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论文题目：COVID-19 and Employee Social Responsibility: Evidence from China

COVID-19 and Employee Social Responsibility: Evidence from China

Joanna Tan Yingxin

Abstract

This paper examines the effect of COVID-19, defined as a firm's exposure to Hubei, on the pay gap between firm executives and general employees. Based on a sample of Chinese A-share listed companies from 2017-2020, I employ a differences-in-differences model to test my two hypotheses: 1) since the COVID-19 Pandemic, pay gap between firm executives and general employees decreased, and 2) the wage of general employees decreased with a smaller magnitude than that of the firm executives. I find that for firms with high exposure to Hubei, the executive-employee pay gap has indeed decreased significantly after the pandemic. While executive wages has decreased significantly, employee wages decreased less. These results confirm my two hypotheses. Further research demonstrates that the above effect is only significant for labor-intensive industries, but not for capital-intensive industries. In short, this paper provides new evidence from the perspective of firms for the impact of the COVID-19 Pandemic on the labor market.

Keywords: COVID-19, Employee social responsibility, Pay gap, Executive, Employee

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1 Introduction

Since the first COVID-19 case in January 2020, the COVID-19 Pandemic rapidly spread around the world, devastating global economies from various aspects. The labor market, especially, endured the most forceful hits, as increasing unemployment and decreasing wages disproportionately affect low-income groups, exacerbating inequality.

This paper studies the effect of COVID-19 on the pay gap between firm executives and general employees. Since COVID-19 led to heavy restrictions on physical interactions, both the supply and the supply elasticity of the employee labor market decreased. I am interested in determining the relationship between the change in employee wages and executive wages. Quantifying COVID-19's impact as a firm's relevancy to Hubei, the epicenter of the pandemic, I hypothesize that the pay gap between firm executives and general employees decreased. I further propose that the closing of the pay gap is primarily due to the smaller decrease in wages of general employees compared to firm executives. A comprehensive understanding of changes in the pay gap is critical for policy-makers who wish to monitor the socio-economic impact of COVID-19 as well as the long-standing dilemma of economic inequality in China.

Based on a sample of Chinese A-share listed companies from 2017-2020, I construct a differences-in-differences model to test the hypotheses. Since the COVID-19 Pandemic started in 2020, I define the years 2017 to 2019 as pre-pandemic era and the year 2020 as post-pandemic era. The key variables are indices that evaluate the exposure of a firm's supply and demand chain to Hubei. For the years 2018 and 2019, the coefficients are close to zero, signifying a parallel trend. In 2020, however, the coefficient is significantly negative. Specifically, the coefficient of the index that measures demand side exposure to Hubei is significantly negative, while the coefficient of the index that measures supply side exposure is insignificant. For robustness tests, I use different sample periods, different sample firms, different proxies for dependent variables, and added other control variables. Results remain robust.

COVID-19's impact on labor economics is frequently studied. A study conducted by Dai et al. (2020) examines the impact of COVID-19 on small and medium-sized enterprises (SME). Using evidence from China, they conclude that although most SMEs reopened by May 2020, many only ran partially, and the rest had to close. This leaves questions about changes in operational logistics of firms that continue to open, specifically changes in wage, which I discuss in this paper. Other papers that study income, however, focus more on regional income inequality. Li et al. (2021), for one, investigates the pandemic's devastating impact on the income of migrant workers in China. Shen et al. (2021) further study income disparities between various regions in China, concluding that rural regions are put to a disadvantage because of social-distancing policies. I do not aim to study regional differences; rather, this paper discusses the pay gap between executives and employees under the COVID-19 Pandemic.

The rest of this paper is as follows. Section 2 establishes the fundamental hypotheses. Section 3 introduces the data I use as well as the empirical framework and key variables. Section 4 presents the empirical results, including benchmark results, and results of robustness tests. Section 5 concludes.

2 Theoretical Analysis and Hypotheses Development

To investigate COVID-19's impact on enterprise labor decisions, I construct a theoretical model for analysis. I consider a typical firm as one with the following production function:

$$Y = AK^{\alpha}L_m^{\beta}L_e^{\gamma} \tag{1}$$

where Y represents the firm's level of output, A symbolizes technological advancements, K denotes capital investment, L_m indicates the number of executives, and L_e

signifies the number of general employees. α, β, and γ represent the contribution of capital, executives, and employees, respectively, to the output level, such that $0 < \alpha < 1$, $0 < \beta < 1$, and $0 < \gamma < 1$. As executives are usually more skilled than general employees, their contribution to the output level must be greater. Thus, $\beta > \gamma$.

On the other hand, a firm faces the following labor market supply:

$$L_m = aW_m \tag{2}$$

$$L_e = bW_e \tag{3}$$

In comparison to expert executives, employees face less skill requirements, leading to an ample supply of workers in the employee market. Consequently, the supply elasticity of the employee market is greater than that of the executive market, which itself is greater than 0. Therefore, $0 < a < b$.

