	−0.0057	0.2906***	−0.0419***
	(0.0019)	(0.0002)	(0.0167)	(0.0207)	(0.0192)	(0.0071)	(0.0181)	(0.0044)
Urban area (urban = 1, rural = 0)	0.0098***	0.0006***	0.0386***	0.0375***	0.0337***	0.0665***	0.0443***	0.0027
	(0.0009)	(0.0002)	(0.0072)	(0.0064)	(0.0061)	(0.0053)	(0.0068)	(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***	0.0010***	0.6331***	0.3483***	0.2314***	3.2107***	7.4784***	0.3940***
	(0.0064)	(0.0003)	(0.0252)	(0.0268)	(0.0235)	(0.0218)	(0.0289)	(0.0154)
Observations	2,045,740	2,045,871	2,045,871	2,045,871	2,045,871	1,986,745	869,660	869,660
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 A10
RDD-DD 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***	0.0346***	−0.0264***	−0.0188***	−0.0159***	−0.0783***	−0.0701***	0.0245*
	(0.0022)	(0.0096)	(0.0058)	(0.0056)	(0.0054)	(0.0188)	(0.0201)	(0.0145)
Lockdown	−0.0033***	−0.0007***	−0.0005	−0.0009	−0.0018	0.0629***	−0.0371***	−0.0064
	(0.0011)	(0.0002)	(0.0041)	(0.0021)	(0.0022)	(0.0177)	(0.0122)	(0.0042)
Month variable	0.0009***	0.0001***	0.0009	0.0003	0.0006**	−0.0118***	0.0105***	0.0019***
	(0.0002)	(0.0000)	(0.0006)	(0.0003)	(0.0003)	(0.0023)	(0.0017)	(0.0006)
Month variable * Lockdown	−0.0015***	−0.0002***	0.0012	0.0008**	0.0004	0.0161***	−0.0069***	−0.0050***
	(0.0002)	(0.0000)	(0.0007)	(0.0003)	(0.0003)	(0.0027)	(0.0018)	(0.0007)
Male (male = 1, female = 0)	0.0003	0.0004***	0.0973***	−0.0291***	−0.0373***	0.0770***	0.1770***	−0.0494***
	(0.0007)	(0.0001)	(0.0054)	(0.0033)	(0.0034)	(0.0044)	(0.0063)	(0.0035)
Age	−0.0056***	0.0000***	−0.0013*	−0.0003	0.0037***	0.0214***	0.0592***	−0.0202***
	(0.0002)	(0.0000)	(0.0007)	(0.0007)	(0.0006)	(0.0009)	(0.0014)	(0.0007)
Age squared	0.0001***	−0.0000***	−0.0001***	−0.0001***	−0.0001***	−0.0003***	−0.0008***	0.0003***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Less than primary education	Reference							
Primary education	0.0008	0.0000	−0.1273***	−0.1267***	−0.1231***	0.0152***	−0.0840***	−0.0071**
	(0.0008)	(0.0001)	(0.0057)	(0.0113)	(0.0107)	(0.0032)	(0.0144)	(0.0035)
Lower-secondary education	0.0008	0.0000	−0.1434***	−0.1016***	−0.1029***	0.0208***	−0.0372**	−0.0205***
	(0.0009)	(0.0001)	(0.0060)	(0.0127)	(0.0123)	(0.0036)	(0.0151)	(0.0034)
Upper-secondary education	0.0055***	−0.0003***	−0.0651***	0.0623***	0.0459***	0.0492***	0.0245	−0.0290***
	(0.0009)	(0.0001)	(0.0068)	(0.0122)	(0.0117)	(0.0038)	(0.0151)	(0.0034)
Post-secondary education	0.0196***	−0.0005***	0.1740***	0.4175***	0.4182***	−0.0011	0.2710***	−0.0554***
	(0.0015)	(0.0001)	(0.0140)	(0.0178)	(0.0163)	(0.0062)	(0.0175)	(0.0043)
Urban area (urban = 1, rural = 0)	0.0080***	0.0002	0.0581***	0.0560***	0.0514***	0.0675***	0.0597***	−0.0000
	(0.0007)	(0.0001)	(0.0072)	(0.0069)	(0.0065)	(0.0054)	(0.0065)	(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***	0.0008***	0.6436***	0.3721***	0.2481***	3.2329***	7.3443***	0.4865***
	(0.0055)	(0.0003)	(0.0231)	(0.0240)	(0.0198)	(0.0235)	(0.0276)	(0.0167)
Observations	3,450,863	3,451,582	3,451,582	3,451,582	3,451,582	3,359,602	1,422,910	1,422,910
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 A11
OLS regressions of employment variables with interactions with Da Nang city.

