Workplace injuries in Malaysian Manufacturing Industries

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ABSTRACT

This study analyzes the determinants of workplace injuries across 44 four-digit manufacturing industries in Malaysia from 1993 to 2008 through the business cycle and structural approaches. The results of fixed-effects estimations revealed that workplace injuries in Malaysian manufacturing sector were negatively influenced by firm size and positively influenced by business cycle. Consistent with the findings of previous studies in other countries, the empirical evidence of this study supports the pro-cyclical behavior of injury rates in manufacturing industries towards business cycle. The analysis demonstrates that both structural and cyclical variation effects are important determinants of workplace injuries in Malaysia.

Keywords: workplace injuries, cyclical variation, structural characteristics, Occupational Safety and Health Act.

INTRODUCTION

Studies on the incidence of industrial accidents or workplace injuries can be grouped into three approaches, viz. business cycle, labor market and structural approaches. The business cycle approach to workplace injuries provides explanations as to how injury rates may be expected to vary over the course of the economic cycle (Kossoris, 1938; Leigh 1985; Robinson and Shor, 1989). These studies support pro-cyclical relation, showing that the number of injuries tend to increase during economic upswings and vice versa. Nevertheless, this approach does not explicitly consider the interaction of choices made by employers between safety and profits and the choices of employees between safety and wages in determining the risk of injuries. This give rise to the second approach, the market oriented approach to workplace injuries as proposed by Chelius (1974), Oi (1974), and Sider (1985). Their studies relate the injury rates to the market factors, such as wage and government control. In general, their analysis shows that, under firm's optimization, occupational injury is determined by wage level and employers' incentives in accident prevention. However, the impact of government intervention through tax and compensation benefit is inconclusive.

The third approach focused on structural effect of the industry such as workers characteristics, firm size, and mechanization or capital intensity in the production process (Oi, 1974; Cooke and Gautschi, 1981; Viscusi, 1986; Currington, 1986). Demographic differentials in work injury rates could have been generated by several structural forces. If other things being equal, (such as type of industry, occupation, firm size and safety of the work site), certain workers are innately more liable to be involved in workplace injuries (Oi, 1974).

Despite the three approaches, it is often assumed that the causes of accidents vary across sectors (Coleman, 1981). A survey report by Centers for Disease Control and Prevention (1993) on fatal injuries in the United States (U.S.) during 1980-1989 shows that the largest number of fatalities occurred in the construction sector, followed by transportation, manufacturing, and primary economic sectors. A large body of existing empirical analysis on workplace injuries focused on manufacturing and construction sectors. This is due to their natural hazard and both sectors are found to be highly responsive to the business cycle, particularly in mature capitalist economies as well as those in transition towards industrialized economies (Robinson and Shor, 1989; Davies et al., 2009).

With the vision of becoming an industrialized economy by the year 2020, Malaysia has started its industrialization effort since 1960s. Industrialization has been an integral part in the Malaysian development strategies and manufacturing sector has shown to be one of the important backbones and a major contributor to the Malaysian economy. The share of manufacturing sector to Gross Domestic Product (GDP) increased significantly from only 12.2 percent in 1970 to 30.1 percent in 2010. Apparently, this sector has been the major sector in creating employment opportunities. In 1970, employment in the manufacturing sector represented only 9.4 percent of total employment (Malaysia, 1976). In line with the industrialization process, the share of employment in the

manufacturing sector increased over the years. As at 2010, the share of employment in the sector has increased to 27.8 percent (Malaysia, 2010).

It is often the case that rapid expansion of manufacturing industries during economic expansion is associated with large employment of new workers and new technologies, machineries and equipments. While the application of new technologies would expose new hazards to the workers, hiring new worker might as well pose higher risk of accident as they are not accustomed to the hazard of workplace environment. Therefore, a study of workplace injuries in Malaysian manufacturing sector is particularly relevant since it would contribute to a greater understanding of factors that determine workplace injuries in the sector.

