

Occupational Safety in China's Coal Mining Industry: The role of regulations, human resources and labor relations

ABSTRACT

This paper presents a theoretical framework of the industrial relations system in China's coal mining industry, combining the roles of management organizations, workers and trade unions, as well as government agencies. It is one of the first empirical attempts to investigate the relationship between human resource practices, labor relations and occupational safety in China's coal mining industry over the past 60 years, based on secondary data on coal mining accidents and case studies of two state-owned coal mines in the City of Huaibei in Anhui Province, China. The fluctuating occupational safety has been affected by government regulations over different time spans, marked by key political agendas, and by coal mining firms taking concrete measures to respond to these regulations, while exhibiting differing safety performance in state-owned versus township-and-village-owned mines. The field studies compared a safety-oriented to a cost-control-oriented human resource and labor relations system, and their influences on safety performance. Coal mining firms and practitioners are advised to shift the traditional personnel management paradigm to a modern human resource management system. In addition, although workers are often blamed directly for accidents, it is suggested that workers' participation and voice in various processes of decision-making and policy implementation, and trade unions' active involvement in protecting workers from occupational hazards, be encouraged.

KEYWORDS: Occupational Safety, Regulations, Human Resource Management, Employment Relationship, Coal Mines, China

The occupational safety situation in China's coal mining industry is notorious for having the largest number of accidents and casualties among workers reported worldwide. Since 2006, under crackdowns by the State Administration of Work Safety (SAWS) and the State Administration of Coal Mine Safety (SACMS), two central government administrations dealing with occupational safety and health (OSH), significant progress has been made (Kong, Cai, & Guo, 2010; Kong, Cai, & Zhang, 2011; Xinhua Net, 2015). However, safety records are still strikingly poor compared with those in developed, as well as some developing, countries.

During the rapid economic globalization that has taken place since the 1980s, the safety of the production environment around the world has deteriorated steadily (Mogensen, 2006). In particular, Chinese workers and their managers seem to be much more vulnerable and more prone to engage in unsafe behaviors in the workplace, for a complex set of reasons, some of which are organizational and managerial problems in general, others specific to China itself, and embedded deeply in the Chinese social, cultural, legal, and political systems. As a result, the official white paper *Notice on Improving Firm Safety Production Work* called upon all coal mining firms to 'strengthen firm safety management' and make it the top priority (China's State Council, 2010). The thirteenth Five-Year plan for coal mine safety production issued by SAWS and SACMS in June 2017 set up targets such that, by 2020, the number of coal mining casualties should have steadily decreased, with serious accidents in particular effectively contained, and progress should have been made in occupational hazard prevention and control to at least the level of medium-developed countries, providing a fundamentally better coal mine safety production situation (China's State Council, 2017).

What are the determinants of the enormously high rate of fatal accidents in Chinese coal mining firms? What are the organizational and managerial factors that contribute to the huge number of casualties in coal mining workplaces? Furthermore, what are the institutional mechanisms within which Chinese coal mining firms combat these hazardous accidents? What are the human resource and employment relationship implications for coal mining firms regarding their effective safeguarding of the well-being and lives of their workers? These critical questions have yet to be addressed at either the practical or the theoretical level. As such, this study aims to find an effective way for both policy makers and practitioners in the coal mining industry to save more lives in this hazardous working environment and put a stop to the seemingly endless rash of fatal accidents.

Prior literature indicates that human resource management and employment relations are related to occupational safety (e.g., Brenner et al., 2004; Butler & Park, 2005; Kochan, Smith, Wells, & Rebitzer, 1994; Lauver, 2004, 2007). However, there is some controversy regarding the contents of these practices and the direction of the relationship. Yet, relatively few studies (exceptions include Zacharatos, 2001; Zacharatos, Barling & Iverson, 2005) have explored the mechanism by which organizational management practices affect safety. On the other hand, an increasing number of research works have discussed coal mining safety issues in China in recent years, but most have been qualitative in nature (Chen, 2006; Guo, 2008), and few of them have tackled the sophisticated employment relationship in the context of Chinese political economy, combined both macro and micro factors, or tested them empirically. This paper addresses a wide range of issues, from institutional changes over different time periods

in the coal industry, to how these institutions are manifested in government regulations and then transferred into stakes and foci for management and workers. In particular, since 2005, China's State Council has made earnest endeavors to control the number of hazardous occupational incidents by issuing policies, and since 2008 there has been a new round of restructuring and reorganizing of state-owned coal mines. Thus, we ask: Are these regulations really useful in controlling accidents? Do state-owned coal mines perform better than other ownership types? How do coal mines respond to government regulations in terms of management and inspections? Are there any obstacles in implementing the regulations? These are questions yet to be answered empirically, and we seek to explore them in this article.

