

Effects of Wages and Global Financial Crisis on Labour Productivity - Does Size Matters?

Nurhani Aba Ibrahim and Lennora Putit

Abstract—Efficiency theory states that employers who pay more wages to their employees will motivate the latter to increase their productivity. In the past decade, evidence has shown that increase in wages was found to be relatively lower than the increase in labour productivity. While studies reveal that wages and labour productivity have significant causal relationship, they have yet to be observed by their firms' relative sizes. This paper examines the effect of wages and global financial crisis on labour productivity of the manufacturing industries in Malaysia based on their relative sizes. The study analyses the industries by their relative sizes, that is, small industries (SIs), small and medium industries (SMIs) and large industries (LIs). Using panel data analysis with fixed effects on monthly data from Jan 2003 until August 2011, the study finds that wages have positively affected labour productivity of firms at all sizes. However, the changes in wages affect the labour productivity in smaller firms more than they do in the large firms. This may be due to the fact that there are increasingly more SMIs implementing performance-based remuneration system to remain competitive. Furthermore, as wage level of labours in LIs is generally known to be higher than those in SMIs, hence, the increase in wages of labours in the LIs may seem relatively lower than those in SMIs. The global financial crisis seems to have a positive effect on the small and medium industries but negative effect on the large industries.

Index Terms—Wages, labour productivity, manufacturing, size.

I. INTRODUCTION

The relationship between wages and labour productivity has long been debated in the literature. Many studies have examined the relationship between wages and labour productivity in the developing and developed economy (e.g. [1], [2]). Many of them found that wages and labour productivity are closely related to each other.

There are two theories that explain the causal relationship between these variables, i.e. marginal productivity theory and efficiency theory. Marginal productivity theory postulated that productivity determines wages and the number of labours that will employed is determined by the point when marginal productivity of labour is equal to marginal cost of labour which is also the real wages. Increase in labour productivity will lead to higher wages rather than the other way around.

On the other hand, efficiency wages theory argued that higher wages would motivate employees to improve their productivity [3]. [4] explained that when employees receive higher wages, the cost of losing their job is higher. High

wages provide the incentive for the employees to be committed to their work and would not take the risk of being fired. Therefore, labour productivity increases. Higher wages is seen as an acknowledgment and appreciation for their employees, resulting in the return of favour by employees in the form of higher productivity as mentioned in the gift-exchange model by [5]. [6] further explained in their fair wage-effort model that if the employees are paid low wages as perceived to be below fair wages, they would not perform as good as they would have if they are paid as per the perceived fair wages. Hence, wages induced labour productivity as opposed to the opposite.

II. LITERATURE REVIEW

Many literatures apply cointegration and Granger causality tests on real wages and labour productivity. [7] found that wages and labour productivity have bidirectional Granger causality, which both support the marginal productivity theory as well as the efficiency theory. However, later studies by [8] on Australia data, [9] on Malaysia data and [10] on Turkey data, have shown that the efficiency theory is supported and has failed to find evidence to support the marginal productivity theory. [8] performs cointegration and Granger causality test with structural break, which suggests that real wages Granger cause productivity in the long run. Using the same methodology, [9] found the effect of real wages on labour productivity is non-linear and real wages does Granger cause labour productivity, however, there is no evidence of bidirectional causation. [10] supports [9] findings using Turkey data.

In Malaysia, other empirical studies that analyse the relationship between wages and labour productivity include [11] and [12] which use cointegration tests, whereas [13] and [9] extended their analyses to the direction of causality between these variables. In all these studies, time series data analyses are carried out for the aggregate manufacturing sector, except for [13] which covers all sectors.

Many researches have been undertaken to determine the effect of a major economic downturn or financial crisis on small and medium firms. Among them is [14] who found that an economic downturn did not have a consistently negative impact on small businesses. Both New Zealand and the United Kingdom samples show a significant minority of small firms performing well during the downturn, which suggests that while they are vulnerable, they also show underlying resilience and a high adaptability and flexibility. [15] found while the impact of financial crisis has not been uniformed across the globe, some factors that are very specific to SMEs made them more vulnerable. These factors include credit crunch, lower diversification product base and

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strong backward linkages with upstream supply chain. On the other hand, [16] results show that while the immediate effects of recession are severe, entrepreneurs recover quite quickly. Importantly, they found that the recessionary growth is hugely concentrated among entrepreneurs with the highest human capital, that is, the larger firms.

While many literature have addressed the effect of financial crisis on small and medium enterprises performance, the study of the effect of wages, identified by their relative sizes, on labour productivity has been scarce. This paper observes the importance of the average wages, identified by their relative sizes, and global financial crises in determining labour productivity.

This study explores the panel data of 113 manufacturing industries at MSIC 5-digit level for the period January 2003 until August 2011. This monthly data will show more immediate effect between the variables than the annual data. The use of panel data will also capture the heterogeneity between industries.

