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Minimum Wages and Labour Cost Stickiness: Evidence from China *

Song Tang,[1] Yiwei Yao,[2] and Zhiwei Ye[3]

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Abstract

In this study, we examine the effect of minimum wages on labour cost stickiness by using a sample of 20,566 firm-year observations from China, which had no minimum wage legislation until 2004. We find that minimum wages are positively associated with labour cost stickiness, suggesting an enhancement effect. The results of further analyses show that the positive effect is mainly driven by the per capita salary stickiness and is more pronounced 1) among firms with lower per capita wages and those located in provinces with higher minimum wage growth and 2) in the post-2008 period, during which China's Labour Contract Law was in effect.

***Keywords*:** Minimum Wages, Labour Cost Stickiness, Employment Stickiness, Per Capita Salary Stickiness, China

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[1] School of Accountancy, Shanghai University of Finance and Economics, 111 Wuchuan Road, Shanghai, China. Email: tangsong@mail.shufe.edu.cn.
[2] Corresponding author. Department of Accountancy, Hang Seng University of Hong Kong, Siu Lek Yuen, Shatin, Hong Kong. Email: yiweiyao@hsu.edu.hk.
[3] School of Accountancy, Shanghai University of Finance and Economics, 111 Wuchuan Road, Shanghai, China. Email: 455790869@qq.com.

最低工资与劳动力成本粘性
—基于中国的经验证据

摘要

中国自 2004 年起开始正式实施《最低工资规定》，各省份每年根据辖区内具体情况，确定和调整当地的最低工资标准。本文以中国各地区上市公司 2004 至 2016 年期间的 20,566 个观测值为样本，对最低工资标准如何影响劳动力成本粘性进行了考察。研究发现，最低工资标准与劳动力成本粘性正相关，即随着最低工资标准的提高，企业劳动力成本粘性随之增强。进一步研究表明，这种粘性增强效应主要是由人均薪酬粘性驱动的；并且，在员工人均薪酬较低的公司，所在地区最低工资增长率较高的公司，以及 2008 年《劳动合同法》实施后，最低工资对劳动力成本粘性的增强效应更为显著。

关键词：最低工资、劳动力成本粘性、用工粘性、人均薪酬粘性、中国

I. Introduction

A minimum wage is the lowest remuneration that employers can legally pay their workers. Formal regulations on minimum wage were firstly promulgated in New Zealand and Australia in the 1890s, and most countries had introduced minimum wage legislation by the end of the 20th century. In China, the first country-level minimum wage legislation was issued in 1993 and incorporated into China's Labour Law in 1994. According to the 1994 Labour Law, all provincial, autonomous-region, and municipal governments must set their own minimum wage in accordance with a set of common principles and local conditions. In the early 2000s, the slow increase and limited coverage of minimum wages, along with growing concerns about minimum wages, led the Chinese central government to revise the regulations on minimum wage. On 1 March 2004, the new minimum wage regulation was put into effect by the Ministry of Labour and Social Security of China. Under the new law, the minimum wage standards were set and adjusted by the local government, trade union, and enterprise confederation of each province but were reviewed by the Ministry of Labour and Social Security before being passed. The new regulation also required local governments to review and adjust (if necessary) minimum wages at least once every two years. Meanwhile, the penalties for violation were increased from 20 to 100% to 100 to 500% of the owed wages. Since then, the frequency and magnitude of changes in minimum wages have been substantial. This unique regulatory environment makes China an excellent setting for examining the effects of minimum wages. It enables us to examine the effects of minimum wages within one country with sufficient cross-sectional and time-series variances. Specifically, in this study, we examine the effect of minimum wages on labour cost stickiness in China over the period from 2004 to 2016.

Cost stickiness, first defined by Anderson, Banker, and Janakiraman (2003), describes the phenomenon that costs rise more with increases in activity volume than they fall with equivalent decreases in activity. Managers in general must increase committed resources when demand increases to accommodate additional sales. However, when demand declines, they may choose to maintain some committed resources to reduce the adjustment costs while bearing the costs of operating with unused capacity if the former is estimated to be greater. Managers may also decide to maintain some unutilised resources due to personal considerations (Banker, Byzalov, and Chen, 2013). In either case, stickiness of cost arises. In this study, we argue that minimum wage legislation may affect labour cost stickiness by affecting adjustment costs through its effects on employment and per capita wage.