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	0.0084***	0.0102	−0.0138**	−0.0109***	−0.0093***	0.0181	−0.0855***	0.0621***
	(0.0015)	(0.0081)	(0.0056)	(0.0018)	(0.0017)	(0.0272)	(0.0150)	(0.0171)
Quarter 2–4 * COVID year * Da Nang	0.0523***	0.0673*	−0.0798***	−0.0725***	−0.0633***	−0.0254	−0.1310***	0.0456
	(0.0064)	(0.0371)	(0.0196)	(0.0158)	(0.0143)	(0.0154)	(0.0438)	(0.0295)
Quarter 2–4	−0.0055***	−0.0007***	0.0184***	0.0058***	0.0044***	0.0685***	−0.0077	−0.0244***
	(0.0012)	(0.0001)	(0.0047)	(0.0010)	(0.0009)	(0.0211)	(0.0047)	(0.0026)
COVID year	−0.0004	−0.0004**	0.0793***	0.0293***	0.0347***	−0.0268	0.2745***	−0.0606***
	(0.0012)	(0.0002)	(0.0087)	(0.0041)	(0.0041)	(0.0203)	(0.0080)	(0.0045)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
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***	0.0008***	0.5930***	0.3303***	0.2064***	3.2261***	7.2429***	0.4994***
	(0.0060)	(0.0002)	(0.0319)	(0.0430)	(0.0417)	(0.0287)	(0.0537)	(0.0254)
Observations	2,758,473	2,759,263	2,759,263	2,759,263	2,759,263	2,682,297	1,124,695	1,124,695
R-squared	0.031	0.007	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 A12
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***	0.0305***	−0.0176***	−0.0090***	−0.0066***	−0.0983***	0.0468***
	(0.0015)	(0.0008)	(0.0040)	(0.0024)	(0.0022)	(0.0050)	(0.0020)
Quarter 3 * COVID year	0.0077***	0.0028***	−0.0135***	−0.0137***	−0.0114***	−0.0674***	0.0204***
	(0.0015)	(0.0006)	(0.0039)	(0.0026)	(0.0025)	(0.0053)	(0.0019)
Quarter 4 * COVID year	0.0087***	0.0004	−0.0154***	−0.0116***	−0.0101***	−0.0776***	0.0941***
	(0.0017)	(0.0003)	(0.0039)	(0.0017)	(0.0016)	(0.0049)	(0.0042)
Quarter 1	Reference						
Quarter 2	−0.0043***	−0.0006***	0.0105**	0.0006	−0.0002	−0.0240***	−0.0137***
	(0.0011)	(0.0001)	(0.0043)	(0.0005)	(0.0004)	(0.0053)	(0.0007)
Quarter 3	−0.0055***	−0.0007***	0.0098**	0.0017**	0.0008	−0.0046	−0.0261***
	(0.0011)	(0.0001)	(0.0044)	(0.0007)	(0.0006)	(0.0058)	(0.0015)
Quarter4	−0.0082***	−0.0008***	0.0235***	0.0086***	0.0076***	−0.0026	−0.0326***
	(0.0014)	(0.0001)	(0.0048)	(0.0003)	(0.0001)	(0.0062)	(0.0019)
COVID year	−0.0006	−0.0004**	0.0933***	0.0521***	0.0573***	0.2801***	−0.0573***
	(0.0009)	(0.0002)	(0.0097)	(0.0062)	(0.0060)	(0.0078)	(0.0039)
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.0214***	0.0014***	0.3843***	0.2460***	0.2070***	8.5054***	0.1047***
	(0.0009)	(0.0001)	(0.0082)	(0.0026)	(0.0028)	(0.0044)	(0.0027)
Observations	2,759,355	2,759,355	2,759,355	2,759,355	2,759,355	1,124,748	1,124,748
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 A13
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***	0.0305***	−0.0186***	−0.0104***	−0.0078***	−0.1024***	0.0501***
	(0.0011)	(0.0004)	(0.0043)	(0.0012)	(0.0011)	(0.0026)	(0.0022)
Quarter 3 * COVID year	0.0078***	0.0028***	−0.0142***	−0.0141***	−0.0117***	−0.0694***	0.0230***
	(0.0011)	(0.0004)	(0.0044)	(0.0012)	(0.0011)	(0.0020)	(0.0015)
Quarter 4 * COVID year	0.0088***	0.0004**	−0.0156***	−0.0112***	−0.0096***	−0.0788***	0.0964***
	(0.0014)	(0.0002)	(0.0045)	(0.0011)	(0.0010)	(0.0031)	(0.0023)
Quarter 1	Reference						
Quarter 2	−0.0043***	−0.0006***	0.0108**	0.0009	0.0001	−0.0221***	−0.0139***
	(0.0012)	(0.0001)	(0.0045)	(0.0007)	(0.0005)	(0.0041)	(0.0017)
Quarter 3	−0.0055***	−0.0007***	0.0101**	0.0021*	0.0011	−0.0019	−0.0262***
	(0.0011)	(0.0001)	(0.0047)	(0.0011)	(0.0011)	(0.0042)	(0.0020)
Quarter4	−0.0082***	−0.0008***	0.0234***	0.0085***	0.0075***	0.0009	−0.0325***
	(0.0014)	(0.0001)	(0.0049)	(0.0007)	(0.0006)	(0.0048)	(0.0021)
COVID year	−0.0007	−0.0005**	0.0882***	0.0473***	0.0528***	0.2857***	−0.0594***
	(0.0010)	(0.0002)	(0.0084)	(0.0034)	(0.0035)	(0.0063)	(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***	0.0013***	0.3826***	0.2441***	0.2054***	8.4967***	0.1056***
	(0.0009)	(0.0001)	(0.0080)	(0.0019)	(0.0020)	(0.0052)	(0.0026)
Observations	2,759,355	2,759,355	2,759,355	2,759,355	2,759,355	1,124,748	1,124,748
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 A14
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***	0.0305***	−0.0166***	−0.0089***	−0.0068**	−0.1074***	0.0532***
	(0.0018)	(0.0008)	(0.0034)	(0.0028)	(0.0029)	(0.0068)	(0.0037)
Quarter 3 * COVID year	0.0083***	0.0028***	−0.0121***	−0.0137***	−0.0120***	−0.0706***	0.0261***
	(0.0017)	(0.0006)	(0.0037)	(0.0038)	(0.0038)	(0.0071)	(0.0015)
Quarter 4 * COVID year	0.0090***	0.0004	−0.0141***	−0.0113***	−0.0101***	−0.0808***	0.0993***
	(0.0019)	(0.0003)	(0.0031)	(0.0022)	(0.0022)	(0.0103)	(0.0061)
Quarter 1	Reference						
Quarter 2	−0.0039***	−0.0006***	0.0134***	0.0029***	0.0018**	−0.0227***	−0.0137***
	(0.0011)	(0.0001)	(0.0042)	(0.0009)	(0.0008)	(0.0052)	(0.0008)
Quarter 3	−0.0051***	−0.0007***	0.0129***	0.0035***	0.0022**	−0.0043	−0.0263***
	(0.0011)	(0.0001)	(0.0042)	(0.0011)	(0.0010)	(0.0056)	(0.0017)
Quarter4	−0.0075***	−0.0008***	0.0280***	0.0103***	0.0087***	−0.0008	−0.0322***
	(0.0014)	(0.0001)	(0.0045)	(0.0011)	(0.0012)	(0.0064)	(0.0018)
COVID year	−0.0005	−0.0004**	0.0812***	0.0315***	0.0369***	0.2744***	−0.0593***
	(0.0010)	(0.0002)	(0.0091)	(0.0071)	(0.0070)	(0.0072)	(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***	0.0007**	0.5503***	0.3001***	0.1829***	7.1983***	0.5076***
	(0.0086)	(0.0003)	(0.0490)	(0.0506)	(0.0465)	(0.0622)	(0.0320)
Observations	2,759,355	2,759,355	2,759,355	2,759,355	2,759,355	1,124,748	1,124,748
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 LFSs.

Table A15
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***	0.0305***	−0.0117***	−0.0105***	−0.0084***	−0.1108***	0.0545***
	(0.0015)	(0.0004)	(0.0018)	(0.0016)	(0.0015)	(0.0028)	(0.0022)
Quarter 3 * COVID year	0.0080***	0.0029***	−0.0073***	−0.0147***	−0.0131***	−0.0714***	0.0265***
	(0.0014)	(0.0004)	(0.0019)	(0.0016)	(0.0014)	(0.0026)	(0.0016)
Quarter 4 * COVID year	0.0089***	0.0004***	−0.0082***	−0.0111***	−0.0103***	−0.0791***	0.0998***
	(0.0018)	(0.0001)	(0.0018)	(0.0011)	(0.0010)	(0.0037)	(0.0029)
Quarter 1	Reference						
Quarter 2	−0.0038**	−0.0006***	0.0083***	0.0038***	0.0028***	−0.0205***	−0.0129***
	(0.0015)	(0.0001)	(0.0020)	(0.0008)	(0.0008)	(0.0040)	(0.0016)
Quarter 3	−0.0047***	−0.0008***	0.0080***	0.0044***	0.0033***	−0.0033	−0.0244***
	(0.0014)	(0.0001)	(0.0022)	(0.0007)	(0.0007)	(0.0045)	(0.0018)
Quarter4	−0.0073***	−0.0008***	0.0221***	0.0105***	0.0093***	−0.0015	−0.0307***
	(0.0018)	(0.0001)	(0.0022)	(0.0008)	(0.0007)	(0.0052)	(0.0021)
COVID year	0.0029*	−0.0002**	0.0562***	0.0261***	0.0300***	0.2314***	−0.0677***
	(0.0015)	(0.0001)	(0.0043)	(0.0038)	(0.0038)	(0.0058)	(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***	0.0005*	0.6319***	0.3618***	0.2403***	7.3266***	0.4884***
	(0.0069)	(0.0002)	(0.0329)	(0.0471)	(0.0455)	(0.0513)	(0.0263)
Observations	2,293,785	2,293,785	2,293,785	2,293,785	2,293,785	951,421	951,421
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 LFSs.

Table A16
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***	0.0305***	−0.0199***	−0.0104***	−0.0081***	−0.1108***	0.0545***
	(0.0013)	(0.0004)	(0.0046)	(0.0016)	(0.0015)	(0.0025)	(0.0023)
Quarter 3 * COVID year	0.0090***	0.0027***	−0.0158***	−0.0139***	−0.0124***	−0.0744***	0.0273***
	(0.0012)	(0.0004)	(0.0046)	(0.0016)	(0.0015)	(0.0022)	(0.0019)
Quarter 4 * COVID year	0.0101***	0.0004***	−0.0177***	−0.0115***	−0.0104***	−0.0856***	0.0991***
	(0.0016)	(0.0001)	(0.0049)	(0.0012)	(0.0011)	(0.0039)	(0.0028)
Quarter 1	Reference						
Quarter 2	−0.0047***	−0.0006***	0.0165***	0.0037***	0.0026***	−0.0204***	−0.0137***
	(0.0013)	(0.0001)	(0.0049)	(0.0009)	(0.0008)	(0.0038)	(0.0020)
Quarter 3	−0.0056***	−0.0006***	0.0164***	0.0036***	0.0027***	−0.0003	−0.0260***
	(0.0012)	(0.0001)	(0.0049)	(0.0009)	(0.0009)	(0.0038)	(0.0023)
Quarter4	−0.0085***	−0.0008***	0.0314***	0.0109***	0.0093***	0.0050	−0.0308***
	(0.0016)	(0.0001)	(0.0052)	(0.0008)	(0.0007)	(0.0048)	(0.0021)
COVID year	−0.0010	−0.0004***	0.0829***	0.0307***	0.0359***	0.2770***	−0.0605***
	(0.0011)	(0.0001)	(0.0077)	(0.0040)	(0.0041)	(0.0053)	(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***	0.0006***	0.6010***	0.3507***	0.2259***	7.2804***	0.4751***
	(0.0057)	(0.0002)	(0.0354)	(0.0473)	(0.0460)	(0.0532)	(0.0253)
Observations	2,291,424	2,291,424	2,291,424	2,291,424	2,291,424	942,730	942,730
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 LFSs.