Workplace injuries have been the subject of growing number of academic research since the last three decades. However, large body of research focusing on the causes of injuries is dominated by empirical studies in industrialized countries, such as European countries and the U.S. In Malaysia, existing studies on workplace injuries were mainly focused on the issues of the establishment and enforcement of the Occupational Safety and Health Act (OSHA) and the evolution of safety related regulations (Jamaluddin, 1994: Rahmah and Sum, 2000; Mansur et al., 2003; Ariffin et al., 2006; Rampal and Nizam, 2006; Lugah et al., 2010; Surienty et al., 2011). Empirical study on workplace injuries in Malaysia, however are still lacking and mostly concentrated on the construction sector (Abdul Hamid et al., 2008; Ali et al., 2010; Zakaria et al., 2010). Apart from these studies, Mansor et al. (2011) examine the influence of individual factors and nature of job on accident among workers at port sites. However, to the best of our knowledge, no attempt has been made to specifically investigate factors that influence workplace injuries in Malaysian manufacturing industries. Hence, the objective of our study is to empirically examine factors that contribute to workplace injuries in Malaysian manufacturing industries during 1993-2008. We specify our empirical model based on two approaches, viz. the business cycle and structural approaches. Difficulties of obtaining data on wage premium and on employees' protection measures for each industry prevent us from incorporating the labor market oriented approach in our model.

The remainder of this paper is structured as follows. Next section provides an overview of workplace injuries in Malaysia and followed by literature review. Subsequently, this study discusses the model specification and data, which is followed by results and discussion. Finally, this study concludes and offers some policy implications.

OVERVIEW OF WORKPLACE INJURIES IN MALAYSIA

Table 1 and Table 2 respectively present the number of industrial accidents by sectors and by types of accident in Malaysia during 1994-2008. There was significant decline in the total number of industrial accidents reported for all sectors, a decrease of 55.30 percent from 125,506 in 1994 to 56,095 in 2008. Among all sectors, the number of accidents reported for the manufacturing sector has been the highest throughout the period. This reflects workers in the manufacturing sector are exposed to higher accidental risks.

Table 1. Industrial Accidents Reported by Sectors, Malaysia, 1994 – 2008.

Sectors	1994	1997	2000	2003	2006	2008
Agriculture, Forestry and Fishing	27,268	24,390	13,293	8,796	5,739	3,962
Mining and Quarrying	1,406	763	643	736	541	368
Manufacturing	68,281	37,829	42,915	33,901	27,066	19,041
Electricity, Gas, Water and Sanitary Services	588	372	592	513	515	524
Construction	4,536	3,648	4,966	5,113	4,500	3,814
Trading	9,173	9,248	15,472	13,576	11,783	11,342
Transportation	4,437	3,276	4,800	4,142	3,653	3,305
Financial Institution	592	367	7,293	6,195	5,386	718
Real Estates, Renting and Business Services	2,830	3,731	6,581	5,617	4,832	4,405
Total[1]	125,506	89,049	98,281	81,003	68,008	56,095

Note: [1] Total accident reported include total commuting accidents.

Source: *Labour and Human Resources Statistics* (various issues), Kuala Lumpur: Ministry of Human Resource.

It can be observed that the pattern of accidents reported varies from one sector to another, reflecting the difference of hazard across sectors. As shown in Table 2, 20.60 percent of total fatal accidents and 37.91 percent of total disablement accidents in 2008 involved workers from the manufacturing sector. Although there has been significant reduction of total accident in the manufacturing sector, accident cases which caused fatality and disablement shown an increment. Between 1998 and 2008, fatal accidents increased from 256 to 268 cases, while disablement increased from 5,823 to 9,701 cases.

Table 2. Types of Accidents Reported by Sectors, Malaysia, 1998 and 2008.

	Fatal Accidents		Disablement	
Sectors	**1998**	**2008**	**1998**	**2008**
Agriculture, Forestry and Fishing	69	154	1,730	1,769
Mining and Quarrying	9	15	130	194
Manufacturing	256	268	5,823	9,701
Electricity, Gas, Water and Sanitary Services	12	13	98	272
Construction	124	102	804	1,736
Wholesale and Retail Trade, Restaurant and Hotel	139	231	1,494	4,142
Transportation	83	121	635	530
Financial Institution	15	16	162	1,649
Civil Service	109	114	767	1,982
Total[1]	1,135	1,301	13,698	25,592

Note: [1] Total includes fatal accidents and disablement from other services.