Theoretical economic models predict that minimum wage legislation and minimum wage increases will decrease employment, especially among inexperienced and unskilled workers (Mincer, 1976; Card and Krueger, 1995). Consistent with this prediction, several recent empirical studies provide evidence on the adverse effects of minimum wages (or changes in minimum wages) on employment. Meer and West (2016) find that a "minimum

wage reduces net job growth, primarily through its effect on job creation by expanding establishments ... [which is] most pronounced for younger workers and in industries with a higher proportion of low-wage workers." Fang and Lin (2015) examine minimum wages and employment in China and also find that "minimum wage changes have significant adverse effects on employment in the Eastern and Central regions of China, and result in disemployment for females, young adults, and low-skilled workers." Thus, the workers with the lowest wage rates are pushed into the ranks of the unemployed. The remaining workers, most likely those whose previous wages were closest to the minimum, will enjoy higher wages (Gwartney, Clark, and Stroup, 1985). This is called the "spillover effect" of minimum wage legislation discussed in the literature (Xiao and Xiang, 2009).

The total labour cost of an enterprise can be broken down into two parts: per capita wage and number of employees. As such, when activity volume declines, the total labour cost can be adjusted either by laying off employees or cutting the per capita wage of existing employees. However, legislation or increases in the minimum wage could effectively limit the downward per capita wage adjustment for the following reason. The level of the lowest wage is fixed by minimum wage legislation, and this lower limit becomes higher where minimum wages are higher or are increasing. Due to the spillover effect of minimum wages, the wages of the higher ranks will be higher and also fixed to some extent as managers have to maintain wage gaps between wage categories to keep employees motivated (Xiao and Xiang, 2009). This adds more labour cost stickiness by constraining the downward adjustments to per capita wage. On the other hand, when activity decreases, managers will fire workers as long as the net present value of the cash flows that the marginal workers are expected to generate during their employment is negative and larger (absolute value) than the firing cost (Bentolila and Bertola, 1990). However, as previous theoretical and empirical studies on minimum wage and employment suggest that a minimum wage pushes low-skilled or marginal workers out of the group of employed, firing workers becomes less likely, with fewer marginal workers left as employed. Therefore, minimum wages may further limit the labour cost cutbacks in response to decreases in activity. For the above two reasons, we predict that minimum wages generate additional labour cost stickiness.

On the upward side, we expect that due to its spillover effect, minimum wage legislation will, on average, make the net present value of an additional worker lower due to the higher average per capita wage in the market for all ranks. Thus, it is less likely that additional workers will be hired. This constrains the upward adjustment of the labour cost for increases in activity and therefore could result in lower labour cost stickiness.

As, theoretically, a minimum wage can constrain both downward and upward cost adjustments, we cannot predict the direction of the effect of minimum wages on labour cost stickiness, and therefore we examine the question empirically.

Specifically, in this study, we examine the effect of minimum wages on labour cost

stickiness using province-level data on minimum wages in China over the period from 2004 to 2016. We find that minimum wages are significantly and positively associated with the stickiness of labour cost. Through further cross-sectional analyses, we find that the above effect is most pronounced among firms with lower per capita wages and those located in provinces where the minimum wage has increased more rapidly in the current year. Lastly, we divide the sample into two sub-periods, before and after 2008, which was the year the Labour Contract Law was implemented in China. We then repeat the main test with the two subsamples and find that the positive effect of minimum wages on labour cost stickiness is more pronounced in the second period. In other words, when the 2008 Labour Contract Law provided more and stronger job security provisions for employees, the effect of minimum wages on labour cost stickiness was more significant.

Our study is closely related to that of Jiang, Yao, and Hu (2016), who find a negative relationship between the implementation of minimum wage legislation and cost stickiness. Our study differs from that of Jiang, Yao, and Hu (2016) in two important ways. First, Jiang, Yao, and Hu (2016) look at the stickiness of total selling, general, and administrative (SG&A hereinafter) costs, whereas we focus on labour cost. Minimum wage legislation is expected to mainly affect labour cost, and as labour cost constitutes part of SG&A costs and is partially included in the cost of goods sold, using the total SG&A costs may increase the measurement error. Second, Jiang, Yao, and Hu (2016) use a dummy variable, Year 2004, which is the year when the minimum wage legislation was implemented, to measure the existence of minimum wages. They compare cost stickiness before and after the implementation year to examine the effect of the minimum wage legislation on cost stickiness. In comparison, we use cross-sectional regressions to examine the association between the minimum wage level and labour cost stickiness.