Based on a systematic literature review of human variables that affect occupational safety at the individual, organizational and national levels, and a historical descriptive analysis of the evolution of safety in China's coal mining industry, we propose a theoretical framework of the industrial relations system constituted by management organizations, workers and trade unions, and government agencies (Dunlop, 1993), which predicts occupational safety. In particular, we investigated the roles of different players to reveal the complex picture in this hazardous industry. Through case studies of two state-owned coal mines in Huaibei City of Anhui Province, we examined major human as well as institutional factors that had directly or indirectly caused fatal accidents in coal mining workplaces. We found that the cost-control-oriented human resource and labor relations system was more likely to cause the necessary attention to be deviated away from safety issues, and to instigate dangerous behaviors, producing a higher likelihood of fatal accidents in the workplace. In contrast, the safety-oriented human resource and labor relations system was found to be positively related to occupational safety performance, and the practices of this system are inter-related in such a way that failure to carry out certain practices will affect the fulfillment of other practices. Compared with other industries, the working conditions and environment in coal mining are much more hazardous, which not only makes fatal accidents a greater possibility, but also necessitates tough and rigorous measures in managerial as well as technical practices in order to ensure safe behaviors are followed by the workers. The role of workers and workers' collective groups (trade unions) was examined, which led to the pertinent suggestion that workers' participation and involvement in various processes of decision-making and policy implementation should be encouraged.

In the following sections, we will first briefly review the literature, introduce the historical development in China's coal mining sector and build our theoretical framework, then examine and analyze the empirical materials from the field studies, and finally discuss and draw conclusions about our findings.

LITERATURE REVIEW

Occupational safety refers to the process by which a firm eliminates potential conditions that may cause casualties, occupational hazards and diseases, or equipment and property loss, or that could jeopardize the environment (Shi, 2009). Numerous studies have investigated the human factors that impact occupational safety performance from multiple levels.

At the individual level, employees' personal characteristics, e.g., personality, values and past experience, have been proven to link to occupational safety. It has been argued that some employees are more inclined to be involved in accidents, and this minority group of workers has been the focus of organizations seeking to attribute the causes of accidents to them (Kay, 1971), despite the lack of empirical data supporting the accident inclination theory (Dwyer, 1991). Some personal traits of employees have been linked to the occurrence of accidents both directly and indirectly. These traits include aggressiveness, neuroticism, levels of IQ, introversion/extroversion etc. (e.g., Sutherland & Cooper, 1991), although the causal relationship for the direct effect seems to have been problematic having been based mostly on retrospective data. It has usually been concluded that workers' personalities may indirectly influence safety through a series of environmental factors, such as the organizational environment (Frone, 1998), time pressure, managers' commitment to safety, and their capacity to control risks (Weyman, Clarke & Cox, 2003).

Chinese data have revealed that workers' personality dimensions of anxiety and risk-taking are positively related to their tendency to break regulations at work (Chen, 2006). However, it is noteworthy that the use of accident inclination and personality to study the relationship between employees' personal characteristics and safety has been challenged from legal and ethical aspects (Zacharatos, 2001), as it would be inappropriate for an organization to choose not to employ someone just because s/he was regarded as more inclined to experience more occupational hazards. Also, employees' experience of stressful incidents in the past (combined with extreme tiredness) has been proven to cause hazards, with empirical support found (Shain, 1982; Holcom, Lehman & Simpson, 1993).

Another stream of safety research at the individual level lies in employees' values, safety motivation, and perceptions of the safety climate and culture as seen by workers and managers. Ford and Tetrick (2008) put forward a model examining the direct impact of employee safety motivation on safety performance, and found employees' personal values in terms of four factors, namely safety, health, stability and collective identity, to be connected with safety motivation. When these personal perceptions were aggregated together, in another piece of research, they formed two factors, safety climate and culture, both of which were related to safety performance (Zacharatos et al., 2005). Actually, mining workers' participation was shown to be an important element of sustaining a corporate culture of safe production (Ariss, 2003). Besides workers', managers' perceptions of safety culture have also been found to impact organizational safety performance, e.g., via managers' abilities (Kettunen, Reiman & Wahlström, 2007).