I then examine firm decision problems. Assuming that a firm output's market price is P, the firm's profit is as follows:

$$\pi = PY - rK - W_m L_m - W_e L_e \tag{4}$$

Substituting equation (1) into equation (4):

$$\pi = PAK^{\alpha} L_m^{\beta} L_e^{\gamma} - rK - W_m L_m - W_e L_e \tag{5}$$

In general, a rational firm aims to maximize profit. Therefore, the number of hired executives and general employees must fulfill the following first-order conditions:

$$\frac{\partial \pi}{\partial L_m} = 0 \tag{6}$$

$$\frac{\partial \pi}{\partial L_e} = 0 \tag{7}$$

Substituting equations (2) and (5) into (6), equations (3) and (5) into (7):

$$\beta PAK^{\alpha} L_m^{\beta-1} L_e^{\gamma} - \frac{2}{a} L_m = 0 \tag{8}$$

$$\gamma PAK^{\alpha} L_m^{\beta} L_e^{\gamma-1} - \frac{2}{b} L_e = 0 \tag{9}$$

Solving simultaneous equations (8) and (9):

$$\frac{L_m}{L_e} = (\frac{a\beta}{b\gamma})^{\frac{1}{2}} \tag{10}$$

Substituting equations (2) and (3) into (10):

$$\frac{W_m}{W_e} = (\frac{b\beta}{a\gamma})^{\frac{1}{2}} \tag{11}$$

where $\frac{W_m}{W_e}$ denotes the pay gap between executives and general employees. Since $\beta > \gamma$ and $b > a$, $\frac{W_m}{W_e} > 1$. This means that executives' wages exceed general employees' wages, as expected.

Substituting equation (10) into (8) and (9), then combining equations (2) and (3):

$$W_m = (1/2 \cdot PAK^{\alpha} a^{\beta+\gamma/2-1} b^{\gamma/2} \beta^{1-\gamma/2} \gamma^{\gamma/2})^{1/(2-\beta-\gamma)} \tag{12}$$

$$W_e = (1/2 \cdot PAK^{\alpha} a^{\beta/2} b^{\beta/2+\gamma-1} \beta^{\beta/2} \gamma^{1-\beta/2})^{1/(2-\beta-\gamma)} \tag{13}$$

Now, I consider the impact of COVID-19. COVID-19 not only directly impacted consumer demand, resulting in declined market prices, but it also affected production, leading to declined output levels. To account for these consequences, I introduce the coefficient λ, where $0 < \lambda < 1$, into the first term of equation (4).

My focus, however, is on COVID-19's effect on the labor market. The pandemic casted heavy restrictions on workers via quarantine, raising the cost of finding jobs, causing both labor supply and labor supply elasticity to decrease. Specifically, employees were more heavily impacted than executives, as new employees often engage in pre-employment training, and quarantine policies escalated the cost of such training. Thus, compared to that of the executives market, the pandemic would have caused a more significant decrease in the supply elasticity of the employee market.

According to the preceding analysis, in my firm decision model under the influence of COVID-19, the firm's profit can be represented by:

$$\pi_{Covid} = \lambda PY - rK - W_{m,Covid} L_{m,Covid} - W_{e,Covid} L_{e,Covid} \tag{14}$$

To simplify the analysis, I assume that the COVID-19 Pandemic only resulted in the decline of employee supply elasticity, while the executive supply elasticity remained the same:

$$L_{m,Covid} = aW_{m,Covid} \tag{15}$$

$$L_{e,Covid} = b_{Covid}W_{e,Covid} \tag{16}$$

where $b_{Covid} < b$. Using the new equations (15) and (16):

$$\frac{W_{m,Covid}}{W_{e,Covid}} = (\frac{b_{Covid}\beta}{a\gamma})^{\frac{1}{2}} \tag{17}$$

$$W_{m,Covid} = (1/2 \cdot \lambda PAK^{\alpha}a^{\beta+\gamma/2-1}b_{Covid}^{\gamma/2}\beta^{1-\gamma/2}\gamma^{\gamma/2})^{1/(2-\beta-\gamma)} \tag{18}$$

$$W_{e,Covid} = (1/2 \cdot PAK^{\alpha}a^{\beta/2}b_{Covid}^{\beta/2+\gamma-1}\beta^{\beta/2}\gamma^{1-\beta/2})^{1/(2-\beta-\gamma)} \tag{19}$$

Because $b_{Covid} < b$ and $\frac{W_{m,Covid}}{W_{e,Covid}} < \frac{W_m}{W_e}$, I arrive at the first hypothesis:

Hypothesis 1 *Since the spread of the COVID-19 Pandemic, the pay gap between firm executives and general employees decreased significantly.*

Comparing (18) and (12), since $\gamma/2 > 0$, $b_{Covid}^{\gamma/2} < b^{\gamma/2}$, and the additional influence of λ is in the same direction, $W_{m,Covid} < W_m$. Yet, comparing (19) and (13), since $\beta < 1$ and $\gamma < 1$, $\beta/2 + \gamma - 1 < 0$. This leads to $b_{Covid}^{\beta/2+\gamma-1} > b^{\beta/2+\gamma-1}$, which is opposite in direction to the influence of λ. As such, I cannot determine whether $W_{e,Covid} < W_e$ or vice versa. However, even if it is true that $W_{e,Covid} < W_e$, the magnitude of decrease would be significantly smaller than that of the executives. Therefore, I form the second hypothesis:

Hypothesis 2 *Since the spread of the COVID-19 Pandemic, the wage of firm executives decreased significantly, while the wage of general employees decreased with a smaller magnitude.*

3 Research Design

3.1 Sample and Data Source

This paper's primary data source is the China Stock Market Accounting Research (CSMAR) Database, which comprehensively covers data on the China stock market and the financial statements of listed firms. I use all A-share listed firms in China from 2017 to 2020 as the initial sample. Following common research practice, I exclude the following samples: 1) firms in the financial industry; 2) samples with asset liability ratios greater than 1; 3) samples with negative business revenue; 4) firms in Hubei province directly affected by the pandemic; 5) samples with missing key variables. The resulting sample contains 12561 annual firm observations. In order to minimize the interference of spurious outliers, I winsorize 1% of each tail for all firm level continuous variables.

In addition, to construct the key industry-Hubei correlation indices in this paper, I use regional industry input-output data most recently published by the National Bureau of Statistics in 2017.

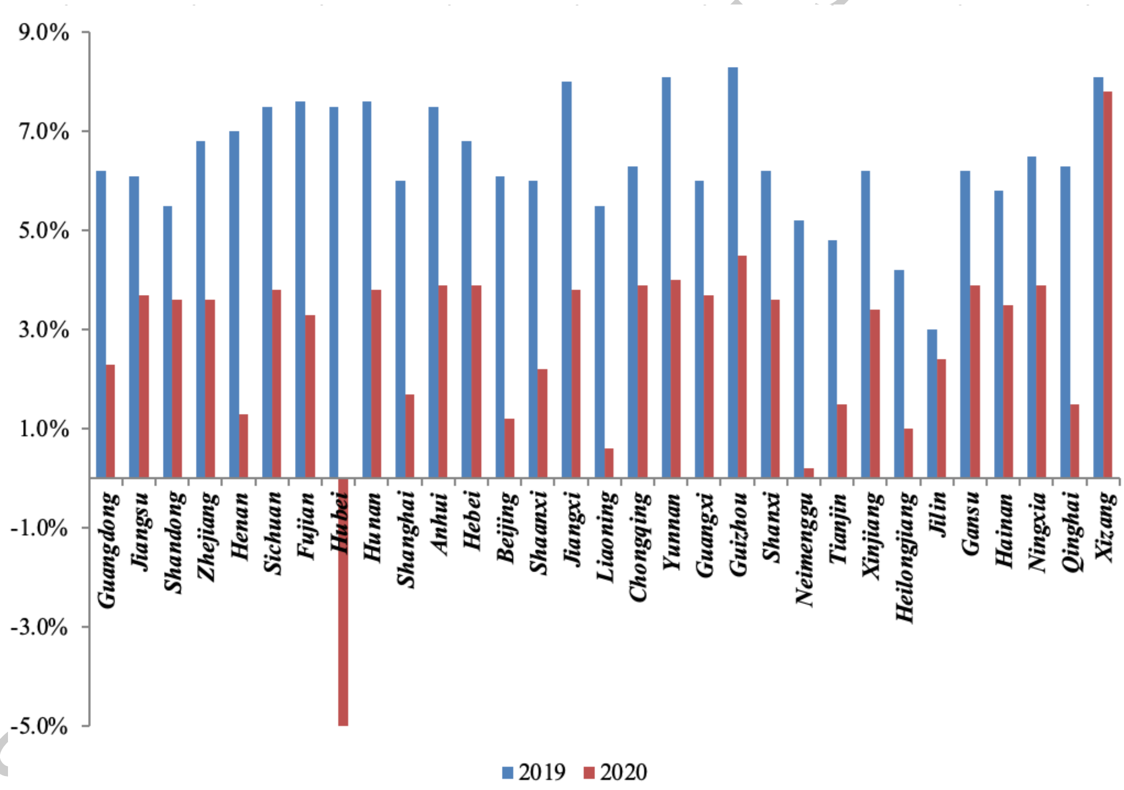
3.2 Empirical Framework and Variable Definition

This paper will empirically test the impact of COVID-19 on the pay gap between firm executives and general employees. The COVID-19 Pandemic is an emergency event that started in 2020, so the impact of the pandemic can be best tested using the differences-in-differences model. The key of this model is constructing the experimental group and the control group. For China, the impact of COVID-19 mainly comes from two aspects: the pandemic situation in Hubei during the first quarter of 2020 and the global pandemic after March 2020. Here, I mainly consider the impact of the pandemic in Hubei because of its greater negative impact on China's economy in 2020.