We contribute to the literature in several ways. First, on the basis of the unique setting of minimum wage legislation in China after 2004, we are able to examine the effect of minimum wages on labour cost stickiness using the data of listed companies in China, and we find a significant and positive association between minimum wages and labour cost stickiness. Our findings complement the study by Banker, Byzalov, and Chen (2013), which uses a sample of 19 OECD countries and finds cost stickiness varies with the stickiness of employee protection legislation (EPL) provisions; we provide additional evidence on this issue from an emerging market, with the confounding institutional factors better controlled by employing a single country setting.

Second, our study contributes to the literature on the effects of minimum wage legislation. Over the last decades, economic research on the effects of minimum wages has provided mixed findings. The debates about the costs and benefits of minimum wages continue. Our findings show that as minimum wages and other variables (e.g. other legislation) may jointly drive the results we observe, it is important to dynamically examine

and consider its effects in specific settings.

Third, our findings in the China context may have implications for regulators who intend to expand the coverage of minimum wage legislation or raise the minimum wages in the covered sectors as we provide evidence on the association between labour cost stickiness and both the level of and changes in minimum wage with cross-sectional and time-series data.

The rest of the paper is arranged as follows. Section II describes our sample, defines our variables, and describes the data. Section III presents and discusses the empirical results. Section IV concludes the paper.

II. Sample, Variables, and Data

2.1 Sample

China's minimum wage regulations have been in effect since 2004, and data on the consumer price index (CPI hereinafter) used for calculating the impact of inflation are available up to 2016. As such, in this study, we select all of the non-financial companies listed on the Shanghai and Shenzhen stock exchanges from 2004 to 2016 as our initial sample.

We obtain the data on minimum wages and real GDP growth rates for all of the provinces, autonomous regions, and municipalities in China from the WIND database, the CPI data for consumer prices from the National Bureau of Statistics, and other data from the CSMAR.

Following Jiang *et al.* (2016), we delete ST firm-year observations,[4] and following Banker and Byzalov (2014), we delete firms with negative labour costs or negative revenues in the current year or previous years. We further delete firms with missing labour cost or revenue data or with a labour cost greater than revenue in the current year or previous years and firms with negative total assets, missing data for other variables, or extreme values (top and bottom 0.5%) of change in labour cost, change in sales, asset intensity, or employee intensity. The final sample consists of 20,566 firm-year observations (2,393 unique firms). The selection process is summarised in Table 1.

[4] In China, publicly listed firms are designated as special treatment (ST) firms by the China Securities Regulatory Commission (CSRC) when they are experiencing financial or operational distress or there are serious accidents. The ST system was initially introduced in China in 1998 to detect poorly performing or high-risk public firms and to release an early warning to both the listed firms and investors. After receiving the ST designation, an ST firm will be under stricter regulations (e.g. its stock will be subject to a daily 5% stop-buying and stop-selling limit). In comparison, the daily stop-buying and stop-selling limit for non-ST firms in China is 10%. Within three years, an ST firm will either return to the normal listing status, with the ST 'cap' being removed due to its improved financial position and prospects, or it will be delisted from the stock exchange.

Table 1 Sample Selection

	Firms	N
Initial sample	**2,494**	**25,553**
Delete ST firm-years	-53	-636
Delete firm-years with negative labour cost or revenue in year t or t-1	0	-2
Delete firm-years with missing labour cost or revenue in year t or t-1	-1	-2,508
Delete firm-years with labour cost greater than revenue in year t or t-1	0	-105
Delete firm-years with missing required data for other variables	-40	-1,104
Truncate at top and bottom 0.5% on ΔLnLabourCosts, ΔLnSales, Asset intensity, and Employee intensity	-7	-632
Final sample	**2,393**	**20,566**