Individual-level HRM safety research has mainly investigated employees' perceptions of HR practices and how they are related to safety outcomes. It has been found that employees' perceptions of a high-performance work system were related to their personal safety orientation and safety incidents (Zacharatos et al., 2005). In an investigation of managers

working in the European nuclear industry, HRM was attributed most frequently as the most important determinant of occupational safety, with subfactors including workers' age distribution, early retirement, new employee recruitment, and employees' capacity sustainment, among others (Kettunen et al., 2007). Job characteristics, such as working hours, intensity, and homogeneity of job design, have also been found to potentially impact workers' tendency to engage in regulation-breaking behaviors, supported by a Chinese sample (Chen, 2006).

Having said this, most HRM and employment relationship studies in safety research have been conducted at the organizational level. Bowen and Ostroff (2004) stated that HR practices should largely be driven by the strategic goals and values of the organization. The foci of the HR practices must be designed around a particular strategic focus, such as safety, control or commitment, to name just a few. Lauver (2004, 2007) found that safety-oriented HR practices, e.g., individual compensation, group compensation, previous work experience, and drug testing, had a positive association with reduced organizational-level injuries. In a similar vein, Glendinning (2001) indicated that safety incentives were positively related to safety performance, and should be part of an overall safety strategy encompassing communication, education, training, monitoring, active participation and accountability. Zacharatos (2001) concluded that there are two sets of HR practices that foster occupational safety: control-oriented and commitment-oriented. According to control orientation, it is the responsibility of the employer to use their authority to control the employees' behavior and coerce efficient performance from them (Barling & Hutchinson, 2000; Walton, 1985). Control-based HRM strategies have been said to rely on power-coercive techniques, and to typically be implemented in a relatively short time frame, but to be associated with high levels of conflict, resulting in increases in turnover and absenteeism (Butler & Teagarden, 1993).

Commitment-based HRM operates under the assumption that employees will sustainably improve their work if encouraged to do so to achieve better work performance. When employees are respected, and regarded as capable, intelligent individuals, they will be more loyal to the organization and more trustful of the management, and in this way, organizational performance will be enhanced by the employees reciprocally (Walton, 1985). The set of commitment-oriented HR practices includes employment security, selective hiring, training, teams and decentralized decision-making, reduced status distinctions, information sharing, contingent compensation, transformational leadership, job quality, and measurement of variables critical to organizational success, which should be considered by firms wishing to enhance occupational safety (Pfeffer, 1998; Zacharatos, 2001).

Similarly, Bulter and Teagarden (1993) proposed three HR systems to respond to the issue of worker safety, health, and environmental problems, with control orientation as the first approach. The second HR system was based on human relations, with long-term strategic objectives of enhancing workers' productivity and satisfaction, and which would take more time to implement than the control-oriented approach. This system could saliently decrease conflict, e.g., absenteeism and turnover. Employee training on task- and quality-related activities would usually feature highly in the system. The third system was the long-term HRM system, with an additional strategic objective of worker development compared with the second approach. It was said to be benefit maximizing, but would also bear the highest

training and recruitment costs in the short run.

Besides the abovementioned high-performance work system, general HR practices, both single and multiple, e.g., how employees are selected, developed, compensated and managed, have also been found to be correlated with safety outcomes. However, consistent conclusions have not been obtained regarding the direction and nature of those relationships. Butler and Park (2005) found that HR practices, such as employee participation in decision-making, could enhance employees' safety motivation and thereby reduce accidents. Based on a sample of contractors in the United States and Singapore, Lai, Liu and Ling (2011) found that safety outcomes were positively related to HR practices, including taking age into consideration during the selection process, and giving feedback to workers about their unsafe behaviors.