Table A17
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***	0.0305***	−0.0167***	−0.0085***	−0.0060***	−0.1081***	0.0544***
	(0.0013)	(0.0004)	(0.0051)	(0.0014)	(0.0013)	(0.0028)	(0.0022)
Quarter 3 * COVID year	0.0083***	0.0028***	−0.0137**	−0.0135***	−0.0115***	−0.0696***	0.0261***
	(0.0014)	(0.0004)	(0.0052)	(0.0015)	(0.0014)	(0.0029)	(0.0018)
Quarter 4 * COVID year	0.0091***	0.0004**	−0.0158***	−0.0107***	−0.0095***	−0.0816***	0.0994***
	(0.0018)	(0.0002)	(0.0053)	(0.0011)	(0.0011)	(0.0046)	(0.0027)
Quarter 1	Reference						
Quarter 2	−0.0033**	−0.0006***	0.0134**	0.0019**	0.0006	−0.0229***	−0.0133***
	(0.0013)	(0.0002)	(0.0055)	(0.0007)	(0.0005)	(0.0044)	(0.0017)
Quarter 3	−0.0051***	−0.0007***	0.0140**	0.0027***	0.0011**	−0.0049	−0.0250***
	(0.0014)	(0.0002)	(0.0055)	(0.0007)	(0.0005)	(0.0043)	(0.0020)
Quarter4	−0.0075***	−0.0008***	0.0287***	0.0087***	0.0071***	−0.0000	−0.0312***
	(0.0018)	(0.0001)	(0.0058)	(0.0007)	(0.0006)	(0.0057)	(0.0022)
COVID year	0.0002	−0.0004**	0.0766***	0.0245***	0.0299***	0.2710***	−0.0590***
	(0.0012)	(0.0002)	(0.0085)	(0.0033)	(0.0033)	(0.0058)	(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***	0.0011***	0.5272***	0.2287***	0.1069***	7.1219***	0.5102***
	(0.0068)	(0.0002)	(0.0189)	(0.0177)	(0.0171)	(0.0522)	(0.0310)
Observations	2,287,381	2,287,381	2,287,381	2,287,381	2,287,381	933,476	933,476
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 LFSs.

Table A18
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***	0.0305***	−0.0196***	−0.0108***	−0.0082***	−0.1071***	0.0560***
	(0.0013)	(0.0004)	(0.0047)	(0.0017)	(0.0015)	(0.0031)	(0.0027)
Quarter 3 * COVID year	0.0092***	0.0027***	−0.0152***	−0.0150***	−0.0129***	−0.0701***	0.0285***
	(0.0012)	(0.0004)	(0.0048)	(0.0016)	(0.0015)	(0.0028)	(0.0020)
Quarter 4 * COVID year	0.0099***	0.0004**	−0.0173***	−0.0118***	−0.0102***	−0.0778***	0.1020***
	(0.0016)	(0.0002)	(0.0049)	(0.0012)	(0.0012)	(0.0035)	(0.0030)
Quarter 1	Reference						
Quarter 2	−0.0049***	−0.0006***	0.0162***	0.0040***	0.0026***	−0.0241***	−0.0147***
	(0.0012)	(0.0001)	(0.0051)	(0.0009)	(0.0008)	(0.0037)	(0.0020)
Quarter 3	−0.0059***	−0.0006***	0.0158***	0.0047***	0.0031***	−0.0046	−0.0272***
	(0.0012)	(0.0002)	(0.0052)	(0.0006)	(0.0008)	(0.0039)	(0.0021)
Quarter4	−0.0084***	−0.0008***	0.0310***	0.0111***	0.0090***	−0.0027	−0.0335***
	(0.0016)	(0.0001)	(0.0054)	(0.0008)	(0.0008)	(0.0048)	(0.0022)
COVID year	−0.0013	−0.0004**	0.0816***	0.0309***	0.0359***	0.2731***	−0.0611***
	(0.0010)	(0.0002)	(0.0080)	(0.0040)	(0.0040)	(0.0058)	(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***	0.0007**	0.6089***	0.3552***	0.2284***	7.2838***	0.4947***
	(0.0066)	(0.0002)	(0.0350)	(0.0473)	(0.0463)	(0.0541)	(0.0292)
Observations	2,291,199	2,291,199	2,291,199	2,291,199	2,291,199	933,564	933,564
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 LFSs.

Table A19
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***	0.0305***	−0.0175***	−0.0088***	−0.0071***	−0.1112***	0.0566***
	(0.0009)	(0.0004)	(0.0051)	(0.0016)	(0.0016)	(0.0034)	(0.0019)
Quarter 3 * COVID year	0.0073***	0.0028***	−0.0120**	−0.0135***	−0.0120***	−0.0747***	0.0305***
	(0.0008)	(0.0004)	(0.0052)	(0.0017)	(0.0017)	(0.0026)	(0.0014)
Quarter 4 * COVID year	0.0070***	0.0005**	−0.0134**	−0.0112***	−0.0097***	−0.0853***	0.1034***
	(0.0009)	(0.0002)	(0.0054)	(0.0014)	(0.0013)	(0.0036)	(0.0026)
Quarter 1	Reference						
Quarter 2	−0.0030***	−0.0006***	0.0140**	0.0021**	0.0015*	−0.0205***	−0.0142***
	(0.0010)	(0.0001)	(0.0055)	(0.0008)	(0.0008)	(0.0038)	(0.0014)
Quarter 3	−0.0041***	−0.0007***	0.0125**	0.0032***	0.0021**	−0.0006	−0.0281***
	(0.0009)	(0.0002)	(0.0056)	(0.0008)	(0.0008)	(0.0038)	(0.0018)
Quarter4	−0.0055***	−0.0009***	0.0271***	0.0103***	0.0084***	0.0041	−0.0340***
	(0.0009)	(0.0001)	(0.0059)	(0.0008)	(0.0008)	(0.0052)	(0.0020)
COVID year	0.0005	−0.0005**	0.0786***	0.0292***	0.0349***	0.2762***	−0.0620***
	(0.0011)	(0.0002)	(0.0089)	(0.0039)	(0.0039)	(0.0051)	(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***	0.0008***	0.6056***	0.3393***	0.2165***	7.2118***	0.5332***
	(0.0062)	(0.0003)	(0.0364)	(0.0509)	(0.0491)	(0.0613)	(0.0229)
Observations	2,313,760	2,313,760	2,313,760	2,313,760	2,313,760	929,234	929,234
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 LFSs.

Table A20
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***	0.0306***	−0.0396***	−0.0070***	−0.0043**	−0.1059***	0.0575***
	(0.0004)	(0.0006)	(0.0012)	(0.0012)	(0.0013)	(0.0032)	(0.0032)
Quarter 3 * COVID year	0.0097***	0.0024***	−0.0355***	−0.0117***	−0.0094***	−0.0764***	0.0321***
	(0.0004)	(0.0005)	(0.0012)	(0.0012)	(0.0012)	(0.0028)	(0.0019)
Quarter 4 * COVID year	0.0095***	0.0004	−0.0402***	−0.0117***	−0.0087***	−0.0958***	0.1037***
	(0.0006)	(0.0002)	(0.0012)	(0.0012)	(0.0012)	(0.0021)	(0.0019)
Quarter 1	Reference						
Quarter 2	−0.0045***	−0.0007**	0.0361***	0.0002	−0.0013***	−0.0249***	−0.0175***
	(0.0003)	(0.0003)	(0.0010)	(0.0004)	(0.0003)	(0.0019)	(0.0028)
Quarter 3	−0.0065***	−0.0003	0.0357***	0.0006	−0.0012	0.0018	−0.0327***
	(0.0004)	(0.0003)	(0.0018)	(0.0013)	(0.0017)	(0.0031)	(0.0026)
Quarter4	−0.0079***	−0.0009**	0.0527***	0.0091***	0.0057***	0.0133***	−0.0368***
	(0.0006)	(0.0003)	(0.0011)	(0.0009)	(0.0007)	(0.0028)	(0.0018)
COVID year	−0.0008	−0.0004	0.0910***	0.0226***	0.0278***	0.2744***	−0.0612***
	(0.0006)	(0.0003)	(0.0034)	(0.0034)	(0.0035)	(0.0042)	(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***	0.0013**	0.5021***	0.1978***	0.0739***	7.0537***	0.5502***
	(0.0068)	(0.0006)	(0.0209)	(0.0169)	(0.0171)	(0.0687)	(0.0409)
Observations	905,699	905,699	905,699	905,699	905,699	364,760	364,760
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 LFSs.