2.2 Variables

As we expect that, in the first order, minimum wages will affect the stickiness of labour cost rather than SG&A costs, we use labour cost instead of SG&A costs as our dependent variable to reduce the measurement noise so as to increase the testing power (Gu, Tang, and Wu 2019). Specifically, SG&A covers various expense items other than labour cost, such as depreciation and amortisation, rentals, R&D, marketing, development of distribution channels, and so forth. In the meantime, some current labour cost may be inventoried in work-in-process and finished goods are therefore not included in SG&A costs. Banker, Byzalov, and Chen (2013) also acknowledge the superiority of directly using labour cost in studies on the effect of employment protection legislation on cost behaviour. They use operating costs as an indirect measure due to the limitations of Compustat. Although Chinese public firms also do not disclose their labour cost, they are required to report cash payments for labour expenditure separately in the statement of cash flows. This unique Chinese dataset allows us to measure labour cost directly. Specifically, as a proxy for labour cost, we use the item "cash paid to and on behalf of employees", which includes the cash paid to employees in the form of salaries/wages, bonuses, and fringe benefits as well as cash paid for employees' pension and unemployment insurance, and housing provident fund. We acknowledge that a portion of the labour cost is not paid in cash but in the form of shares, share options, and other share-based compensation plans; certainly, these are not captured in the cash paid to and on behalf of employees. However, in China, the use of employee stock ownership by listed firms was largely limited by the China Securities Regulatory Commission (CSRC) before 2014, when the CSRC issued "Guidelines on the Implementation of Employee Stock Ownership Plans in Public Companies". In our sample

period, we have 437 firm-year observations in our sample which adopted employee ownership plans, accounting for 6.8% of the post-2014 subsample or 2.1% of our full sample. To address this issue, we run a robustness test in which we first remove the firm-year observations with employee stock ownership plans from our sample and second restrict our sample to the period from 2004 to 2013. All of the variables are defined in Table 2.

Table 2 Variable Definitions

Variables	
Sales	Sales revenue for year t
LabourCost	Labour cost, measured as cash paid to and on behalf of employees in year t
Δ*LnLabourCosts*	Change in labour cost, calculated as the natural logarithm of labour cost for year t minus the natural logarithm of labour cost for year t-1
Δ*LnSales*	Change in sales, calculated as the natural logarithm of sales revenue for year t minus the natural logarithm of sales revenue for year t-1
Decrease	Dummy variable, equals 1 if change in sales is negative in year t
Successive_decrease	Dummy variable, equals 1 if change in sales is negative in both years t and t-1
GDP_growth	GDP growth rate in year t
Asset_intensity	Asset intensity, measured as the natural logarithm of the ratio of year-end total assets to sales for year t
Employee_intensity	Employee intensity, measured as the natural logarithm of the ratio of labour cost to sales for year t
Minwage_lowlimit (in 1,000 ¥)	Minimum wage in 1,000 ¥ of the province or municipality where the firm was incorporated
Per capita wage	Firm-level average monthly wage for year t, calculated as the cash paid to employees over the number of total employees for year t and then divided by 12
Minwage_growth	Minimum wage growth rate in year t

Note: Except for the dummy variables, all of the variables are treated with CPI subtraction based on 2004.

2.3 Data Description

We report the descriptive statistics in Table 3. The means and medians of the variables used in the regressions in tables 4 to 8 are reported. The mean (median) of Δ*LnLabourCosts* for the sample firms is 0.14 (0.11), with an annual sales change of 0.10 (0.09). About 32% of the firm-years exhibit a decrease in sales, and 13% of the observations show consecutive decreases for two years.

Table 3 Descriptive Statistics

Variable	N	Mean	Median	Standard deviation	MAX	MIN
Δ*LnLabourCosts*	20,566	0.14	0.11	0.24	1.71	-1.08
Δ*LnSales*	20,566	0.10	0.09	0.31	2.10	-1.35
Decrease	20,566	0.32	0.00	0.47	1.00	0.00
Successive_decrease	20,566	0.13	0.00	0.34	1.00	0.00
GDP_growth	20,566	0.09	0.08	0.02	0.14	0.07
Asset_intensity	20,566	0.65	0.61	0.68	3.18	-1.22
Employee_intensity	20,566	-2.45	-2.40	0.71	-0.63	-5.02
Minwage_lowlimit	20,566	0.76	0.75	0.29	1.59	0.24

Note: Δ*lnLabourCosts*, Δ*lnSales*, *Asset_intensity*, and *Employee_intensity* are truncated at the top and bottom 0.5%. See Table 2 for the definitions of the variables.