Source: *Labour and Human Resources Statistics* (1998) and (2008), Kuala Lumpur: Ministry of Human Resource.

Figure 1 illustrates the trend of industrial accidents in the manufacturing sector reported from 1993 to 2008. Overall, total industrial accidents in the manufacturing sector were on a declining trend, except from 1998 to 2000 which shows an upward trend. An upward trend of industrial accidents during this period was attributable to Malaysian economic recovery from the Asian financial crisis which hit Malaysia in the middle of 1997. The upward and downward trend in total accidents during economic crisis and its recovery partly explain the influence of business cycle over industrial accidents. During economic crisis in 1997, firms tended to reduce both the volume and cost of production in response to decrease in aggregate demand. Reducing production involves the lay-off of newly hired, less experienced and unskilled workers who are normally more vulnerable to accident at the workplace. Hence by running the plants with the experienced and skilled workers during economic recession helps to reduce the number of accident cases reported.

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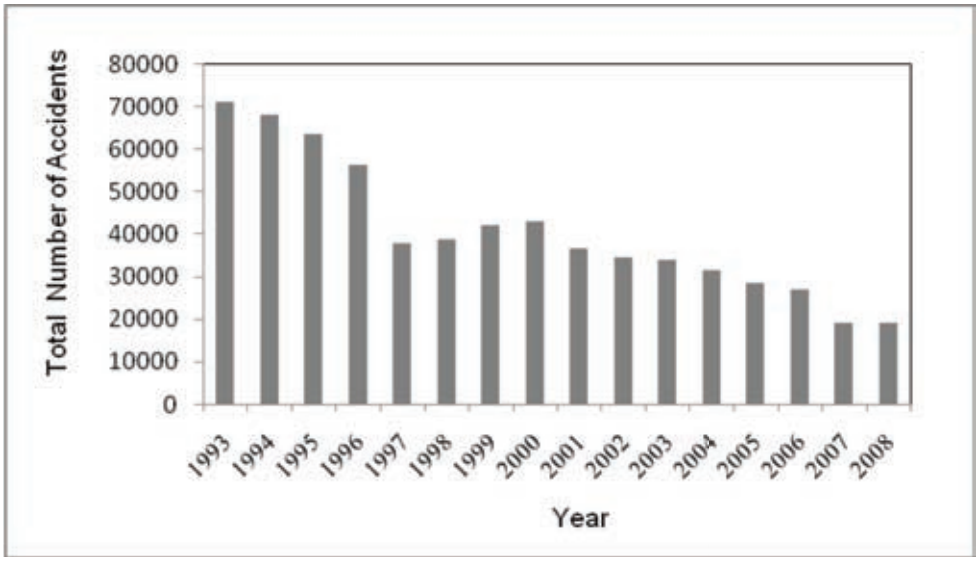

Figure 1. Industrial Accidents in Manufacturing Sector, Malaysia, 1993 – 2008.

As the economy began to recover in 1998, there was an increase in employment due to increase in production. Increase in employment during economic upswing meant hiring new workers who are not accustomed to the hazards of their new jobs and hence increased the number of accidents reported. After 2000, total accidents in the manufacturing sector were steadily declined. This could be attributed to the remarkable improvement in the safety and health conditions in the workplace. The growing concern among the regulators and employers over the safety and health issues at workplace in Malaysia has led to the introduction of the comprehensive OSHA enacted in 1994 along its related regulations. The legislations that govern issues pertaining to occupational safety and health at the workplace in Malaysia are:

1. Factories and Machinery Act 1967;
2. Employees Social Security Act 1969;
3. Occupational Safety and Health Act 1994;
4. Occupational Safety and Health (Employer's Safety and Health General Policy Statements) (Exception) Regulations 1995;
5. Occupational Safety and Health (Control of Industrial Major Accident Hazards) Regulations 1996;
6. Occupational Safety and Health (Safety and Health Committee) Regulations 1996;
7. Occupational Safety and Health (Classification, Packaging and Labeling of Hazardous Chemicals) Regulations 1997;
8. Occupational Safety and Health (Use and Standards of Exposure of Chemicals Hazardous to Health) Regulations 2000;
9. Occupational Safety and Health (Notification of Accident, Dangerous Occurrence, Occupational Poisoning and Occupational Disease) Regulations 2004-NADOOPOD.