Figure 1 reports the real GDP growth rate of 31 provinces in China from 2019 to

2020[1]. In 2020, the real GDP growth rate of Hubei Province was -5.0%, which makes Hubei the only province with a negative growth rate among all mainland provinces in China. In comparison to 2019, when the real GDP growth rate of Hubei Province was as high as 7.5%, there has been a decrease of 12.5 percentage points. This means that Hubei Province has the largest decline among the 31 provinces, evincing COVID-19's devastating impact on the economy of Hubei. In contrast, in 2020, China's imports and exports increased by 1.9%, exports alone increased by 4%, and foreign trade still maintained positive growth, indicating that the global pandemic situation has little impact on China's economy.

Figure 1: Real GDP Growth Rate of 31 Provinces in China from 2019 to 2020



Therefore, my main focus is on the effects of the pandemic situation in Hubei. For

[1] Source: regional statistics bureau websites

this, I construct a differences-in-differences model. Expanding upon the ideas of Ding, Fan and Lin (2020), the empirical model for testing Hypothesis 1 is as follows:

$$Com\_Wage_{it} = \beta_0 + \beta_1 Hubei\_exposure_i \times Post_t + \beta_2 Size_{it} + \beta_3 Leverage_{it} \\ +\beta_4 Growth_{it} + \beta_5 ROA_{it} + \mu_i + \nu_t + \epsilon_{it} \quad (20)$$

where the dependent variable Com_Wage represents the pay gap between firm executives and general employees. Using available data, I define executive wages in two ways. Firstly, I record the mean compensation of the top three earning executives as $Com1$, which is equal to the sum of the compensations of the top three earning executives divided by three. Secondly, I record the average compensation of all paid executives as $Com2$, which is equal to the total executive compensation divided by the difference between the total number of executives and the number of unpaid executives. Employee wage is recorded as $Wage$, where $Wage =$ (cash paid to and for employees + employee wage paid at the end of the year - employee wage paid at the beginning of the year - total executive wage) / (number of employees - number of paid executives) (Kong, Kong and Lu, 2020). I then define the pay gap between executives and employees as the average compensation of executives divided by the average compensation of employees (Firth et al., 2015), so that $Com\_Wage1 = Com1/Wage$ and $Com\_Wage2 = Com2/Wage$.

The independent variable is $Hubei\_exposure \times Post$, where $Post$ is a dummy variable representing the occurrence of the COVID-19 Pandemic, taking on a value of 1 for year 2020 and 0 for years 2017 to 2019. $Hubei\_exposure$ refers to the relevance of a firm's industry to Hubei. Based upon the methodology of Ding, Fan and Lin (2020), I use China's 2017 province-sector level IO table to determine industry-level input and output shares of Hubei province for each firm, measuring its Hubei exposure from the perspective of production network. Input and output correspond to $Hubei\_input\ share$ and $Hubei\_output\ share$, respectively.

I mainly control several important financial indicators, including $Size$ (the natural logarithm of total assets), $Leverage$ (total liabilities divided by total assets), $Growth$ (operating revenue of this year / operating revenue of last year - 1), and ROA (net profit divided by total assets) In addition, I also add year fixed effect and firm fixed effect. Considering that the independent variable $Hubei\_exposure$ is an industry level variable, I use robust standard errors clustered by industry.

According to Hypothesis 1, β_1 from equation (20) should be significantly negative.

Further, I construct the following model to test Hypothesis 2:

$$\begin{aligned} LnCom_{it} = \beta_0 + \beta_1 Hubei\_exposure_i \times Post_t + \beta_2 Size_{it} + \beta_3 Leverage_{it} \\ + \beta_4 Growth_{it} + \beta_5 ROA_{it} + \mu_i + \nu t + \epsilon_{it} \end{aligned} \quad (21)$$

$$\begin{aligned} LnWage_{it} = \beta_0 + \beta_1 Hubei\_exposure_i \times Post_t + \beta_2 Size_{it} + \beta_3 Leverage_{it} \\ + \beta_4 Growth_{it} + \beta_5 ROA_{it} + \mu_i + \nu t + \epsilon_{it} \end{aligned} \quad (22)$$

The dependent variable in equation (21) is $LnCom$, which is the natural logarithm of executive wage. $LnCom$ takes on two definitions. Firstly, I take the average compensation of the top three earning executives, which is $Com1$, and record its natural logarithm as $LnCom1$. Then, I take the average compensation of all paid executives, which is $Com2$, and record its natural logarithm as $LnCom2$. The dependent variable in equation (22) is $LnWage$, which is the natural logarithm of employee wage. The variable definitions remain the same.

According to Hypothesis 2, the β_1 coefficient of equation (21) should be significantly negative, while the β_2 coefficient of equation (22) may not be significant.