III. Empirical Results

3.1 Main Result

Following Anderson, Banker, and Janakiraman (2003), we run the following regression model to test whether minimum wages affect labour cost stickiness. All of the variables are defined in Table 2. The dependent variable is the natural logarithm of the change in labour cost, which is supposed to change with changes in activities (measured as the natural logarithm of the change in sales in the model). Labour cost stickiness is then reflected in a significant and negative coefficient, β_2, on the interaction between log change in sales and a decrease in the sales dummy. Our focus is on β_3, which captures the incremental labour cost stickiness generated or reduced by minimum wages. The other factors, such as GDP growth, consecutive decrease in sales, assets intensity, and employee intensity, which previous studies have found to have a moderating effect on cost stickiness are included as additional interacting factors in the regression model.

$$\begin{aligned}\Delta lnLaborCosts_{i,t} &= \beta_0 + \beta_1 \Delta lnSales_{i,t} + \beta_2 \Delta lnSales_{i,t} * Decrease_{i,t} \\ &+ \beta_3 Minwage\_lowlimit * \Delta lnSales_{i,t} * Decrease_{i,t} \\ &+ \beta_4 GDP\_growth * \Delta lnSales_{i,t} * Decrease_{i,t} \\ &+ \beta_5 Successive\_decrease * \Delta lnSales_{i,t} * Decrease_{i,t} \\ &+ \beta_6 Asset\_intensity * \Delta lnSales_{i,t} * Decrease_{i,t} \\ &+ \beta_7 Employee\_intensity * \Delta lnSales_{i,t} * Decrease_{i,t} + \varepsilon\end{aligned} \quad (1)$$

The regression results are reported in Table 4. First, we simply regress the change in labour cost on the change in sales and an interaction term between change in sales and the decrease dummy to check for the existence of labour cost stickiness in China. The regression results are reported in column (1) of Table 4. As shown in the table, the

coefficients on changes in sales and the interaction between changes in sales and the sales decrease dummy, namely β_1 and β_2, are significantly positive and negative, respectively, consistent with prior studies on cost stickiness. These results indicate the existence of labour cost stickiness in China. We then include our key independent variable, an interaction between minimum wages, change in sales, and the sales decrease dummy, along with the four additional control variables. The results are presented in column (2) of Table 4. Although the negative coefficient on the interaction between changes in sales and the sales decrease dummy turns to insignificant, all of the confounding factors including minimum wages have a significant influence on labour cost stickiness. Specifically, the coefficient on *Minwage_lowlimit* ΔLnSales*Decrease* is -0.212 and significant at the 1% level, which is consistent with the prediction that minimum wages generate additional labour cost stickiness. The coefficients on all of the control variables are in the directions that are consistent with the prior literature.

Table 4 Effect of Minimum Wages on Labour Cost Stickiness

Independent Variables	Dependent Variable *ΔLnLabourCosts*	
	(1)	(2)
ΔLnSales	0.398***	0.397***
	(26.224)	(25.967)
*ΔLnSales*Decrease*	-0.199***	-0.070
	(-7.443)	(-0.447)
*Minwage_lowlimit*ΔLnSales*Decrease*		-0.212***
		(-2.948)
*GDP_growth*ΔLnSales*Decrease*		-1.525
		(-1.455)
*Successive_decrease*ΔLnSales*Decrease*		0.246***
		(8.961)
*Asset_intensity*ΔLnSales*Decrease*		-0.050**
		(-2.232)
*Employee_intensity*ΔLnSales*Decrease*		-0.059**
		(-1.968)
Intercept	0.084***	0.086***
	(28.952)	(28.857)
N	20,566	20,566
Adjusted R-squared	0.195	0.203

The t-values (in brackets) are adjusted for firm clustering effects. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

3.2 Further Analyses

3.2.1 Effect of per capita wage

As we argue above, due to its unemployment and spillover effects, minimum wages may generate additional labour cost stickiness by constraining firms from firing employees

and/or restricting downward salary adjustments. Our main results show a positive association between labour cost stickiness and minimum wages. We further expect that the lower a firm's per capita wage is, the more its labour cost stickiness will be affected by minimum wages, as the unemployment and spillover effects of minimum wages are more pronounced in firms with lower per capita wages.

To test this prediction, we divide the sample into two subgroups, the low per capita wage group and the high per capita wage group, on the basis of the median of per capita wage of the province or municipality where the firm was incorporated and then rerun the regression equation for the two subsamples separately. The regression results for the low per capita wage group and the high per capita wage group are reported in columns (1) and (2) of Table 5, respectively. As shown in the table, consistent with our prediction, minimum wages have a significant positive effect on labour cost stickiness in the low per capita wage group but have no significant effect on labour cost stickiness in the high per capita wage group, suggesting that the main results reported in Table 4 are mainly driven by firms with a low per capita wage.