LITERATURE REVIEW

An early study on workplace injuries relates its structural nature to the business cycles. Kossoris (1938) was the first researcher who investigated the relationship between business cycle and workplace injuries for the U.S. manufacturing industry for the years 1929 through 1935. He showed that, in general, the trend of injuries frequency rate followed the trend of industrial employment thus provides an early indication of pro-cyclic behavior of workplace injuries towards business cycle. Studies by Cooke and Gautschi (1981), Viscusi (1986) and Robinson and Shor (1989) support the pro-cyclical relation showing that the number of injuries tends to increase during economic upswings and vice versa. An inference as to why injury rates increase during economic expansion is the increase in employment of new inexperienced workers in the workforce who are vulnerable to accident at their new workplace. A pattern of decrease in injury rates observed by Kossoris (1938) during the Great Depression was related to workers' initiatives to report injuries. Workers tend to avoid reporting an injury, minor injuries in particular, in order to secure their position in the industry.

While the above studies support the pro-cyclical relation, a study on Finnish manufacturing and construction industries by Saloniemi and Oksanen (1998) during 1977 to 1991 however provides no evidence on the

relationship between fatal accidents and business cycle. Similarly, in a study of workplace injuries for the United Kingdom from 1986 to 2005 by Davies et al. (2009) found no significant relationship between business cycle and major injuries.

Oi (1974) analyses various aspects of workplace injuries in the U.S. including the characteristics of workers, labor turnover and establishment size. It appears that over all ages, males were three times as likely to be injured at work as females. As for labor turnover, an increase in the accession rate or new hires of less experienced workers during high employment gives rise to an increase in the overall work injury rates. Injury rates in relation to establishment size exhibit an inverted U-shaped where the smallest and the largest establishments reporting lower injury cases. Lower injury frequency in larger establishments could be explained by lower labor turnover, larger fractions of workers in safer tasks and fewer young males.

Smith (1979) estimates the impact of OSHA inspections on the U.S. manufacturing industry for the years 1972 to 1974. The study finds that injury as it pertains to inspection effect varies across plant-size and hazardous plant categories. Inspection effects were larger and statistically significant for the smallest plant and tend to be greater in the more dangerous plants. Similarly, Smith (1979) suggests that the relationship between firm size and injury rates probably is an inverted U-shaped. One possible explanation to the relationship is that small firms are less hazardous and easily monitored, while large firms, with the advantage of economies of scale are able to apply safety machineries and equipments.

Cooke and Gautschi (1981) examine the impact of OSHA citation activities and plant-specific programs upon changes in the injury rates for 113 Maine manufacturing plants over the period 1970-1976. Apart from OSHA citations, other factors included in the study are plant size and business cycle. The study employs the change in the percentage of production workers receiving first payments as a proxy measure of business cycle. They found that both firm size and business cycle were highly significant to injury rates. While firm size influences injury rates negatively, business cycle affects positively. They concluded that OSHA investigation activities have reduced the injury rates substantially for the case of larger firms.

Using a sample of 20 two-digit U.S. manufacturing industries from 1973 to 1983, Viscusi (1986) investigates the impact of OSHA on workplace safety. The independent variables included in the analysis are production workers, female workers and three variables to capture the influence of business cycle, namely the percentage change in the industry's employment, average weekly work hours and average overtime hours. While production workers are found to be positively related to accidents, female workers showed the reverse effect. A positive relationship between business cycle and injury rates is only significant for percentage change in the industry's employment. The results thus support for pro-cyclical relationship between employment and workplace injuries.

Currington (1986) analyses the impact of OSHA standards on injury frequency rates for 18 manufacturing industries in New York from 1964 to 1976. The analysis of the study is performed separately for "all injuries", "caught in machine", and "struck by machine" injuries. The independent variables included are unionization, capital intensity, firm size, new hire rate, employment ratio and production workers. All these variables are only significant for "all injuries" except the employment ratio, a proxy measure for cyclical variation. Among the significant variables, firm size is found to be the only variable which affects injury frequency negatively.