3.3 Descriptive Statistics

Table 1 summarizes the descriptive statistical results of the key variables in this paper. On average, the mean compensation of the top three executives is about 8.4 times the mean compensation of employees, and the mean compensation of all executives is about 3.6 times the mean compensation of employees. This indicates that the wage of executives is significantly higher than that of employees, and the pay gap within executives is large. Further, $Hubei\_input\,share$, which measures firms' upstream relevance with Hubei, has a mean of 0.035, while $Hubei\_output\,share$, which measures firms' downstream relevance with Hubei, has a mean of 0.043. This is slightly higher than that of Ding, Fan and Lin (2020). One possible reason for this is that the indices in this paper are calculated based on the latest data in 2017, while Ding, Fan and Lin (2020) use data in 2012. In 2012, Hubei's GDP ranked 9th among 31 provinces in China and was promoted to 7th in 2017. The rise in GDP ranking may have increased Hubei's relevance with other provinces. In addition, the average leverage is 42%, indicating that the average debt level of listed companies is within reasonable range. The average growth is 18% and the average ROA is close to 4%, which means that the listed companies show strong growth and good profitability.

Table 1: Descriptive Statistics

Variable	**Mean**	**Median**	**1st Quartile**	**3rd Quartile**	**SD**
Com_wage1	8.396	6.232	4.130	9.855	7.343
Com_wage2	3.632	2.843	1.938	4.288	2.820
Hubei_input share	0.035	0.035	0.029	0.038	0.008
Hubei_output share	0.043	0.042	0.035	0.051	0.013
LnCom1	13.371	13.343	12.909	13.787	0.722
LnCom2	12.567	12.557	12.121	12.988	0.691
LnWage	11.532	11.501	11.192	11.840	0.550
Size	22.115	21.943	21.167	22.872	1.319
Leverage	0.424	0.414	0.253	0.582	0.211
Growth	0.179	0.095	-0.037	0.254	0.560
ROA	0.036	0.037	0.014	0.068	0.071

4 Empirical Results

4.1 Benchmark

Table 2 reports the test results of Hypothesis 1. Among the independent variables, $Hubei\_output\ share \times Post$ has significantly negative coefficients, which meets the expectations of Hypothesis 1. However, $Hubei\_input\ share \times Post$ does not have significant coefficients. This result is consistent with Ding, Fan and Lin (2020). A possible explanation is that if the firm's upstream supply side is impacted by the COVID-19 Pandemic in Hubei, it may be easy to find a substitute from other provinces. Yet, if the firm's downstream demand side is impacted, it may be difficult to find substitutes. Ultimately, the results in columns (3) and (4) of Table 2 support Hypothesis 1.

Table 2: Tests for H1

	(1)	(2)	(3)	(4)
	Com_wage1	Com_wage2	Com_wage1	Com_wage2
Hubei_input share * Post	-5.645	0.701		
	(13.659)	(5.254)		
Hubei_output share * Post			-10.872**	-4.460**
			(4.494)	(1.989)
Size	1.602***	0.607***	1.594***	0.604***
	(0.253)	(0.092)	(0.253)	(0.092)
Leverage	0.438	0.210	0.438	0.207
	(0.910)	(0.312)	(0.919)	(0.316)
Growth	0.663***	0.269***	0.664***	0.269***
	(0.143)	(0.058)	(0.142)	(0.058)
ROA	2.350***	0.569**	2.357***	0.567**
	(0.707)	(0.244)	(0.704)	(0.242)
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	12561	12561	12561	12561
Within R-Squared	0.845	0.836	0.845	0.836

Notes: Robust standard errors clustered by industry are reported in parentheses. ***significant at the 0.01 level, ** significant at the 0.05 level, * significant at the 0.1 level.

Passing the parallel trend hypothesis test is a key prerequisite for the effectiveness of a DID model, therefore, a parallel trend test is conducted on Hypothesis 1. Using the $Year$ dummy variable instead of the $Post$ variable to interact with $Hubei\_output\ share$, I test the impact of COVID-19 in each year. Table 3 evince that compared with 2017, the independent variables $Hubei\_output * Year2018$ and $Hubei\_output * Year2018$ did not have significant coefficients. After the outbreak in 2020, however, the coefficients of the interaction term are significantly negative, indicating that the DID model has passed the parallelism test.

Table 3: Parallel Trends Test

	(1)	(2)
	Com_wage1	Com_wage2
Hubei_output share * Year 2018	-4.740	-3.112
	(5.267)	(2.236)
Hubei_output share * Year 2019	-6.280	-3.330
	(6.573)	(2.342)
Hubei_output share * Year 2020	-14.848**	-6.775***
	(5.967)	(2.501)
Size	1.592***	0.603***
	(0.253)	(0.092)
Leverage	0.436	0.204
	(0.919)	(0.316)
Growth	0.666***	0.270***
	(0.142)	(0.058)
ROA	2.346***	0.561**
	(0.702)	(0.243)
Year FE	Yes	Yes
Firm FE	Yes	Yes
Observations	12561	12561
Within R-Squared	0.845	0.836

Notes: Robust standard errors clustered by industry are reported in parentheses. ***significant at the 0.01 level, ** significant at the 0.05 level, * significant at the 0.1 level.