Table 5 Effect of Minimum Wages on Labour Cost Stickiness—Low Per Capita Wage and High Per Capita Wage Partitions

Independent Variables	Dependent Variable *ΔLnLabourCosts*	
	(1) Per capita wage Low level	(2) Per capita wage High level
ΔLnSales	0.389***	0.388***
	(16.352)	(18.299)
*ΔLnSales*Decrease*	-0.227	0.099
	(-1.009)	(0.442)
*Minwage_lowlimit*ΔLnSales*Decrease*	-0.232**	-0.135
	(-2.157)	(-1.290)
*GDP_growth*ΔLnSales*Decrease*	-0.346	-3.097**
	(-0.220)	(-2.106)
*Successive_decrease*ΔLnSales*Decrease*	0.270***	0.221***
	(6.491)	(5.197)
*Asset_intensity*ΔLnSales*Decrease*	-0.030	-0.083***
	(-0.784)	(-2.614)
*Employee_intensity*ΔLnSales*Decrease*	-0.087*	-0.029
	(-1.768)	(-0.669)
Intercept	0.082***	0.092***
	(18.415)	(21.441)
N	10,084	10,231
Adjusted R-squared	0.204	0.191

The t-values (in brackets) are adjusted for firm clustering effects. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

3.2.2 Effect of the growth of minimum wages

Similarly, if the minimum wage increases rapidly in a province or municipality in a year, all of the incorporated firms in the year then face more limitations with regard to adjusting wages downwards as activity decreases. In this case, we expect that a more dramatic increase in minimum wages at the provincial level is associated with a more significant positive effect of minimum wages on labour cost stickiness for all of the firms affected.

To test the above prediction, we divide the sample into low minimum wage growth and high minimum wage growth groups by the median minimum wage growth rate of all of the provinces and municipalities in a year. Columns (1) and (2) in Table 6 show the regression results for the low-growth and high-growth groups, respectively. The results show that the minimum wages have no significant impact on labour cost stickiness in the low minimum wage growth group, whereas they have a significant enhancement effect on labour cost stickiness in the high minimum wage growth group, which is consistent with our expectation and our main findings in Table 4.

Table 6 Effect of Minimum Wages on Labour Cost Stickiness—Low Minimum Wage Growth and High Minimum Wage Growth Partitions

Independent Variables	Dependent Variable *ΔLnLabourCosts*	
	(1) *minwage_growth* Low level	(2) *minwage_growth* High level
ΔLnSales	0.400***	0.392***
	(17.764)	(17.819)
*ΔLnSales*Decrease*	-0.146	0.005
	(-0.713)	(0.020)
*Minwage_lowlimit*ΔLnSales*Decrease*	-0.135	-0.261**
	(-1.402)	(-2.417)
*GDP_growth*ΔLnSales*Decrease*	-1.555	-1.220
	(-1.172)	(-0.723)
*Successive_decrease*ΔLnSales*Decrease*	0.285***	0.242***
	(7.419)	(5.461)
*Asset_intensity*ΔLnSales*Decrease*	-0.037	-0.060*
	(-1.160)	(-1.773)
*Employee_intensity*ΔLnSales*Decrease*	-0.064	-0.022
	(-1.603)	(-0.476)
Intercept	0.081***	0.093***
	(18.498)	(21.071)
N	9,617	10,043
Adjusted R-squared	0.217	0.190

The t-values (in brackets) are adjusted for firm clustering effects. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

3.2.3 Employment stickiness and per capita salary stickiness

Our main results in Table 4 show that the dominant effect of minimum wages on labour cost stickiness is positive: that is, minimum wages generate additional labour cost stickiness. As we argue above, this enhancing effect can be achieved through two possible channels: restricting employee layoffs or constraining the reduction of the per capita wage of existing employees.

Table 7 Effect of Minimum Wages on Labour Cost Stickiness—Stickiness of Per Capita Wages vs. Employment Stickiness

Independent Variables	Dependent Variables	
	(1)	(2)
	Per capita wage	Number of employees
Δ*LnSales*	0.110***	0.288***
	(4.749)	(11.898)
Δ*LnSales*Decrease*	-0.137	0.069
	(-0.527)	(0.283)
*Minwage_lowlimit*ΔLnSales*Decrease*	-0.329***	0.125
	(-2.763)	(1.074)
*GDP_growth*ΔLnSales*Decrease*	-3.512*	2.133
	(-1.917)	(1.264)
*Successive_decrease*ΔLnSales*Decrease*	0.152***	0.101**
	(3.084)	(2.089)
*Asset_intensity*ΔLnSales*Decrease*	0.078**	-0.136***
	(2.092)	(-3.778)
*Employee_intensity*ΔLnSales*Decrease*	-0.212***	0.159***
	(-5.122)	(4.198)
Intercept	0.055***	0.031***
	(12.046)	(6.458)
N	20,482	20,482
Adjusted R-squared	0.009	0.043