Nevertheless, the relationship between HR practices and occupational safety performance has not always been found to be positive, and can be moderated by labor relations. Brenner et al. (2004), for instance, showed that 'flexible' work practices, such as the use of quality circles and just-in-time production, were positively related to cumulative trauma disorders, which can be attributed to reduced cycle times, speedups, ill-fitting parts, increased worker responsibility, and reduced worker empowerment. The employment relationship has a role in predicting occupational safety as well. Kochan et al. (1994) found that, although the contract form of employment relationship offered an important degree of flexibility, it could also create stress, with potentially severe adverse effects on workplace safety. To explain, it was indicated that a high level of coordination was required among HR professionals, line managers, corporate executives, unions, and government agencies in order to overcome the threat to safety while maintaining flexibility in the employment relationship. Additionally, workers' type, e.g., temporary, contract or fixed, showed some correlation with the adoption of HR practices and workplace safety. For example, the safety training and supervision received by contract workers were not as effective as that received by fixed workers, which had some effect on accident rates (Rebitzer, 1995). This also reflects that labor relations (workers' contracts in this case), together with the adoption of HR practices, could impact occupational safety.

Thus the way HR practices and employee relations operate in contributing to organizational performance remains a black box to a large extent (Kaufman & Miller, 2011; Lepak, Liao, Chung & Harden, 2006). To name a few intervening factors, the mechanisms by which HRM practices might improve occupational safety include employees' safety motivation (Ford & Tetrick, 2008), their commitment (Iles, Mabey, & Robertson, 1990), as well as their attitudes, beliefs, and opinions on safety (Robertson, 1983), thus increasing their safety knowledge, skills, and ability to follow safety procedures. Employee-manager relations have been found to explain the HR-safety link to some extent, as research has shown that employees' trust in the management affects safety performance directly, and mediates the relationship between HR practices and safety (Zacharatos et al., 2005). In another work, employees' perceived safety was positively related to management's care for employees and safety orientation, while, on the contrary, employees' perceived safety was negatively related to management's orientation towards productivity (Janssens, Brett & Frank, 1995). Chinese studies have indicated that the worker-management relationship is negatively related to the workers' tendency to break regulations at work (Chen, 2006). Another mediator in the HR-safety link is a favorable safety climate and culture (Ariss, 2003; Kettunen et al., 2007; Neal & Griffin,

2004; Zacharatos et al., 2005).

Chinese domestic studies have noted that the HR practices in China's coal mining industry are far from scientific and systematic. For example, they are old-fashioned in terms of routine personnel management, rigid in their staffing, lag behind in terms of long-term incentives, and are inefficient at performance appraisal, thus failing to either motivate employees or prevent accidents. There is a shortage of investment in employee training; almost all coal mining firms have been found to lack OSH training in particular (Li, 2006; Shen & Song, 2007). Firm management practices have been studied as reasons for coal mining accidents and hazards. Management error, incorrect decisions and institutional factors have led workers to engage in unsafe behaviors, which have directly caused fatal accidents (e.g., Han & Yu, 2006; Xiao, 2007). HR and labor relations, such as the motivation mechanism, compensation and punishment, safety training and education, and performance feedback, have all been argued to influence coal mining workers' perceptions on safety and thus impact their choice of unsafe behaviors (Chen, 2006). Empirical data support Cao (2007)'s argument of a relationship between safety outcomes and safety training, communication and labor relations (Fan, Xie, Huang & Li, 2004). Similarly, communication, monitoring, motivation and a corporate culture of safe production have been studied (Peng & Huang, 2001). Fu and Nie (2006)'s opinions provide a relatively accurate picture that most coal mining workers' knowledge, skills and mindset fail to meet the safety needs at the organizational level. Coal mining firms should adopt a new paradigm of modern HRM and an employment relations system to help them recruit and develop qualified labor, who fit in with the organizational goals of safe production.

From a more macro perspective, e.g., at the national level, Poole (1986) summarized the external institutional factors that could impact organizational management practices, and then affect outcomes (i.e., occupational safety). These institutions include social and cultural values, political ideologies, economic conditions, and public and legislative policies. Janssens et al. (1995) provided empirical support on the national differences in the predicting role of institutions, based on their international sample of French, American and Argentinean employees. Homer (2009) made a comparison of the safety records and influencing factors in the Chinese and American coal mining industries. Both countries had a unique legislation system in the coal mining sector, but the problem in China was that effective implementation of these safety laws and legislation could not be safeguarded, given the lack of supervision, lack of effective trade unions, corruption, and difficulties central government faced in managing township-and-village coal mines. In relation to this, a focus on township-and-village coal mines has been called for, given the fact that most of the workers in these coal mines are untrained labor that has been transferred from the agricultural industry, and thus more likely to be injured than the experienced workers in state-owned coal mines, and to have less awareness of safety-related issues (Wright, 2004).