Further, for the results of Table 2, I propose the possibility that it may be because it is difficult for firms to find substitutes for their downstream demand side. I build a triple differences-in-differences model to test this possibility. If the firm's demand side has a stronger relationship with Hubei, then the impact should be greater. I use trade credit provided by firms to measure correlation between Hubei and the firms' demand side. This index is defined as (accounts receivable + bonds receivable + pre-payments) / total assets, which is recorded as TC. I multiply the index by 100 to avoid values that are too small, which may result in regression coefficients that are too significant. I then use the TC in year 2019 before the COVID-19 Pandemic to build a triple DID model. Test results are reported in Table 4. The coefficients of $Hubei\_output\, share * Post * TC$ are significantly negative, indicating that firms with higher downstream correlation with Hubei are more heavily affected by the pandemic, which further verifies my conjecture.

Table 4: Triple Differences-In-Differences

	(1)	(2)
	Com_wage1	Com_wage2
Hubei_output share * Post * TC	-0.380*	-1.467**
	(0.191)	(0.555)
Post * TC	0.009	0.053**
	(0.009)	(0.025)
Hubei_output share * Post	4.404	25.336*
	(4.826)	(13.909)
Size	0.524***	1.363***
	(0.141)	(0.341)
Leverage	0.209	0.742
	(0.457)	(1.162)
Growth	0.267***	0.651***
	(0.075)	(0.186)
ROA	0.545*	2.390***
	(0.286)	(0.783)
Year FE	Yes	Yes
Firm FE	Yes	Yes
Observations	7729	7729
Within R-Squared	0.837	0.848

Notes: Robust standard errors clustered by industry are reported in parentheses. ***significant at the 0.01 level, ** significant at the 0.05 level, * significant at the 0.1 level.

4.2 Robustness Tests

Upon the benchmark results, I conduct the following robustness tests. Firstly, I use different sample periods. For the benchmark test, I use samples from 2017 to 2020. Here, I adjust them to two different sample periods: 2016 to 2020 and 2018 to 2020. The test results are reported in Table 5. Using the 2016 to 2020 sample period, the coefficients of $Hubei\_output\,share * Post$ are significantly negative. Using the 2018-2020 sample period, even though the coefficients of $Hubei\_output\,share * Post$ are negative, the regression on Com_wage2 does not produce significant results. This may be because of the sudden Sino-US trade war in 2018. However, on the whole, the empirical results remain robust after using different sample periods.

I then use different sample firms. In the benchmark test, I exclude the firms in Hubei province that are directly affected by the pandemic. Here, I retain these firms for reinspection. The corresponding results are reported in columns (1) and (2) of Table 6. The coefficients of $Hubei\_output\,share * Post$ are significantly negative, and the empirical results remain robust. Moreover, since executives are generally considered to have higher abilities than employees, executive wages are higher than that of general employees. As such, I exclude samples where the average compensation of executives is lower than the average compensation of employees. The corresponding results are reported in columns (3) and (4) of Table 6. The coefficients of $Hubei\_output\,share * Post$ are still significantly negative, which means that the results remain robust.

I also run robustness tests using other proxies for dependent variables. In the benchmark test, I define the executive-employee pay gap by dividing the executive wage by the employee wage. Here, I adjust wages to their natural logarithms and find the difference. The results are shown in Table 7. When a different executive-employee pay gap measure is used, the coefficients are still significantly negative.

Lastly, I add other control variables. In the benchmark test, I only control the basic financial indicators of firms. Considering that remuneration is often closely related to the performance of corporate governance, I further add corporate governance variables (Faleye, Reis and Venkateswaran, 2013), including $Board$ (the natural logarithm of the total number of directors), $Indep$ (the number of independent directors divided by the total number of directors), $Dual$ (takes on a value of 1 when the chairman and general manager are the same person, otherwise 0), SOE (takes on a value of 1 if is a state-owned firm, otherwise 0), $Top1$ (the number of shares held by the first largest shareholder divided by the total number of shares), and $Z\,index$ (the sum of the number of shares held by the first largest shareholder divided by the number of shares held by the second to fifth largest shareholders). The results are reported in Table 8. After adding these corporate governance control variables, the coefficients of $Hubei\_output\,share * Post$ are still significantly negative. The results remain robust.

Table 5: Robust Tests: Using Different Sample Periods

	(1)	(2)	(3)	(4)
	[2016-2020]		[2018-2020]	
	Com_wage1	Com_wage2	Com_wage1	Com_wage2
Hubei_output share * Post	-11.093*	-4.756*	-8.717*	-3.338
	(5.608)	(2.464)	(4.638)	(2.037)
Size	1.881***	0.705***	2.196***	0.774***
	(0.239)	(0.083)	(0.426)	(0.157)
Leverage	-0.244	-0.024	0.147	0.295
	(0.854)	(0.317)	(0.987)	(0.360)
Growth	0.462***	0.220***	0.622***	0.275***
	(0.146)	(0.058)	(0.165)	(0.068)
ROA	2.642***	0.706***	1.801***	0.461**
	(0.675)	(0.242)	(0.586)	(0.225)
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	15161	15161	9672	9672
Within R-Squared	0.814	0.806	0.875	0.867

Notes: Robust standard errors clustered by industry are reported in parentheses. ***significant at the 0.01 level, ** significant at the 0.05 level, * significant at the 0.1 level.