The t-values (in brackets) are adjusted for firm clustering effects. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Following Liu and Liu (2014), we differentiate the above two channels by decomposing the change in labour cost into two components: change in the number of employees and change in per capita wage. By replacing the dependent variable, the log change in labour cost, with the log change in the number of employees and the log change in per capita wages in regression model (1), we then decompose labour cost stickiness into employment stickiness and per capita salary stickiness. Columns (1) and (2) in Table 7 report the results on employment stickiness and on per capita salary stickiness, respectively.

As shown in the table, when change in total labour cost is replaced with change in per capita salary in the regression model, the estimated coefficient on the interaction between minimum wages, change in sales, and the sales decrease dummy remains negative and significant (-0.329 and significant at the 1% level). However, the coefficient turns to positive and insignificant when the total number of employees is used as the dependent variable in the regression model (0.125, insignificant). Together, these results indicate that minimum wages affect labour cost stickiness positively mainly by imposing constraints on reductions of the per capita wage of existing employees rather than by restricting employee layoffs.

3.2.4 Effect of the implementation of the Labour Contract Law in 2008

The Labour Contract Law was implemented in China in 2008, and it provides more job security provisions. As employment protection legislation affects cost stickiness (Banker, Byzalov, and Chen, 2013; Liu and Liu, 2014) and the 2008 Labour Contract Law further complements the existing minimum wages legislation, any relationship between minimum wages and labour cost stickiness may be nonlinear over the full sample period (2004–2016) crossing 2008. Specifically, the 2008 Labour Contract Law substantially increased firing costs, thus making reducing per capita wage a more important adjustment provision for decreases in activity after 2008. In the analyses of employment stickiness and per capita salary stickiness reported above, we find that minimum wages only affect per capita salary stickiness significantly. Therefore, we predict that the new Labour Contract Law in 2008 will make the enhancement effect of minimum wages on labour cost stickiness more pronounced.

To test this prediction, we divide the whole sample into two sub-periods, namely, before and after 2008, the year in which the Labour Contract Law was implemented. We then rerun the regression equation (1) with the two subsamples. The regression results are reported in Table 8, with the results for the pre- and post-2008 subsamples presented in columns (1) and (2), respectively. Our focus, the coefficient on the interaction term between minimum wages, change in sales, and the sales decrease dummy, is negative in both columns but significant in the second column only, suggesting that minimum wages have a significant enhancement effect on the stickiness of labour cost only in the post-2008 period. The results are consistent with our expectation that the enhancement effect of minimum wages on labour cost stickiness is more pronounced in the post-2008 period. Another probable reason for the loss of a significant effect in the pre-2008 period is related to the imbalanced sample distribution between the two periods, specifically, the much smaller sample size for the pre-2008 period (around one fourth of the sample size of the post-2008 group).

Table 8 Effect of Minimum Wages on Labour Cost Stickiness—Before and After the Implementation of the 2008 New Labour Contract Law

Independent Variables	Dependent Variable ΔLnLabourCosts	
	(1) Before 2008	(2) After 2008
Δ*LnSales*	0.322***	0.405***
	(9.186)	(22.449)
Δ*LnSales*Decrease*	-0.156	0.137
	(-0.704)	(1.086)
*Minwage_lowlimit*ΔLnSales*Decrease*	-0.220	-0.180***
	(-0.843)	(-2.688)
*GDP_growth*ΔLnSales*Decrease*	-0.748	-5.184***
	(-0.302)	(-3.987)
*Successive_decrease*ΔLnSales*Decrease*	0.088	0.278***
	(1.099)	(8.579)
*Asset_intensity*ΔLnSales*Decrease*	-0.043	-0.044*
	(-0.890)	(-1.749)
*Employee_intensity*ΔLnSales*Decrease*	-0.118	-0.064**
	(-1.643)	(-2.025)
Intercept	0.083***	0.087***
	(10.455)	(25.193)
N	4,173	16,393
Adjusted R-squared	0.117	0.217

The t-values (in brackets) are adjusted for firm clustering effects. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