III. RESEARCH METHODOLOGY

This study also uses monthly data collected by the Department of Statistics (DOS), Malaysia, in their monthly manufacturing survey. Monthly data is used due to limited time dimension available for annual data, i.e. from the year 2000 to 2007, and therefore cannot capture the effects of the recent global financial crisis. By using the monthly data, the time dimension is greatly enhanced from 7 years to 104 months (from January 2003 until August 2011) as the monthly data are updated monthly whereas the yearly data are only available three years later. This is important to capture more time series in the panel data analysis. Furthermore, the monthly data would be able to capture the recession immediate effects on the firms' response to retrench. The data obtained from DOS are industries specified at 5-digit MSIC (Malaysian Standard of Industrial Classification) level and deflated to get their real values wherever necessary.

This study uses panel data analysis with fixed effects after performing the Hausman tests. The independent variables in the model are wage, global financial crisis, size, retrenchment. The dependent variable is labour productivity. Details of the variables are in the following section.

$$P_{it} = \alpha_{it} + \beta_{1it}S_{it} + \beta_{2it}R_{it} + \beta_{3it}W_{it} + \beta_{4it}C_{it} + \varepsilon_{it}$$

where

P_{it} - Labour productivity (value added per labour)

W_{it} - Average real wages per worker (MYR)

C_{it} - Global financial crisis dummy ($C=1$ if there is GFC, otherwise 0)

S_{it} - Average size (number of workers per establishment)

R_{it} - Retrenchment dummy

IV. DESCRIPTIVE STATISTICS

The descriptive statistics of the variables that has continuous values are highlighted in Table I. Wage is average real wages, which is measured by the paid salaries divided by the number of labour employed in each category of industry. It has a mean value of RM2,500 and a standard deviation

value of RM4,160. The workers earned a minimum average wages of RM400 per month and a maximum of RM83, 800 per month.

Labour productivity is measured by the real sales revenue minus raw material divided by the number of labor. It has a mean value of 21.23 and a standard deviation value of 104.10. According to the table above, the average labour productivity of firm in the industries has a minimum of -5316 and a maximum of 1530.6. The panel of all variables are strongly balanced with total observations of 11,856.

The dummies for retrenchment and GFC are specified as 1 if Yes, 0 otherwise. Using the dataset provided by DOS, retrenchment is identified if the specific industry has reduced at least three workers on average during the specific month, and not lesser than the said figure. GFC is identified as a period from October 2008 until December 2009 when the crisis actually occurred.

Size refers to average size, which is measured by the number of paid employment divided by the number of establishments at 5-digit MSIC level. It has a mean value of 336.50 and a standard deviation value of 436.46. According to the table below, the average size of firms in each industry has a minimum of 9 paid workers and a maximum of 7667 paid workers.

TABLE I: DESCRIPTIVE STATISTICS

Variable	Obs	Mean	Std. Dev.	Min	Max
Wages	11856	2.50	4.16	0.40	83.80
Labour Productivity	11856	21.23	104.10	-5316	1530.6
Size	11856	336.50	436.36	9	7667

Table II shows the correlation amongst size, labour productivity and wages. The relationship between labour productivity and average size is negative with a correlation coefficient (r) of -0.30. Even though it is significant at 5%, but it indicates quite a weak relationship. The positive sign indicates that when labour productivity increases, average size tends to decrease. The relationship between the average wages and average size is negative with a correlation coefficient (r) of -0.03. The coefficient is very low. The negative sign indicates that as average wages increases, average size tends to decrease. The relationship between the average wages and labour productivity is positive with a correlation coefficient (r) 0.10. The positive sign indicates that on average wages increases, labour productivity tends to increase.

TABLE II: CORRELATION BETWEEN VARIABLES

	Size	Labour Productivity	Wages
Size	1.00		
Labour Productivity	-0.30* 0.0011	1.00	
Wage	-0.03* 0.0030	0.10* 0.0000	1.00

V. PANEL DATA RESULTS

In analysing the effect of wages and global financial crisis on labour productivity for the whole sample, two models were run as shown in Table III. The models regress alternately with average size and retrenchment dummy used as control variables. This is to test whether the wage and

global financial crisis coefficients are significantly affected by these two control variables. The results show that it does not have any effect on wage and global financial crisis. In both models, wages significantly influence labour productivity at 1% level. The coefficient shows an increase of 1% in wages will increase labour productivity by 0.73%. This strongly supports the wage theory claims, as similarly found in [9], [8], and [10].

To analyse the effect of wage and global financial crisis on labour productivity by their relative size, three models were run as shown in Table IV. To check for robustness, the study analyses the industries by their relative sizes by dividing total observations into three categories, i.e., small industries (SIs), small and medium industries (SMIs) and large industries (LIs). The industries are specified as SIs if their average employment (L) is ≤ 150 , SMIs if $L \leq 300$ and LIs if $L > 300$.