Table A21
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***	0.0305***	−0.0062***	−0.0077***	−0.0059***	−0.1033***	0.0566***
	(0.0004)	(0.0005)	(0.0013)	(0.0015)	(0.0016)	(0.0041)	(0.0023)
Quarter 3 * COVID year	0.0061***	0.0029***	−0.0012	−0.0157***	−0.0129***	−0.0611***	0.0287***
	(0.0004)	(0.0004)	(0.0014)	(0.0018)	(0.0018)	(0.0033)	(0.0015)
Quarter 4 * COVID year	0.0048***	0.0004**	−0.0020	−0.0104***	−0.0088***	−0.0655***	0.1065***
	(0.0004)	(0.0001)	(0.0012)	(0.0011)	(0.0010)	(0.0027)	(0.0026)
Quarter 1	Reference						
Quarter 2	−0.0010**	−0.0006***	0.0027**	0.0010	0.0002	−0.0278***	−0.0137***
	(0.0004)	(0.0001)	(0.0010)	(0.0007)	(0.0007)	(0.0024)	(0.0019)
Quarter 3	−0.0030***	−0.0008***	0.0015	0.0048***	0.0023**	−0.0135***	−0.0268***
	(0.0003)	(0.0001)	(0.0017)	(0.0009)	(0.0009)	(0.0032)	(0.0020)
Quarter4	−0.0034***	−0.0009***	0.0149***	0.0081***	0.0060***	−0.0167***	−0.0371***
	(0.0004)	(0.0001)	(0.0008)	(0.0008)	(0.0007)	(0.0036)	(0.0023)
COVID year	0.0053***	−0.0003*	0.0468***	0.0216***	0.0254***	0.2205***	−0.0680***
	(0.0005)	(0.0001)	(0.0033)	(0.0035)	(0.0035)	(0.0038)	(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***	0.0014**	0.5646***	0.2202***	0.1028***	7.1190***	0.5773***
	(0.0066)	(0.0004)	(0.0156)	(0.0174)	(0.0166)	(0.0626)	(0.0389)
Observations	908,060	908,060	908,060	908,060	908,060	373,451	373,451
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 LFSs.

Table A22
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***	0.0306***	−0.0164***	−0.0123***	−0.0109***	−0.1150***	0.0562***
	(0.0004)	(0.0005)	(0.0013)	(0.0012)	(0.0012)	(0.0045)	(0.0023)
Quarter 3 * COVID year	0.0086***	0.0028***	−0.0092***	−0.0159***	−0.0153***	−0.0820***	0.0331***
	(0.0005)	(0.0004)	(0.0012)	(0.0015)	(0.0014)	(0.0031)	(0.0015)
Quarter 4 * COVID year	0.0082***	0.0004***	−0.0063***	−0.0100***	−0.0088***	−0.0817***	0.1038***
	(0.0004)	(0.0001)	(0.0012)	(0.0014)	(0.0014)	(0.0022)	(0.0025)
Quarter 1	Reference						
Quarter 2	−0.0064***	−0.0007***	0.0129***	0.0055***	0.0052***	−0.0161***	−0.0153***
	(0.0005)	(0.0001)	(0.0009)	(0.0008)	(0.0009)	(0.0020)	(0.0018)
Quarter 3	−0.0053***	−0.0007***	0.0107***	0.0067***	0.0064***	0.0068	−0.0311***
	(0.0007)	(0.0001)	(0.0018)	(0.0016)	(0.0017)	(0.0037)	(0.0024)
Quarter4	−0.0067***	−0.0008***	0.0217***	0.0114***	0.0097***	0.0018	−0.0351***
	(0.0007)	(0.0001)	(0.0012)	(0.0010)	(0.0009)	(0.0031)	(0.0018)
COVID year	−0.0162***	−0.0005***	0.0751***	0.0353*	0.0342*	0.1571***	−0.0489***
	(0.0041)	(0.0001)	(0.0153)	(0.0156)	(0.0146)	(0.0097)	(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***	0.0000	0.7634***	0.5574***	0.4329***	7.5542***	0.4538***
	(0.0088)	(0.0003)	(0.0264)	(0.0311)	(0.0290)	(0.0385)	(0.0316)
Observations	912,103	912,103	912,103	912,103	912,103	382,705	382,705
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 LFSs.

Table A23
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***	0.0306***	−0.0071***	−0.0057***	−0.0049***	−0.1178***	0.0508***
	(0.0004)	(0.0005)	(0.0012)	(0.0010)	(0.0011)	(0.0029)	(0.0015)
Quarter 3 * COVID year	0.0052***	0.0031***	−0.0035**	−0.0105***	−0.0102***	−0.0781***	0.0238***
	(0.0004)	(0.0004)	(0.0011)	(0.0014)	(0.0013)	(0.0021)	(0.0012)
Quarter 4 * COVID year	0.0055***	0.0006***	−0.0036**	−0.0091***	−0.0094***	−0.0968***	0.0954***
	(0.0003)	(0.0001)	(0.0012)	(0.0013)	(0.0011)	(0.0026)	(0.0026)
Quarter 1	Reference						
Quarter 2	−0.0001	−0.0006***	0.0038***	−0.0007	−0.0003	−0.0134***	−0.0093***
	(0.0004)	(0.0001)	(0.0011)	(0.0007)	(0.0008)	(0.0024)	(0.0008)
Quarter 3	−0.0018**	−0.0009***	0.0038	−0.0005	−0.0001	0.0033	−0.0216***
	(0.0006)	(0.0001)	(0.0021)	(0.0015)	(0.0015)	(0.0034)	(0.0019)
Quarter4	−0.0038***	−0.0010***	0.0167***	0.0069***	0.0070***	0.0145***	−0.0263***
	(0.0004)	(0.0001)	(0.0015)	(0.0012)	(0.0011)	(0.0031)	(0.0016)
COVID year	−0.0012**	−0.0006***	0.0261***	0.0157***	0.0136***	0.1318***	−0.0341***
	(0.0005)	(0.0001)	(0.0022)	(0.0023)	(0.0023)	(0.0032)	(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***	0.0016***	0.5658***	0.2166***	0.1125***	7.2190***	0.4714***
	(0.0082)	(0.0001)	(0.0159)	(0.0165)	(0.0164)	(0.0519)	(0.0277)
Observations	908,285	908,285	908,285	908,285	908,285	382,617	382,617
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 LFSs.