Jeong (1997) analyses the characteristics and causes of accidents for Korean manufacturing industry during 1991-1994. Analysis of causes of accidents in the study includes firm size, age and work experience. The analysis shows that larger companies tend to have a lower accident rates and adults and less experience workers are more prone to accidents. Fabiano et al. (2004) examine the relationship between workplace injuries and types of Italian industry during 1995-2000 with a large sample of 2,983,753 firms. They identify four major factors that influenced accident frequency, namely economical factors, technologies used, organizational factors and human factors and relate these factors to the firm size effect. An inverse relationship between accident frequency and firm size is found in all types of industries. The results of the study suggest that the four factors are unfavorable for small firms which prove to be more liable to high accident frequency.

Previous studies on workplace injuries in Malaysia are mainly focused on the evolution and enforcement of OSHA and level of awareness and knowledge on safety issue among employers and employees (Jamaluddin, 1994; Mansur et al., 2003; Ariffin et al., 2006; Rampal and Nizam, 2006; Lugah et al., 2010). As shown by their studies, safety and health regulations in Malaysia have evolved from very prescriptive legislations to detailed technical provisions and to the one that is more flexible where self-regulations are encouraged under OSHA 1994. Rahmah and Sum (2000) on the other hand, analyze the impact of OSHA on labor market demand in 50 manufacturing firms. The results of cross-sectional analysis of their study show that OSHA has a significant impact on the demand for labour by firms. The impact of OSHA is also different across types of industry where labor-intensive firms were found to be more sensitive towards the regulations. A recent study by Surienty et al. (2011) investigates the impact

of demographical variables (company size, type of organization and years of establishment), management commitment, external support and legislation on Occupational Safety and Health (OSH) implementation in Small and Medium Enterprises (SMEs) in Malaysia. The correlation analysis performed on surveyed data of 35 companies shows that only management and external support were significant to OSH implementation where both variables have positive correlation.

Several studies have attempted to examine the causes of accidents in the construction sector in Malaysia (Abdul Hamid et al., 2008; Ali et al., 2010, Zakaria et al., 2010). Through analysis made on surveyed data, they show that the main causes of accidents at construction sites are workers' negligence, failure to obey the work procedures, work at high elevation, operate equipments without safety devices, poor site management and low skill and knowledge. A study on accidents at port sites by Mansor et al. (2011) focuses on two common dimensions of workplace accidents, namely individual and job related factors. Using 177 surveyed samples, correlation test results show that stress and fatigue, unsafe action, machinery and tools, design of workplace, training procedures are the significant factors that contribute to workplace accidents.

MODEL SPECIFICATION AND DATA DESCRIPTION

This study analyzes factors that contribute to workplace injuries in 44 Malaysian manufacturing industries during the period from 1993 to 2008. The structure of our data set which contains both cross-sectional and time series satisfies the balanced panel data estimation technique. Using panel data, with a large number of data points and high degree of freedom helps to reduce the multi-collinearity problem (Hsiao, 2003). To identify which character of our data set belongs to, either fixed or random, the Hausman specification test is first performed. The test results suggest that the industry-specific effects are fixed and the general fixed-effects model is presented as follows:

$$Y_{it} = \alpha_i + \beta_i X_{it} + \mu_{it} \quad (1)$$

where Y_{it} is the dependent variable, i is entity, t is time, α_i (i = 1 . . . .n) is the n entity-specific intercept, and β_i is the coefficient for independent variable, X_{it} and μ_{it} is the error term. Based on the general fixed-effects model, we rewrite equation (1) into the following specification:

$$IR_{it} = \alpha_i + \beta_1 logS_{it} + \beta_2 log KI_{it} + \beta_3 PW_{it} + \beta_4 FW_{it} + \beta_5 CV_{it} + \mu_{it} \quad (2)$$

where:

IR = the injury rate;
S = the firm size;
KI = the capital intensity;
PW = the percentage of production workers in the industry;
FW = the percentage of female workers in the industry;
CV = the cyclical variation;
α = the industry-specific intercepts;
β = the coefficient for each independent variable;
μ = the error term;
i = industry;
t = year

The injury rate, as a proxy for workplace injuries, is measured by the percentage of accidents reported per worker employed. Firm size is measured by employees per establishment and capital intensity is measured by the value of fixed assets per worker where these two independent variables take the natural logarithm form. Production workers and female workers are respectively measured as a percentage of total employment. The cyclical variation variable is measured by the percentage change of total employment in the manufacturing industries.