An integrated model was constructed based on the existing literature at multiple levels of analysis, and is shown in Figure 1, which summarizes the relationship between HRM, employee relations and occupational safety.

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THE SAFETY EVOLUTION IN CHINA'S COAL MINING INDUSTRY: A GENERAL OVERVIEW

According to the supervisory pattern of the government and how it has been balanced against market and economic power, the evolution of China's coal mining firms can be divided into three periods. The first period was 1950-1978, during which public ownership and national planning was the primary control pattern of the government. It was believed at that time that only through those two mechanisms could the government take control of the structure of the national economy, and restrain behaviors that could otherwise harm public health, safety and well-being (Wang, 2004). The second period was 1979-1999. Following the reform and opening-up of China in the late 1970s, the national controlling pattern changed, with public ownership and national planning gradually replaced by market forces. However, government supervision remained. The third period is 2000-the present. On December 30 1999, China's State Council established SACMS, which came under the direct leadership of China's State Economic and Trade Commission. SACMS was placed in charge of safety supervision and investigating coal mining accidents. Its establishment symbolized more strenuous supervision by the government.

Based on statistics gathered by the author from reliable sources¹, e.g., official accident case books published by SAWS and SACMS and their official websites², the figure below illustrates a historical trend in the representative accidents in China's coal mining industry since the foundation of the People's Republic of China. In period 1 (1950-1978) there were 63 accidents, with an average death toll of 37.08 in each accident. State-owned coal mines (SOMs) made up a proportion of 93.7% of all coal mine accidents. It can be seen that the state-planned economy was the main form of government in this period and the coal mines were mainly state-owned reflecting this.

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In period 2 (1979-1999) there were 493 accidents, with an average death toll of 17.50. SOMs made up a proportion of 41.8% of all accidents. The underpricing of coal resulted in a severe shortage, and to mitigate this through increased output, during this period, non-state-owned coal mines (non-SOMs) were allowed to sell their coal at market-negotiated prices. In 1979 and 1980, the safety of coal mining production was improved with the establishment of safety regulations and laws after the Third Plenary Session of the 11th Central Committee of the Chinese Communist Party. However, there were fluctuations, closely related to changes in

¹ The dataset includes all severe and extremely severe coal mining accidents that occurred in China from 1950 to 2010, as filed in the formal archives of SAWS and SACMS, and some representative accidents of all types, e.g., gas explosions, water leaks (see footnote 5 for the definitions of different levels of accident). We did not add more data after 2010, but it can be shown from the national level statistics that the number of accidents and casualties has declined a lot in recent years. For example, in 2017, the number of coal mining accidents was 219 (death toll of 375), the number of severe accidents was 6 (death toll of 69), the number of extremely severe accidents was 0, and the death rate per million tons of coal production was 0.106 (decreasing rate of 32.1%). (Xinhua net, 2018).

² E.g., *Collection of Most Severe Accidents, 2000-2003*, *Collection of Most Severe Accidents, 2004-2005*, China Labor and Social Welfare Press, March 2005, first edition. *Collection of Most Severe Coal Mining Accidents*, Coal Industry Press, May 2000, first edition. *Accidents in China's Coal Mining and Professional Analysis*, Books I & II, edited by Wang Jiefan & Li Wenjun, published by China Coal Industry Press, 2002.

state regulations. For example, in 1983, the State Council published regulations termed *youshui kuailiu* (Water Flows Quickly) to encourage the rapid development of township-and-village coal mines (TVMs) and thereby satisfy the demand for coal. The blind explosion in TVMs caused negative effects as employers exclusively sought profits, decreased safety considerations in their equipment, recruited rural labor and temporary workers at the lowest cost, and ignored safety laws, even making a reckless move towards illegal production. It can be observed that non-SOMs made up a larger proportion of all coal mine accidents and attracted more attention in this period.

In period 3 (2000-2010) there were 70 accidents (mostly categorized as severe and especially severe in our dataset)³, with an average death toll of 51.23. Accidents at SOMs made up a proportion of 34.3% of all accidents. Before 1998, the Ministry of the Coal Industry within the central government was responsible for overseeing all key state coal mines⁴. Due to the many policy burdens on state-owned enterprises and competition from small coal mines, the profits of the key SOMs were negative in the 1990s. To provide a greater profit incentive, the management of the key SOMs was shifted to the provincial governments, through a delegation decision made at China's ninth National People's Congress in March 1998. This decentralization only lasted until February 2001, though, when SAWS was established, representing a new stage for China's coal mining industry. In 2003 SACMS became an institute supervised directly by the State Council, and a top-down line-management safety supervision system was formed. Since 2006, the occupational safety performance of China's coal mining firms has improved, with a steady decline in casualties, the number of accidents, and direct economic losses.