Table A24
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***	0.0305***	−0.0147***	−0.0132***	−0.0089***	−0.1041***	0.0508***
	(0.0005)	(0.0005)	(0.0013)	(0.0016)	(0.0015)	(0.0035)	(0.0012)
Quarter 3 * COVID year	0.0124***	0.0027***	−0.0158***	−0.0164***	−0.0137***	−0.0631***	0.0183***
	(0.0009)	(0.0004)	(0.0011)	(0.0013)	(0.0014)	(0.0026)	(0.0007)
Quarter 4 * COVID year	0.0167***	0.0002	−0.0187***	−0.0118***	−0.0113***	−0.0700***	0.0913***
	(0.0008)	(0.0001)	(0.0012)	(0.0008)	(0.0008)	(0.0026)	(0.0016)
Quarter 1	Reference						
Quarter 2	−0.0074***	−0.0006***	0.0117***	0.0066***	0.0037***	−0.0261***	−0.0114***
	(0.0006)	(0.0000)	(0.0011)	(0.0008)	(0.0009)	(0.0032)	(0.0011)
Quarter 3	−0.0089***	−0.0006***	0.0163***	0.0057**	0.0037*	−0.0105**	−0.0182***
	(0.0009)	(0.0000)	(0.0020)	(0.0018)	(0.0018)	(0.0041)	(0.0017)
Quarter4	−0.0149***	−0.0006***	0.0319***	0.0104***	0.0096***	−0.0104**	−0.0244***
	(0.0009)	(0.0000)	(0.0016)	(0.0015)	(0.0014)	(0.0043)	(0.0014)
COVID year	−0.0070***	−0.0000	0.0183***	0.0059**	0.0059**	0.0419***	−0.0188***
	(0.0008)	(0.0001)	(0.0023)	(0.0022)	(0.0020)	(0.0028)	(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***	0.0004	0.6016***	0.3056***	0.1820***	7.6018***	0.3252***
	(0.0093)	(0.0004)	(0.0179)	(0.0206)	(0.0200)	(0.0388)	(0.0188)
Observations	885,724	885,724	885,724	885,724	885,724	386,947	386,947
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 LFSs.

Table A25
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	−0.0001	0.0283***	−0.0027	−0.0033	−0.0060	−0.0059
	(0.0012)	(0.0005)	(0.0039)	(0.0032)	(0.0033)	(0.0076)	(0.0053)
Quarter 3 * Year 2016	−0.0018	0.0005	0.0289***	−0.0020	−0.0029	0.0036	−0.0097*
	(0.0011)	(0.0005)	(0.0039)	(0.0032)	(0.0033)	(0.0075)	(0.0050)
Quarter 4 * Year 2016	−0.0006	−0.0000	0.0323***	0.0008	−0.0015	0.0145*	−0.0075
	(0.0012)	(0.0004)	(0.0039)	(0.0033)	(0.0034)	(0.0075)	(0.0049)
Quarter 1	Reference						
Quarter 2	−0.0038***	−0.0006***	0.0082***	0.0037**	0.0027*	−0.0205***	−0.0128***
	(0.0006)	(0.0001)	(0.0018)	(0.0017)	(0.0016)	(0.0035)	(0.0019)
Quarter 3	−0.0047***	−0.0008***	0.0078***	0.0042**	0.0031*	−0.0033	−0.0244***
	(0.0006)	(0.0001)	(0.0019)	(0.0017)	(0.0017)	(0.0035)	(0.0018)
Quarter4	−0.0073***	−0.0008***	0.0218***	0.0102***	0.0090***	−0.0015	−0.0307***
	(0.0005)	(0.0001)	(0.0019)	(0.0017)	(0.0016)	(0.0035)	(0.0018)
Year 2015	−0.0024**	0.0002	−0.0832***	−0.0217***	−0.0251***	−0.2292***	0.0429***
	(0.0010)	(0.0004)	(0.0032)	(0.0026)	(0.0027)	(0.0066)	(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***	0.0004*	0.6606***	0.3566***	0.2365***	7.4617***	0.4678***
	(0.0021)	(0.0002)	(0.0053)	(0.0057)	(0.0056)	(0.0107)	(0.0073)
Observations	2,318,436	2,319,226	2,319,226	2,319,226	2,319,226	933,315	933,315
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 LFSs.

Table A26
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	−0.0001	0.0283***	−0.0027	−0.0033	−0.0060	−0.0059
	(0.0012)	(0.0005)	(0.0039)	(0.0032)	(0.0033)	(0.0076)	(0.0053)
Quarter 3 * Year 2016	−0.0018	0.0005	0.0289***	−0.0020	−0.0029	0.0036	−0.0097*
	(0.0011)	(0.0005)	(0.0039)	(0.0032)	(0.0033)	(0.0075)	(0.0050)
Quarter 4 * Year 2016	−0.0006	−0.0000	0.0323***	0.0008	−0.0015	0.0145*	−0.0075
	(0.0012)	(0.0004)	(0.0039)	(0.0033)	(0.0034)	(0.0075)	(0.0049)
Quarter 1	Reference						
Quarter 2	−0.0038***	−0.0006***	0.0082***	0.0037**	0.0027*	−0.0205***	−0.0128***
	(0.0006)	(0.0001)	(0.0018)	(0.0017)	(0.0016)	(0.0035)	(0.0019)
Quarter 3	−0.0047***	−0.0008***	0.0078***	0.0042**	0.0031*	−0.0033	−0.0244***
	(0.0006)	(0.0001)	(0.0019)	(0.0017)	(0.0017)	(0.0035)	(0.0018)
Quarter4	−0.0073***	−0.0008***	0.0218***	0.0102***	0.0090***	−0.0015	−0.0307***
	(0.0005)	(0.0001)	(0.0019)	(0.0017)	(0.0016)	(0.0035)	(0.0018)
Year 2016	−0.0039***	−0.0001	0.0426***	0.0034	0.0041	0.0464***	0.0014
	(0.0009)	(0.0004)	(0.0031)	(0.0025)	(0.0027)	(0.0064)	(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***	0.0006	0.5774***	0.3350***	0.2114***	7.2325***	0.5108***
	(0.0021)	(0.0005)	(0.0056)	(0.0056)	(0.0055)	(0.0110)	(0.0083)
Observations	2,319,226	2,319,226	2,319,226	2,319,226	2,319,226	933,315	933,315
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 LFSs.

Table A27
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***	0.0001	−0.0136***	−0.0024	−0.0021	−0.0070	−0.0003
	(0.0011)	(0.0003)	(0.0039)	(0.0034)	(0.0035)	(0.0076)	(0.0047)
Quarter 3 * Year 2017	0.0028***	−0.0002	−0.0148***	0.0017	0.0002	−0.0126*	−0.0013
	(0.0009)	(0.0003)	(0.0040)	(0.0035)	(0.0036)	(0.0074)	(0.0045)
Quarter 4 * Year 2017	0.0053***	−0.0000	−0.0159***	−0.0015	−0.0020	−0.0204***	−0.0070
	(0.0010)	(0.0003)	(0.0039)	(0.0032)	(0.0032)	(0.0075)	(0.0045)
Quarter 1	Reference						
Quarter 2	−0.0047***	−0.0006***	0.0164***	0.0036**	0.0025	−0.0202***	−0.0137***
	(0.0006)	(0.0001)	(0.0018)	(0.0016)	(0.0016)	(0.0035)	(0.0020)
Quarter 3	−0.0056***	−0.0006***	0.0163***	0.0035**	0.0025	−0.0002	−0.0259***
	(0.0006)	(0.0002)	(0.0019)	(0.0017)	(0.0016)	(0.0035)	(0.0019)
Quarter4	−0.0085***	−0.0008***	0.0313***	0.0107***	0.0091***	0.0051	−0.0307***
	(0.0006)	(0.0001)	(0.0019)	(0.0017)	(0.0017)	(0.0035)	(0.0018)
Year 2017	0.0055***	−0.0001	0.0528***	0.0504***	0.0544***	0.1752***	−0.0231***
	(0.0005)	(0.0002)	(0.0018)	(0.0015)	(0.0015)	(0.0032)	(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***	0.0007**	0.5932***	0.3341***	0.2097***	7.2331***	0.5053***
	(0.0020)	(0.0003)	(0.0052)	(0.0054)	(0.0053)	(0.0104)	(0.0076)
Observations	2,319,226	2,319,226	2,319,226	2,319,226	2,319,226	933,315	933,315
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 LFSs.