Table 6: Robust Tests: Using Different Sample Firms

	(1)	(2)	(3)	(4)
	Include Hubei		Com >Wage	
	Com_wage1	Com_wage2	Com_wage1	Com_wage2
Hubei_output share * Post	-9.490*	-4.002*	-9.476**	-3.950**
	(4.949)	(2.151)	(4.320)	(1.947)
Size	1.891***	0.701***	1.727***	0.626***
	(0.244)	(0.090)	(0.249)	(0.088)
Leverage	0.146	0.111	0.382	0.183
	(0.888)	(0.304)	(0.960)	(0.323)
Growth	0.658***	0.268***	0.741***	0.314***
	(0.142)	(0.058)	(0.144)	(0.057)
ROA	1.919***	0.425*	2.464***	0.593**
	(0.702)	(0.239)	(0.721)	(0.247)
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	12936	12936	12040	12040
Within R-Squared	0.843	0.834	0.845	0.836

Notes: Robust standard errors clustered by industry are reported in parentheses. ***significant at the 0.01 level, ** significant at the 0.05 level, * significant at the 0.1 level.

Table 7: Robust Tests: Other Proxies for Dependent Variables

	(1)	(2)
	Com_wage1_new	Com_wage2_new
Hubei_output share * Post	-0.643*	-0.658*
	(0.336)	(0.340)
Size	0.149***	0.146***
	(0.027)	(0.027)
Leverage	0.039	0.027
	(0.091)	(0.087)
Growth	0.053***	0.051***
	(0.015)	(0.015)
ROA	0.294***	0.176***
	(0.067)	(0.058)
Year FE	Yes	Yes
Firm FE	Yes	Yes
Observations	12548	12548
Within R-Squared	0.852	0.834

Notes: Robust standard errors clustered by industry are reported in parentheses. ***significant at the 0.01 level, ** significant at the 0.05 level, * significant at the 0.1 level.

4.3 Tests for Hypothesis 2

I conduct tests for Hypothesis 2, and Table 9 reports the regression results for models (2) and (3). The coefficients of $Hubei\_output\ share * Post$ in columns (1) and (2) are significantly negative, while the coefficient of $Hubei\_output\ share*Post$ in column (3) is negative but not significant. Moreover, considering coefficient magnitude, the coefficient values of $Hubei\_output\ share * Post$ in columns (1) and (2) are significantly greater than that of column (3). These results demonstrate that since the COVID-19 Pandemic, executive wages decreased significantly, while employee wages decreased less. This is consistent with Hypothesis 2.

4.4 Additional Tests

According to my theoretical analysis, the supply elasticity of the employee labor market is the key factor affecting the executive-employee pay gap after the pandemic. As such,

Table 8: Robust Tests: Including Other Control Variables

	(1)	(2)
	Com_wage1	Com_wage2
Hubei_output share * Post	-5.081**	-10.963**
	(2.034)	(4.494)
Size	0.612***	1.523***
	(0.096)	(0.237)
Leverage	0.208	0.531
	(0.312)	(0.916)
Growth	0.263***	0.672***
	(0.060)	(0.148)
ROA	0.660**	2.342***
	(0.266)	(0.735)
Board	-0.962***	1.108
	(0.260)	(0.692)
Indep	0.068	1.637
	(0.579)	(1.434)
Dual	-0.113**	-0.188
	(0.054)	(0.141)
SOE	0.109	-0.010
	(0.105)	(0.218)
Top1	0.014	0.035
	(0.009)	(0.026)
Z index	0.172	0.323
	(0.119)	(0.342)
Year FE	Yes	Yes
Firm FE	Yes	Yes
Observations	12349	12349
Within R-Squared	0.838	0.846

Notes: Robust standard errors clustered by industry are reported in parentheses. ***significant at the 0.01 level, ** significant at the 0.05 level, * significant at the 0.1 level.

Table 9: Tests for H2

	(1)	(2)	(3)
	LnCom1	LnCom2	LnCom3
Hubei_output share * Post	-1.050**	-1.070***	-0.453
	(0.434)	(0.351)	(0.390)
Size	0.159***	0.152***	0.004
	(0.024)	(0.023)	(0.025)
Leverage	0.006	-0.020	-0.084
	(0.066)	(0.062)	(0.085)
Growth	-0.004	-0.002	-0.059***
	(0.012)	(0.011)	(0.012)
ROA	0.229***	0.104**	-0.111***
	(0.054)	(0.045)	(0.040)
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	12606	12606	12552
Within R-Squared	0.905	0.902	0.825

Notes: Robust standard errors clustered by industry are reported in parentheses. ***significant at the 0.01 level, ** significant at the 0.05 level, * significant at the 0.1 level.