Most studies on workplace injuries and business cycle support the existence of pro-cyclical relationship where the number of accidents tends to increase during economic upswings and reduce during economic recession

(Kossoris, 1938; Leigh, 1985; Robinson and Shor, 1989). Thus, we expect a positive relationship between injury rates and cyclical variation. Similarly, capital intensity, production worker, and female worker are expected to have positive influence over the injury rates. As for firm size, a negative relationship with injury rate is expected in the sense that larger firms are better in controlling accidents among workers as compared to smaller firms (Cooke and Gautschi, 1981; McVittie et al., 1997)

Three types of workplace injuries are included in the study, viz. fatal accidents, permanent disability and temporary disability. Data on workplace injuries were obtained from Annual Report published by Social Security Organization (SOCSO). The Annual Survey of Manufacturing Industry, published by the Department of Statistics, provides data on total employees, fixed assets and total establishments for each industry. Unpublished data of production and female workers in manufacturing plants were obtained from the Department of Statistics.

Table 3 presents a summary of the descriptive statistics of the variables used in this study. During 1993-2008, the average injury rate among the sample manufacturing industries was approximately 3.90 percent ranging from a minimum of 0 to a maximum of 54.86 percent. The lowest and the highest injury rate came from tanneries and leather finishing industries and metal and wood working machinery manufacturing respectively. The average for firm size and capital intensity was 134.21 and 120.63 percent respectively. The mean for total production worker and female worker were 57.86 and 21.33 percent respectively. The average cyclical variation was 5.60 percent throughout the period of study.

Table 3. Descriptive Statistics.

Variables	*IR*	*S*	*KI*	*PW*	*FW*	*CV*
Mean	3.90	134.21	120.63	57.86	21.33	5.60
Median	1.99	75.80	73.76	65.06	17.40	3.06
Maximum	54.86	1399.63	1367.41	92.17	75.20	136.61
Minimum	0.00	1.51	1.76	0.13	0.00	-83.87
Std. Dev.	5.50	202.49	174.46	21.26	18.20	23.65

RESULTS AND DISCUSSION

The results of fixed-effects estimation under two separate regressions are reported in Table 4. We treat Model 1 as the reference model. In Model 2, production workers (*PW*) is excluded to isolate the possible influence of this variable over female workers (*FW*) resulting from our measurement method.

The results of this study reveal a strong negative relationship between firm size (*S*) and injury rate (*IR*) as the sign of the coefficient and its level of significance are consistent under the two models. This finding is consistent with the theory (Oi, 1974; Smith, 1979) and supports the empirical findings of previous studies (Cooke and Gautschi, 1981; McVittie et al., 1997). It turns out that the larger the firm, the lower the injury rate. This could be attributed to a proper safety precaution practiced by larger firm or adoption of safety machinery and equipments.

The coefficient for capital intensity (*KI*) is positive, however, it is statistically insignificant in both models. Production workers (*PW*) and female workers (*FW*) are found to have positive influence over injury rate (*IR*) and both are significant at 5 percent level. Our finding with respect to production workers is consistent with Viscusi (1986). The result is justifiable as production workers are those who are directly involve in firms operation and having direct contact with machineries and equipments. Hence, increase in the fraction of production workers in manufacturing plants would increase the injury rate. In contrast, Viscusi (1986) found a negative relationship between female workers and industrial accidents where he expected that higher fraction of female workers involve less physical effort and pose lower risk. A positive sign of female workers in this study leads us to draw a number of inferences. A common explanation is to relate accident to the natural characteristics of women which physically are less capable of performing some tasks (Lin et al., 2008). Industrialization would normally result in increase participation of women in manufacturing industries and most of them are assigned the same tasks as performed by men. In addition, workplace and machinery designs are usually designed to fit male's capacity (Taiwo et al., 2008). Hence, these factors would expose female workers to the similar risks faced by male workers, but the impact would be different as far as women physical anthropology is concerned.