Table A28
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***	−0.0000	−0.0121***	−0.0041	−0.0023	0.0115	0.0047
	(0.0012)	(0.0003)	(0.0041)	(0.0033)	(0.0032)	(0.0071)	(0.0041)
Quarter 3 * Year 2018	0.0039***	−0.0004	−0.0115***	−0.0039	−0.0020	0.0094	0.0052
	(0.0011)	(0.0003)	(0.0041)	(0.0032)	(0.0032)	(0.0070)	(0.0039)
Quarter 4 * Year 2018	0.0044***	−0.0002	−0.0140***	−0.0030	−0.0009	0.0187***	0.0075*
	(0.0011)	(0.0003)	(0.0041)	(0.0033)	(0.0033)	(0.0072)	(0.0039)
Quarter 1	Reference						
Quarter 2	−0.0049***	−0.0006***	0.0162***	0.0040**	0.0026	−0.0240***	−0.0149***
	(0.0006)	(0.0001)	(0.0018)	(0.0016)	(0.0017)	(0.0036)	(0.0021)
Quarter 3	−0.0059***	−0.0006***	0.0157***	0.0046***	0.0029*	−0.0046	−0.0273***
	(0.0006)	(0.0002)	(0.0018)	(0.0017)	(0.0017)	(0.0036)	(0.0020)
Quarter4	−0.0084***	−0.0008***	0.0310***	0.0110***	0.0089***	−0.0028	−0.0337***
	(0.0006)	(0.0001)	(0.0019)	(0.0017)	(0.0016)	(0.0036)	(0.0019)
Year 2018	0.0006	0.0002	0.0562***	0.0139***	0.0208***	0.1400***	−0.0277***
	(0.0009)	(0.0003)	(0.0031)	(0.0024)	(0.0025)	(0.0061)	(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***	0.0007**	0.5935***	0.3336***	0.2096***	7.2373***	0.5069***
	(0.0020)	(0.0003)	(0.0052)	(0.0054)	(0.0053)	(0.0104)	(0.0076)
Observations	2,319,226	2,319,226	2,319,226	2,319,226	2,319,226	933,315	933,315
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 LFSs.

Table A29
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***	0.0001	−0.0015	0.0054	0.0031	−0.0055	0.0030
	(0.0015)	(0.0002)	(0.0043)	(0.0040)	(0.0040)	(0.0083)	(0.0038)
Quarter 3 * Year 2019	−0.0051***	0.0001	0.0041	0.0032	0.0024	−0.0095	0.0095***
	(0.0015)	(0.0002)	(0.0044)	(0.0041)	(0.0040)	(0.0084)	(0.0037)
Quarter 4 * Year 2019	−0.0098***	0.0003	0.0050	0.0007	0.0017	−0.0141*	0.0095***
	(0.0015)	(0.0002)	(0.0045)	(0.0041)	(0.0039)	(0.0083)	(0.0036)
Quarter 1	Reference						
Quarter 2	−0.0030***	−0.0006***	0.0140***	0.0021	0.0015	−0.0203***	−0.0144***
	(0.0005)	(0.0001)	(0.0018)	(0.0015)	(0.0015)	(0.0034)	(0.0021)
Quarter 3	−0.0040***	−0.0007***	0.0125***	0.0031**	0.0021	−0.0005	−0.0283***
	(0.0005)	(0.0002)	(0.0018)	(0.0016)	(0.0016)	(0.0033)	(0.0020)
Quarter4	−0.0055***	−0.0009***	0.0271***	0.0102***	0.0084***	0.0043	−0.0342***
	(0.0005)	(0.0001)	(0.0018)	(0.0015)	(0.0016)	(0.0034)	(0.0020)
Year 2019	0.0079***	−0.0004*	0.0590***	0.0203***	0.0252***	0.2334***	−0.0428***
	(0.0013)	(0.0002)	(0.0032)	(0.0028)	(0.0028)	(0.0070)	(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***	0.0007**	0.5958***	0.3347***	0.2102***	7.2335***	0.5071***
	(0.0020)	(0.0003)	(0.0052)	(0.0054)	(0.0052)	(0.0103)	(0.0076)
Observations	2,319,226	2,319,226	2,319,226	2,319,226	2,319,226	933,315	933,315
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 LFSs.

Table A30
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***	0.0110	−0.0147**	−0.0118***	−0.0100***	0.0179	−0.0873***	0.0626***
	(0.0016)	(0.0080)	(0.0056)	(0.0018)	(0.0017)	(0.0271)	(0.0148)	(0.0174)
Quarter 2–4	−0.0055***	−0.0007***	0.0184***	0.0058***	0.0044***	0.0685***	−0.0077	−0.0244***
	(0.0012)	(0.0001)	(0.0047)	(0.0010)	(0.0009)	(0.0211)	(0.0047)	(0.0026)
COVID year	−0.0004	−0.0004**	0.0793***	0.0293***	0.0347***	−0.0268	0.2745***	−0.0606***
	(0.0012)	(0.0002)	(0.0087)	(0.0041)	(0.0041)	(0.0203)	(0.0080)	(0.0045)
Male (male = 1, female = 0)	0.0003	0.0003*	0.0947***	−0.0298***	−0.0383***	0.0763***	0.1770***	−0.0506***
	(0.0008)	(0.0001)	(0.0038)	(0.0037)	(0.0036)	(0.0035)	(0.0050)	(0.0038)
Age	−0.0056***	0.0000*	−0.0014**	−0.0001	0.0039***	0.0220***	0.0591***	−0.0202***
	(0.0003)	(0.0000)	(0.0006)	(0.0005)	(0.0006)	(0.0010)	(0.0015)	(0.0010)
Age squared	0.0001***	−0.0000**	−0.0001***	−0.0001***	−0.0001***	−0.0003***	−0.0008***	0.0003***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Less than primary education	Reference							
Primary education	0.0002	0.0001	−0.1092***	−0.0998**	−0.0966**	0.0129***	−0.0478	−0.0123
	(0.0016)	(0.0001)	(0.0249)	(0.0372)	(0.0366)	(0.0040)	(0.0429)	(0.0078)
Lower-secondary education	0.0000	0.0001	−0.1220***	−0.0709	−0.0730*	0.0192***	0.0016	−0.0270***
	(0.0018)	(0.0001)	(0.0280)	(0.0416)	(0.0412)	(0.0045)	(0.0462)	(0.0084)
Upper-secondary education	0.0044*	−0.0001	−0.0395	0.0965**	0.0789*	0.0455***	0.0682	−0.0375***
	(0.0022)	(0.0003)	(0.0306)	(0.0455)	(0.0448)	(0.0050)	(0.0490)	(0.0093)
Post-secondary education	0.0177**	−0.0007***	0.2100***	0.4621***	0.4613***	−0.0093	0.3262***	−0.0668***
	(0.0066)	(0.0002)	(0.0486)	(0.0613)	(0.0594)	(0.0086)	(0.0482)	(0.0113)
Urban area (urban = 1, rural = 0)	0.0084***	0.0006**	0.0526***	0.0477***	0.0427***	0.0660***	0.0519***	0.0004
	(0.0010)	(0.0002)	(0.0089)	(0.0107)	(0.0104)	(0.0049)	(0.0083)	(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***	0.0008***	0.5930***	0.3303***	0.2064***	3.2261***	7.2429***	0.4994***
	(0.0060)	(0.0002)	(0.0319)	(0.0430)	(0.0417)	(0.0287)	(0.0537)	(0.0254)
Observations	2,759,355	2,759,355	2,759,355	2,759,355	2,759,355	2,682,379	1,124,748	1,124,748
R-squared	0.031	0.005	0.247	0.334	0.328	0.209	0.346	0.088

Note: 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 A31
Heterogeneous effect of the pandemic across provinces with different ratios of export to GDP.