I divide the sample into labor-intensive industries and capital-intensive industries for further discussion. Firms in labor-intensive industries should be more sensitive to changes in the labor market due to the COVID-19 Pandemic. Thus, I expect results to be more significant in labor-intensive industries. For the categorization of industries, I first calculate the labor-capital ratio of firms in 2019 before the pandemic. I then take the average value of all firms in each industry to obtain the labor-capital ratio of that industry. All industries above the median are defined as labor-intensive industries, otherwise they are capital-intensive industries.

I test both Hypothesis 1 and Hypothesis 2 on firms in labor-intensive industries and capital-intensive industries. Table 10 reports the results of Hypothesis 1. For labor-intensive industries, the coefficients of $Hubei\_output\ share * Post$ are not only significantly negative, but also larger in magnitude and more significant than those of the benchmark regression. For capital-intensive industries, the coefficients of $Hubei\_output\ share*$

$Post$ are not significant. These results are consistent with my hypothesis.

Table 10: Tests for H1: Labor-Intensive Industry vs. Capital-Intensive Industry

	(1)	(2)	(3)	(4)
	Labor Intensive Industry		Capital Intensive Industry	
	Com_wage1	Com_wage2	Com_wage1	Com_wage2
Hubei_output share * Post	-8.609***	-20.139***	2.515	6.829
	(2.034)	(3.871)	(4.895)	(13.057)
Size	0.639***	1.480***	0.582***	1.734***
	(0.141)	(0.392)	(0.152)	(0.382)
Leverage	0.227	0.820	-0.137	-0.875
	(0.315)	(0.835)	(0.457)	(1.241)
Growth	0.075	0.266**	0.429***	0.950***
	(0.056)	(0.120)	(0.066)	(0.166)
ROA	0.462**	2.026**	0.071	1.138
	(0.201)	(0.836)	(0.395)	(0.885)
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	5929	5929	6304	6304
Within R-Squared	0.865	0.878	0.843	0.849

Notes: Robust standard errors clustered by industry are reported in parentheses. ***significant at the 0.01 level, ** significant at the 0.05 level, * significant at the 0.1 level.

Table 11 reports the test results of Hypothesis 2. For labor-intensive industries, the regression coefficients of $Hubei\_output\ share * Post$ for $Lncom1$ and $Lncom2$ are significantly negative, but the coefficient for $LnWage$ is not. For capital-intensive industries, the coefficients of $Hubei\_output\ share * Post$ on $Lncom1$, $Lncom2$ and $LnWage$ are all insignificant. These results are again fully consistent with the hypothesis.

Table 11: Tests for H2: Labor-Intensive Industry vs. Capital-Intensive Industry

	(1)	(2)	(3)	(4)	(5)	(6)
	Labor Intensive Industry			Capital Intensive Industry		
	LnCom1	LnCom2	LnWage	LnCom1	LnCom2	LnWage
Hubei_output share * Post	-1.744**	-1.698***	-0.521	-0.094	-0.260	-0.832
	(0.681)	(0.560)	(0.492)	(0.696)	(0.560)	(0.674)
Size	0.160***	0.157***	-0.003	0.161***	0.150***	0.019
	(0.044)	(0.039)	(0.040)	(0.023)	(0.034)	(0.030)
Leverage	0.066	0.012	-0.010	-0.104	-0.115	-0.041
	(0.104)	(0.108)	(0.128)	(0.081)	(0.088)	(0.076)
Growth	-0.021	-0.024	-0.031**	0.017	0.023*	-0.076***
	(0.020)	(0.017)	(0.012)	(0.010)	(0.011)	(0.015)
ROA	0.168***	0.047	-0.166**	0.175**	0.032	0.022
	(0.055)	(0.050)	(0.066)	(0.066)	(0.083)	(0.083)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5958	5958	5925	6322	6322	6298
Within R-Squared	0.912	0.909	0.838	0.916	0.912	0.847

Notes: Robust standard errors clustered by industry are reported in parentheses. ***significant at the 0.01 level, ** significant at the 0.05 level, * significant at the 0.1 level.

5 Conclusion

This paper examines the effect of the COVID-19 pandemic situation in Hubei on the pay gap between firm executives and general employees. The differences-in-differences model evinces that, in 2020, the exposure of a firms' supply side to Hubei does not significantly impact pay gaps, but the exposure of a firms' demand side significantly reduces pay gaps. Changing sample periods, sample firms, and proxies for dependent variables, and adding control variables does not impact the significance of this result. Further, since the COVID-19 Pandemic, employee wages decreased less than executive wages, thus reducing the pay gap. I also find results to be more significant in labor-intensive industries than in capital-intensive industries.

In conclusion, this study presents new evidence from the firm level for understanding the impact of the COVID-19 Pandemic on the labor market. The conclusions also provide significant insights for policies that aim to address inequality after the pandemic. Facing the impact of COVID-19, firms, as the demand side of the labor market, will significantly reduce executive wages but will not do so for the wages of general employees. As such, ensuring the successful operation of firms and reducing the inequality caused by the pandemic should become important factors to consider when implementing post-pandemic policies.

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