3.2.5 Effect of minimum wages on the stickiness of SG&A costs

Although we expect minimum wages to affect labour cost rather than SG&A costs in the first order, SG&A costs may also be affected indirectly.[5] When activity decreases, management's consideration is to reduce total costs rather than to focus on certain components only. As we argued and found previously, with the existence of minimum wages or lower minimum wages, it is more difficult to adjust labour cost downwards than it is to make upward adjustments for increases in activity. To survive downturns, management may hence switch their effort to cutting other costs, such as depreciation and amortisation (by selling or deferring purchase of long-lived assets), R&D, marketing, and so on. As these expenses constitute a significant portion of SG&A costs, we may observe more downward adjustments of SG&A costs when activity level decreases and thus less stickiness of SG&A costs. Consistent with this prediction, Jiang *et al.* (2016) find the minimum wages legislation in China in 2004 reduces the stickiness of SG&A costs. However, the differences

[5] We thank the reviewer for bringing this point to our attention.

in sample selection, measurement of variables, and methodologies used by Jiang *et al.* (2016) and our study make a direct comparison a bit risky. To test the possible indirect effect of minimum wages on the stickiness of SG&A costs and to reconcile the "mixed" findings of Jiang *et al.* (2016) and our study, we replace the dependent variable in models (1) and (2) in our main test (in Table 4) with Δln (SG&A), measured as the log change in SG&A costs, and rerun the regressions. The results are presented in Table 9. Consistent with Jiang *et al.* (2016), the coefficient on the interaction among log change in sales, minimum wage, and decrease dummy is positive and significant at the 5% level, suggesting a reducing effect of minimum wages on the stickiness of SG&A costs.

Table 9 Effect of Minimum Wages on Stickiness of SG&A Costs

Independent Variables	Dependent Variable *ΔLnSG&A*	
	(1)	(2)
Δ*LnSales*	0.458***	0.457***
	(31.414)	(30.355)
Δ*LnSales*Decrease*	-0.269***	-0.556***
	(-8.869)	(-2.769)
*Minwage_lowlimit*ΔLnSales*Decrease*		0.213**
		(2.246)
*GDP_growth*ΔLnSales*Decrease*		1.992
		(1.489)
*Successive_decrease*ΔLnSales*Decrease*		0.132***
		(3.821)
*Asset_intensity*ΔLnSales*Decrease*		-0.079***
		(-2.967)
*Employee_intensity*ΔLnSales*Decrease*		0.006
		(0.180)
Intercept	0.053***	0.054***
	(17.776)	(18.178)
N	19,920	19,920
Adjusted R-square	0.198	0.201

The t-values (in brackets) are adjusted for firm clustering effects. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

3.3 Robustness Checks

We perform several robustness checks. First, to address the issue that our measure of labour cost may not capture wages not paid in cash, we 1) identify and remove those firm-years with employee stock ownership plans from our sample and 2) delete all of the firm-year observations for 2014 and after. We then rerun all of the tests with the reduced samples, and the results remain qualitatively unchanged. Second, past research (Fang, 2011) has documented significantly more labour cost stickiness for managers than for non-management employees in China due to abuse of management power. We therefore need to control for this confounding effect. However, a large portion of management

compensation is not in form of immediate cash payment, and managers are less likely to be affected by changes to the minimum wage, even by the spillover effect, as the manager market is quite isolated from the labour market. Therefore, we choose to directly subtract management compensation (the portion in cash) from our measure of labour cost and rerun all the previous tests. The results remain qualitatively the same. Lastly, we remove the transition year 2008 from our sample and conduct all the tests with the reduced sample. The results are not qualitatively changed.

IV. Conclusion

In this study, we examine the effect of minimum wages on labour cost stickiness using China data. We find that minimum wages significantly enhance labour cost stickiness in a sample of 20,566 firm-year observations in the period from 2004 to 2016. We further find that the above enhancement effect is more pronounced in 1) firms with lower per capita wage, 2) provinces or districts experiencing higher growth in minimum wage, and 3) after 2008, when the new Labour Contract Law was implemented. Furthermore, when we decompose labour cost stickiness into employment stickiness and per capita salary stickiness, we find that the positive association between minimum wages and labour cost stickiness is mainly driven by per capita salary stickiness. The results are robust to removing firm-year observations with employee non-cash compensation plans, taking the cash paid to managers out of our proxy for labour cost, and deleting observations from 2008. These results shed light on the question of how employee protection legislation affects labour cost behaviour by using a more direct measure of labour cost and by simultaneously employing a single-country setting, which allows us to better control the confounding institutional variables. The results have implications for regulators by showing one side effect of minimum wages, namely increasing the stickiness of labour cost in the covered firms.

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