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 * Ratio of export of provinces	−0.0398***	−0.0114***	0.2161***	0.3797***	0.3603***	0.0200	−0.0348	−0.0500
	(0.0140)	(0.0026)	(0.0479)	(0.0648)	(0.0695)	(0.1144)	(0.2602)	(0.1191)
Quarter 2–4 * COVID year	0.0101***	0.0113	−0.0207***	−0.0224***	−0.0201***	0.0173	−0.0862***	0.0643***
	(0.0014)	(0.0081)	(0.0056)	(0.0020)	(0.0018)	(0.0250)	(0.0145)	(0.0212)
Quarter 2–4	−0.0055***	−0.0007***	0.0184***	0.0058***	0.0044***	0.0685***	−0.0077	−0.0244***
	(0.0012)	(0.0001)	(0.0047)	(0.0010)	(0.0009)	(0.0211)	(0.0047)	(0.0026)
COVID year	−0.0004	−0.0004**	0.0793***	0.0293***	0.0347***	−0.0268	0.2745***	−0.0606***
	(0.0012)	(0.0002)	(0.0087)	(0.0041)	(0.0041)	(0.0203)	(0.0080)	(0.0045)
Male (male = 1, female = 0)	0.0003	0.0003*	0.0947***	−0.0298***	−0.0383***	0.0763***	0.1770***	−0.0506***
	(0.0008)	(0.0001)	(0.0038)	(0.0037)	(0.0036)	(0.0035)	(0.0050)	(0.0038)
Age	−0.0056***	0.0000*	−0.0014**	−0.0001	0.0039***	0.0220***	0.0591***	−0.0202***
	(0.0003)	(0.0000)	(0.0006)	(0.0005)	(0.0006)	(0.0010)	(0.0015)	(0.0010)
Age squared	0.0001***	−0.0000**	−0.0001***	−0.0001***	−0.0001***	−0.0003***	−0.0008***	0.0003***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Less than primary education	Reference							
Primary education	0.0002	0.0001	−0.1092***	−0.0997**	−0.0966**	0.0129***	−0.0478	−0.0123
	(0.0016)	(0.0001)	(0.0249)	(0.0372)	(0.0366)	(0.0040)	(0.0429)	(0.0078)
Lower-secondary education	0.0000	0.0001	−0.1220***	−0.0709	−0.0730*	0.0192***	0.0016	−0.0270***
	(0.0018)	(0.0001)	(0.0280)	(0.0416)	(0.0412)	(0.0045)	(0.0462)	(0.0084)
Upper-secondary education	0.0044*	−0.0001	−0.0395	0.0965**	0.0789*	0.0455***	0.0682	−0.0375***
	(0.0022)	(0.0003)	(0.0306)	(0.0455)	(0.0448)	(0.0050)	(0.0490)	(0.0093)
Post-secondary education	0.0177**	−0.0007***	0.2100***	0.4621***	0.4613***	−0.0093	0.3262***	−0.0668***
	(0.0066)	(0.0002)	(0.0486)	(0.0613)	(0.0594)	(0.0086)	(0.0482)	(0.0113)
Urban area (urban = 1, rural = 0)	0.0084***	0.0006**	0.0525***	0.0476***	0.0427***	0.0660***	0.0519***	0.0004
	(0.0010)	(0.0002)	(0.0089)	(0.0107)	(0.0104)	(0.0049)	(0.0083)	(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***	0.0008***	0.5930***	0.3303***	0.2063***	3.2261***	7.2429***	0.4994***
	(0.0060)	(0.0002)	(0.0319)	(0.0430)	(0.0417)	(0.0287)	(0.0537)	(0.0254)
Observations	2,758,473	2,759,263	2,759,263	2,759,263	2,759,263	2,682,297	1,124,695	645,381
R-squared	0.031	0.005	0.247	0.334	0.328	0.209	0.346	0.088

Note: 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 A32
Heterogeneous effect of the pandemic across provinces with different ratios of import to GDP.

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 * Ratio of import of provinces	−0.0018**	0.0001	0.0061**	0.0145***	0.0144***	0.0068	−0.0069	−0.0032
	(0.0007)	(0.0006)	(0.0029)	(0.0039)	(0.0042)	(0.0086)	(0.0122)	(0.0059)
Quarter 2–4 * COVID year	0.0102***	0.0109	−0.0188***	−0.0215***	−0.0197***	0.0133	−0.0818***	0.0653***
	(0.0013)	(0.0076)	(0.0054)	(0.0023)	(0.0022)	(0.0236)	(0.0145)	(0.0218)
Quarter 2–4	−0.0055***	−0.0007***	0.0184***	0.0058***	0.0044***	0.0685***	−0.0077	−0.0244***
	(0.0012)	(0.0001)	(0.0047)	(0.0010)	(0.0009)	(0.0211)	(0.0047)	(0.0026)
COVID year	−0.0004	−0.0004**	0.0793***	0.0293***	0.0347***	−0.0268	0.2745***	−0.0606***
	(0.0012)	(0.0002)	(0.0087)	(0.0041)	(0.0040)	(0.0203)	(0.0080)	(0.0045)
Male (male = 1, female = 0)	0.0003	0.0003*	0.0947***	−0.0298***	−0.0383***	0.0763***	0.1770***	−0.0506***
	(0.0008)	(0.0001)	(0.0038)	(0.0037)	(0.0036)	(0.0035)	(0.0050)	(0.0038)
Age	−0.0056***	0.0000*	−0.0014**	−0.0001	0.0039***	0.0220***	0.0591***	−0.0202***
	(0.0003)	(0.0000)	(0.0006)	(0.0005)	(0.0006)	(0.0010)	(0.0015)	(0.0010)
Age squared	0.0001***	−0.0000**	−0.0001***	−0.0001***	−0.0001***	−0.0003***	−0.0008***	0.0003***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Less than primary education	Reference							
Primary education	0.0002	0.0001	−0.1092***	−0.0998**	−0.0966**	0.0129***	−0.0478	−0.0123
	(0.0016)	(0.0001)	(0.0249)	(0.0372)	(0.0366)	(0.0040)	(0.0429)	(0.0078)
Lower-secondary education	0.0000	0.0001	−0.1220***	−0.0709	−0.0730*	0.0192***	0.0016	−0.0270***
	(0.0018)	(0.0001)	(0.0280)	(0.0417)	(0.0412)	(0.0045)	(0.0462)	(0.0084)
Upper-secondary education	0.0044*	−0.0001	−0.0395	0.0965**	0.0789*	0.0455***	0.0682	−0.0375***
	(0.0022)	(0.0003)	(0.0306)	(0.0455)	(0.0449)	(0.0050)	(0.0490)	(0.0093)
Post-secondary education	0.0177**	−0.0007***	0.2100***	0.4620***	0.4612***	−0.0093	0.3262***	−0.0668***
	(0.0066)	(0.0002)	(0.0486)	(0.0613)	(0.0594)	(0.0086)	(0.0482)	(0.0113)
Urban area (urban = 1, rural = 0)	0.0084***	0.0006**	0.0525***	0.0476***	0.0427***	0.0660***	0.0519***	0.0004
	(0.0010)	(0.0002)	(0.0089)	(0.0107)	(0.0104)	(0.0049)	(0.0083)	(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***	0.0008***	0.5930***	0.3303***	0.2064***	3.2261***	7.2429***	0.4994***
	(0.0060)	(0.0002)	(0.0319)	(0.0430)	(0.0417)	(0.0287)	(0.0537)	(0.0254)
Observations	2,758,473	2,759,263	2,759,263	2,759,263	2,759,263	2,682,297	1,124,695	1,110,764
R-squared	0.031	0.005	0.247	0.334	0.328	0.209	0.346	0.088

Note: 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 A33
Heterogeneous effect of the pandemic across provinces with different ratios of trade (import and export) to GDP.