Firm ownership shows itself to be a factor in the variance in safety performance through the different time spans. Based on the safety performance indexes in both coal mining firm ownership types, the accidents between 1950 and 1974 occurred solely in SOMs. This was due to the fact that other ownership types did not exist then. There were 50 accidents over 1950-1974, with a total death toll of 1739, and a total injury toll of 786. From 1975 to 2010, the number of accidents (239) and total death toll (5969) in SOMs were lower than those in non-SOMs.

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In the 1980s, especially after the State Council published the *youshui kuailiu* (Water Flows Quickly) policy, there was a steady increase in the production output of TVMs. However, the death toll also increased rapidly in non-SOMs, which made up 84.20% of all coal mine accidents in 1989. In the 1990s, the death toll in the non-SOMs raised still higher, comprising 78.23% of all coal mine accidents in 1998. From the start of the 21st century, with the increase in government supervision, the annual death toll in the SOMs began to decline, but it is only since 2006 that the annual death toll in the non-SOMs has begun to decline. Meanwhile the proportion of non-SOMs among the coal mines at which accidents occurred

³ The number of especially severe accidents in 2011, 2012, 2013, 2014, 2015 and 2016 was 1, 1, 1, 0, 0 and 2 respectively.

⁴ SOMs are divided into two kinds: key SOMs and local SOMs, and the central government took direct control of the former category before 1998. Although the authority to control the key SOMs was allocated to local government after 1998, they were still referred to as key SOMs. The other type of coal mine, known as TVMs by law, includes collective-owned, joint venture, private, foreign-invested and other coal mines. To avoid confusion, we use the terms SOMs and non-SOMs in our paper.

was still increasing, and between 2000 and 2010, the ratio of deaths in SOMs to those in non-SOMs was 7:5.

----- INSERT FIGURE 3 ABOUT HERE -----

In terms of the death rate per million tons of coal production in the state-owned and non-state-owned firms, except for the first several years, when there were no non-SOMs, the death rate in the non-SOMs has always been much higher than that in the SOMs. This is due to factors such as the occurrence of coal seams, financial strength, management practices and workers' lack of abilities. Before the 1980s, the death rate in the SOMs was relatively higher in the first national Five-Year Plan period and the years of the Cultural Revolution. After 1980, the death rate in the SOMs was typically around two, except in the year 1985, when two especially severe accidents occurred. Since 2006, the death rate in the SOMs has declined dramatically to less than one. The situation in the non-SOMs has been quite different. After 1980, the death rate in the non-SOMs experienced a rapid increase, connected to the *youshui kuailiu* policy. After the mid-1990s, another dramatic rise occurred, with the death rate exceeding 12 in some years. Affected by Asian financial crisis in 1997, some TVMs were closed down, and the death rate accordingly declined slightly. The sound safety situation did not last long though. Since 2000, with the rapid development of the Chinese economy, the supply of national resources could again not meet the demand, leading to the reopening of many TVMs and the return of the high death rate. In 2003, the government began to rectify the situation and shut down illegal small coal mines, which lowered the death rates in 2003 and 2004 respectively. However, in areas where taxation of TVMs contributed a large proportion of the local financial income, it was difficult to close these small coal mines. Therefore, in 2005 the government initiated a three-year strategy to solve the safety problems in small coal mines nationally. As a consequence, a declining trend in the death rate in non-SOMs can be observed after 2006. Although this rose again in 2009, it then dropped to a relatively low level of 4.32 in 2010.

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It can be seen that the majority of normal accidents in the representative dataset occurred in SOMs, while the majority of the severe accidents occurred in non-SOMs⁵. Also, in SOMs, the death toll was likely to be at either extreme: SOMs made up the majority of the small accidents and extremely severe accidents, while non-SOMs made up the majority of medium-intensity accidents, that is, those that were severe but not extremely severe. However, in terms of the death rate per million tons of coal production, SOMs appear to perform much better than non-SOMs in general, according to the statistics.