TABLE III: PANEL DATA REGRESSIONS WITH FIXED EFFECTS
DEPENDENT VARIABLE: LABOUR PRODUCTIVITY

Variables	(1)	(2)
Constant	-0.5024 (0.0163)	-0.5514 (0.0647)
Average Wage (\ln)	0.7306 (0.0088)**	0.7312 (0.0087)**
Global Financial Crisis Dummy	0.0332 (0.0094)**	0.0325 (0.0094)*
Average Size (\ln)		0.0085 (0.0117)
Retrenchment Dummy	-0.0069 (0.0082)	
R ² :		
within	0.7539	0.7535
between	0.7001	0.6940
overall	0.7208	0.7177
F-Stat	8902.31	8969.55
(P value)	(0.0000)	(0.0000)
Observations	11740	11856

Notes: Coefficients are labelled ** and * to denote statistical significance at 1% and 5% levels respectively. Values in parentheses are standard errors.

The normal definition of SMEs which state that their number of employment of ≤ 75 workers cannot be applied here because it will significantly reduce the number of industries specified under SMIs. Instead, the study decides on the range of employment to have a more evenly distributed number of observations among the small, medium and large industries. See Table IV. The control variable, average size, is included in the models to capture both the downsizing and recruiting effect on SMIs' labour productivity.

TABLE IV: PANEL DATA REGRESSIONS BY RELATIVE SIZE OF INDUSTRIES,
DEPENDENT VARIABLE: LABOUR PRODUCTIVITY

Variables	SIs	SMIs	LIs
Constant	-0.1696 (0.1643)	-0.4547 (0.0952)	-0.5851 (0.1597)
Average Wage (\ln)	0.7851 (0.0150)**	0.7806 (0.0103)**	0.6018 (0.0158)**
Global Financial Crisis dummy	0.1078 (0.0178)**	0.0560 (0.0113)**	-0.0549 (0.0161)*
Average Size (\ln)	-0.0908 (0.0356)	-0.0327 (0.0190)	0.0548 (0.0240)
R ² :			
within	0.7651	0.7607	0.7433
between	0.7311	0.7227	0.7953
overall	0.7258	0.7420	0.7431
F-Stat	3596.97	6612.70	2441.18
(P value)	(0.0000)	(0.0000)	(0.0000)
Observations	4490	8423	3433

Notes: Coefficients are labelled ** and * to denote statistical significance at 1% and 5% levels respectively. Values in parentheses are standard errors.

The study finds that wages have positively affected labour

productivity of firms at all sizes. However, the changes in wages affects the labour productivity in smaller firms more than they do in the large firms. This may be due the fact that there are increasingly more SMIs implementing performance-based remuneration system to remain competitive. Furthermore, as wage level of labours in LIs is generally known to be higher than those in SMIs, the increase in wages of labours in the LIs, hence, may seem relatively lower than those in SMIs. Downsizing is included in the model as a control variable.

GFC is found to have a positive significant effect on labour productivity of SMIs but a negative effect on labour productivity of the LIs. The GFC variable captures the period from the fourth quarter of 2008 to the fourth quarter in 2009, when the crisis actually set in. Because of the concern raised during the economic crisis and the possible threat of downsizings, the SMIs workers may have been motivated to work harder to help their company and themselves to go through the crisis proactively. The economic stimulus packages announced in November 2008 and February 2009 may have assisted the industries to a certain extent. This may not be the case with the LIs.

This study provides evidence that the SMIs are generally able to cope well during the GFC, whereas the LIs are badly affected by the GFC. Due to their relatively smaller size, the SMIs are more resilient and flexible in adjusting to their production and business strategies during the crisis. The LIs, on the other hand, have rather limited ability to make similar adjustments due to their large volume of output. Thus, it has caused a negative effect on them.

VI. CONCLUSION

This paper analyses the effects of wages and global financial crisis on the manufacturing sector's labour productivity in Malaysia at relative sizes, i.e. small, medium and large. It provides evidence that changes in wages affect the small industries' labour productivity more than the large industries. The level of wages for labour in small firms is generally smaller than the large ones. The results implies that workers in the smaller firms are more responsive by 18% towards increases in wages compared to labour in the large industries.

Global financial crisis is also found to motivate a relative higher positive labour productivity in small industries compared to a relatively lower negative labour productivity in the large industries. This provide evidence of the ability of small industries to make adjustments to ensure a continuous improvement in their labour productivity.

In examining the effect of wages and global financial crisis on labour productivity, the study provides evidence that both wages and global financial crisis do have significant effects on labour productivity of manufacturing industries in Malaysia.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Dr. Nurhani Aba Ibrahim, assisted by a research assistant,

has done most of the work for this paper. Associate Professor Dr. Lennora Putit has reviewed and give comments on areas for improvement.

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