Table 4. Fixed-effects Estimation Results.

Explanatory Variables	Model 1	Model 2
Firm Size (*S*)	-1.780	-1.876

	(-5.24)***	(-5.58)***
Capital Intensity (*KI*)	0.339	0.517
	(1.07)	(1.50)
Production Workers (*PW*)	0.020	
	(1.82)**	
Female Workers (*FW*)	0.013	0.036
	(0.60)	(2.02)**
Cyclical Variation (*CV*)	0.018	0.017
	(2.47)**	(2.35)**
R squared	0.49	0.49
Adjusted R squared	0.44	0.44
F-statistic	9.84	9.91
Standard error of regression	4.11	4.11
Durbin-Watson statistic	1.52	1.52

Notes: Figures in parentheses are t-statistics value. ** Significant at 5% level, *** Significant at 1% level.

Our result for business cycle (*CV*) impact on industrial accident is consistent with pro-cyclical relation in previous studies (Kossoris, 1938; Leigh 1985; Cooke and Gautschi, 1981; Robinson and Shor, 1989). The coefficient for cyclical variation remains positive and significant under the two different estimations, suggesting that business cycle is an important determinant of injury rate in Malaysian manufacturing industries.

CONCLUSION AND POLICY IMPLICATION

This paper sought to analyze the determinants of workplace injuries in Malaysian manufacturing industries during the period 1993 to 2008. Adopting the structural and business cycle approach, our panel data was tested using fixed-effects estimation method. The results of this study reveal that firm size, production workers, female workers and cyclical variation are the important factors for workplace injuries in Malaysian manufacturing industries. Our empirical findings, however, provide no evidence to support the effect arising from the level of capital intensity of manufacturing industries.

The most robust findings of this study are that workplace injuries were negatively influenced by firm size and positively influenced by cyclical variation. Consistent with previous studies, this study found that large manufacturing firms are more capable of controlling accidents at workplace as compared to small firms. This reflects greater level of awareness on OSH matters among large firms. Efforts by employers from SMEs in Malaysia in promoting safety and health in the workplace are still lacking (Rampal and Nizam, 2006) possibly due to low awareness over OSH requirements (Surienty et al., 2011). Under OSHA 1994 (Section 30), every employer shall establish a safety and health committee at the place of work if there are 40 or more persons employed. Lack of law enforcement on smaller firms is possibly the underlying factor that they are less sensitive towards OSH issues. Therefore, to improve safety at workplace in Malaysian manufacturing industries, higher priorities should as well be given to small firms through supplementary and special inspections to ensure that small firms apply the appropriate safety and health standards and codes of practices.

Similarly, focus of safety regulations should as well be given to reduce business-cycle-related injuries. Since business cycle is an unpredictable phenomenon, advanced preventive efforts towards potential accidents among workers during economic upswing might be useful to reduce accidental risks in industries. Preventive measures may include training programs and technical skills education. In Malaysia, there have been concerted efforts among government agencies to prepare the Malaysian youths with relevant skills, knowledge and experience through vocational and technical schools, polytechnics and industrial training institutions. On the employers' side, hiring safety machineries and equipments as well as safety devices will further help to reduce the risks of getting injured at workplace.

The results of this study also reveal that production workers and female workers in manufacturing plant are equally significant for injury rates. It is generally known that production workers, either male or female, are those who directly perform the operation in the plants and have a direct contact with machinery and equipments. Poor working attitude, inadequate knowledge and experience, and poor supervision by the management are among the

factors that place them into accidental risks. Therefore, improved training programs and enforcement of compliant safety regulations should be the priorities by both the employees and employers.

This study has shown that workplace injuries in Malaysia are generally attributed to both business cycle and structural factors. Hence, it suggests the importance of OSHA enforcement and its compliance to codes of practices among manufacturing industries in Malaysia. Our study is limited by some measures which were not able to be included in the analysis, such as compensation, level of workers' knowledge and experience and other relevant factors. We leave these limitations to be improved in future in-depth analysis.

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