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 * Ratio of import of provinces	−0.0009**	−0.0001	0.0043***	0.0083***	0.0080***	0.0017	−0.0020	−0.0014
	(0.0003)	(0.0001)	(0.0012)	(0.0017)	(0.0018)	(0.0034)	(0.0062)	(0.0029)
Quarter 2–4 * COVID year	0.0103***	0.0111	−0.0203***	−0.0227***	−0.0206***	0.0156	−0.0843***	0.0648***
	(0.0014)	(0.0079)	(0.0055)	(0.0021)	(0.0020)	(0.0243)	(0.0146)	(0.0217)
Quarter 2–4	−0.0055***	−0.0007***	0.0184***	0.0058***	0.0044***	0.0685***	−0.0077	−0.0244***
	(0.0012)	(0.0001)	(0.0047)	(0.0010)	(0.0009)	(0.0211)	(0.0047)	(0.0026)
COVID year	−0.0004	−0.0004**	0.0793***	0.0293***	0.0347***	−0.0268	0.2745***	−0.0606***
	(0.0012)	(0.0002)	(0.0087)	(0.0041)	(0.0041)	(0.0203)	(0.0080)	(0.0045)
Male (male = 1, female = 0)	0.0003	0.0003*	0.0947***	−0.0298***	−0.0383***	0.0763***	0.1770***	−0.0506***
	(0.0008)	(0.0001)	(0.0038)	(0.0037)	(0.0036)	(0.0035)	(0.0050)	(0.0038)
Age	−0.0056***	0.0000*	−0.0014**	−0.0001	0.0039***	0.0220***	0.0591***	−0.0202***
	(0.0003)	(0.0000)	(0.0006)	(0.0005)	(0.0006)	(0.0010)	(0.0015)	(0.0010)
Age squared	0.0001***	−0.0000**	−0.0001***	−0.0001***	−0.0001***	−0.0003***	−0.0008***	0.0003***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Less than primary education	Reference							
Primary education	0.0002	0.0001	−0.1092***	−0.0997**	−0.0966**	0.0129***	−0.0478	−0.0123
	(0.0016)	(0.0001)	(0.0249)	(0.0372)	(0.0366)	(0.0040)	(0.0429)	(0.0078)
Lower-secondary education	0.0000	0.0001	−0.1220***	−0.0709	−0.0730*	0.0192***	0.0016	−0.0270***
	(0.0018)	(0.0001)	(0.0280)	(0.0417)	(0.0412)	(0.0045)	(0.0462)	(0.0084)
Upper-secondary education	0.0044*	−0.0001	−0.0395	0.0965**	0.0789*	0.0455***	0.0682	−0.0375***
	(0.0022)	(0.0003)	(0.0306)	(0.0455)	(0.0449)	(0.0050)	(0.0490)	(0.0093)
Post-secondary education	0.0177**	−0.0007***	0.2100***	0.4621***	0.4613***	−0.0093	0.3262***	−0.0668***
	(0.0066)	(0.0002)	(0.0486)	(0.0613)	(0.0594)	(0.0086)	(0.0482)	(0.0113)
Urban area (urban = 1, rural = 0)	0.0084***	0.0006**	0.0525***	0.0476***	0.0427***	0.0660***	0.0519***	0.0004
	(0.0010)	(0.0002)	(0.0089)	(0.0107)	(0.0104)	(0.0049)	(0.0083)	(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***	0.0008***	0.5930***	0.3303***	0.2064***	3.2261***	7.2429***	0.4994***
	(0.0060)	(0.0002)	(0.0319)	(0.0430)	(0.0417)	(0.0287)	(0.0537)	(0.0254)
Observations	2,758,473	2,759,263	2,759,263	2,759,263	2,759,263	2,682,297	1,124,695	1,124,695
R-squared	0.031	0.005	0.247	0.334	0.328	0.209	0.346	0.088

Note: 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 A34
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***	−0.0139***	−0.0099	−0.0108	−0.0150	−0.1273***	−0.1413***	−0.1937**
	(0.0385)	(0.0032)	(0.0060)	(0.0097)	(0.0199)	(0.0339)	(0.0350)	−0.0702
Quarter 2–4	0.0329***	−0.0018	−0.0072***	−0.0058*	−0.0759***	0.0250***	0.0323***	−0.0049
	(0.0034)	(0.0029)	(0.0015)	(0.0033)	(0.0064)	(0.0057)	(0.0031)	(0.0058)
COVID year	0.1022***	−0.0217***	−0.0003	0.0320***	0.0200***	0.0370***	0.1709***	0.2181***
	(0.0072)	(0.0028)	(0.0014)	(0.0033)	(0.0056)	(0.0086)	(0.0069)	(0.0099)
Male (male = 1, female = 0)	0.0739***	0.0063***	0.0026***	0.0080***	0.0501***	0.0526***	0.0977***	−0.0118
	(0.0047)	(0.0010)	(0.0005)	(0.0007)	(0.0045)	(0.0058)	(0.0047)	(0.0079)
Age	0.0339***	0.0018***	0.0008***	0.0013***	0.0072***	0.0284***	0.0405***	0.0121***
	(0.0011)	(0.0001)	(0.0001)	(0.0002)	(0.0016)	(0.0012)	(0.0013)	(0.0014)
Age squared	−0.0005***	−0.0000***	−0.0000***	−0.0000***	−0.0001***	−0.0004***	−0.0006***	−0.0002***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Less than primary education	Reference							
Primary education	0.0589***	−0.0010	−0.0008	−0.0121***	−0.0573***	0.0486***	0.0532***	0.0314***
	(0.0078)	(0.0019)	(0.0010)	(0.0022)	(0.0163)	(0.0058)	(0.0127)	(0.0076)
Lower-secondary education	0.0802***	0.0019	−0.0006	−0.0104***	−0.0533***	0.0591***	0.0837***	0.0370***
	(0.0092)	(0.0022)	(0.0012)	(0.0027)	(0.0150)	(0.0063)	(0.0142)	(0.0083)
Upper-secondary education	0.0622***	0.0047**	0.0014	−0.0026	−0.0257	0.0295***	0.0844***	0.0086
	(0.0111)	(0.0022)	(0.0014)	(0.0029)	(0.0168)	(0.0083)	(0.0163)	(0.0098)
Post-secondary education	0.0982***	0.0110***	0.0052***	0.0109***	0.0664***	0.0631***	0.1443***	−0.0097
	(0.0133)	(0.0024)	(0.0013)	(0.0030)	(0.0182)	(0.0113)	(0.0186)	(0.0161)
Urban area (urban = 1, rural = 0)	0.0227***	0.0034***	0.0008	0.0015	−0.0042	0.0257***	0.0239***	0.0170**
	(0.0051)	(0.0008)	(0.0006)	(0.0011)	(0.0046)	(0.0057)	(0.0051)	(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***	8.5720***	8.7577***	8.9119***	9.2160***	7.4063***	7.4470***	7.5715***
	(0.0257)	(0.0044)	(0.0021)	(0.0062)	(0.0417)	(0.0235)	(0.0325)	(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: 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 A35
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	−0.1101*	−0.0331	−0.1138***	−0.1442***	−0.3687*	−0.2739**	−0.2463***	−0.0971***
	(0.0357)	(0.0534)	(0.0329)	(0.0248)	(0.0309)	(0.1961)	(0.1184)	(0.0588)	(0.0294)
Effects on workers not below minimum wages	0.0219	−0.0125	0.0867***	0.0011	−0.0188*	0.0576	0.0565	−0.0361	−0.0194***
	(0.0189)	(0.0327)	(0.0110)	(0.0236)	(0.0093)	(0.0695)	(0.0751)	(0.0314)	(0.0066)
Effects on workers in wage quintile 1	−0.0312	−0.2405***	−0.0532	−0.0596	−0.1273***	−0.5564***	−0.3454***	−0.3456***	−0.1020***
	(0.0417)	(0.0597)	(0.1249)	(0.0353)	(0.0336)	(0.1326)	(0.1166)	(0.0680)	(0.0219)
Effects on workers in wage quintiles 2 to 5	−0.0289***	0.0036	0.0415**	−0.0170	−0.0390***	0.0713	0.0361	−0.0693***	−0.0122
	(0.0066)	(0.0228)	(0.0153)	(0.0239)	(0.0057)	(0.0684)	(0.0802)	(0.0218)	(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 A36
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***	−0.1759***	−0.0799***	−0.0681***	−0.0950***	−0.0246	−0.1176***	−0.0644***
	(0.0289)	(0.0584)	(0.0214)	(0.0095)	(0.0144)	(0.0228)	(0.0149)	(0.0076)
Effects on workers not below minimum wages	0.0164	−0.0257	0.0179	0.0103	0.0206	−0.0086	−0.0349	−0.0007
	(0.0238)	(0.0158)	(0.0230)	(0.0112)	(0.0144)	(0.0108)	(0.0227)	(0.0218)
Effects on workers in wage quintile 1	−0.1464**	−0.2415***	−0.1960**	−0.2438***	−0.2558***	−0.0040	−0.1025	−0.1320*
	(0.0655)	(0.0743)	(0.0934)	(0.0531)	(0.0460)	(0.0577)	(0.0938)	(0.0712)
Effects on workers in wage quintiles 2 to 5	−0.0066	−0.0309*	0.0040	−0.0049	−0.0036	−0.0295***	−0.0486**	−0.0196
	(0.0208)	(0.0157)	(0.0232)	(0.0204)	(0.0077)	(0.0086)	(0.0212)	(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.

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