⁵ An extremely severe accident refers to one in which more than 30 people were killed, or more than 100 people were severely injured, or economic losses of over 100 million *yuan* were caused. A severe accident refers to one in which 10-30 people were killed, or 50-100 people were severely injured, or economic losses of 50-100 million *yuan* were caused. A big accident refers to one in which 3-10 people were killed, or 10-50 people were severely injured, or economic losses of 10-50 million *yuan* were caused. A normal accident refers to one in which less than 3 people were killed, or less than 10 people were severely injured, or economic losses of less than 10 million *yuan* were caused.

THEORETICAL FRAMEWORK

China's coal mining industry's safe production management system is multi-stakeholder in contrast to those of its counterparts abroad. Firms are the primary actors responsible for production safety, and workers are required to comply with the regulations and labor policies. The industrial administrative authorities take the role of monitoring, supervising and inspecting the safety work within the industry according to central regulations and standards, while the state regulatory agencies serve as the leading authority, issuing and enforcing safety regulations.

With the regulation of the market and government, the traditional unitary employment relationship in China has been shifted, with the establishment of various economic forms and managerial styles. Along with the industrialization process that occurred in the 1980s and 1990s, accompanied by gradual privatization and rapid marketization (Taylor, 2002), the 're-invented' industrial relations (IR)⁶ system has significantly influenced recruitment and selection, the wages and reward system, and social security problems (Ding & Warner, 1999). The employment relationship has been more dynamic in China, manifesting in various ownership types, and has also triggered some problems which can be seen in a series of labor conflicts, in which OSH is a serious and salient issue. The IR system consists of three players, namely management organizations, workers and the formal/informal ways they are organized, e.g., trade unions, and government agencies (Dunlop, 1993). Thus, our framework is quite straightforward regarding the relationship between the IR system and occupational safety, as we review the relations from the viewpoints of different IR players, and evaluate their positions on and influence over safety outcomes.

First and foremost, how workers are treated by management organizations essentially determines their well-being. Although relevant management practices are in place, e.g., the safe production responsibility system, a majority of employers in China's coal mining industry have adopted cost-control-oriented HR practices under Zacharotos (2001)'s classification, especially those that have had accidents occur. These practices include recruiting unqualified cheap labor, reducing technical and administrative investments, preferring punishment to motivation, and putting ordinary workers in critical positions, as a means to maximize coal production as their number one priority given the huge demand for coal. In terms of labor protection, the management invests as little as they can in safety equipment, and even fail to provide the absolutely necessary self-rescuer system to every underground worker. As such, coal mining workers are treated merely as a commodity in the attempt to achieve profit maximization, at a huge cost to their well-being. These control-oriented management practices are neither able to develop a competent labor force nor to sustain a harmonious employment relationship, thus are negatively related to occupational safety performance.

Second, the transformation of the traditional unitary employment relationship has resulted in the creation of many temporary workers and workers without a legal contract, a more flexible option for organizations⁷. The segregation and institutional controls such as the

⁶ In this paper, IR is defined in its traditional and broad sense (Kaufman, 2001), and used interchangeably with employment relationship, employee relations, and labor relations.

⁷ In recent years, there has been a trend among China's labor-intensive factories in low-skilled industries to use labor

household registration system (*hukou*) have forced many rural migrants, who are usually less educated (Tan, Zhao, Sang, Li, Luo & Li, 2006), into segregated, low-skilled and low-paying jobs in cities, jobs usually involving with most hazardous occupational threats. Unfortunately, most miners are migrants from rural areas, for whom mining is the only feasible way to make a living. As an growing labor force in China's industrialization process, rural migrant workers have been treated differently from their urban counterparts in many ways, such as occupational welfare and wages (Meng & Zhang, 2001), and seeking a balance between efficiency, equity and voice in the IR system has been a luxury they could not afford (Budd, 2004).

As workers' collective organizations, Chinese trade unions have had very little involvement in accident prevention in coal mines, not to mention a lack of ability to properly represent workers' voice or organize strikes or collective bargaining on behalf of any substantial interests for workers (Liu, 2011), although OSH is set as a precondition for all other workers' rights, according to China's Trade Union Law. Not only that, but the Chinese trade unions have a very vague and ambiguous relationship with the management, as they are financially dependent on it and include members of the senior corporate executive among their membership and even their leadership, although they do demonstrate better performance in private and foreign-invested firms. Thus, it is not difficult to understand why trade unions are predicted to be powerless to solve workers' problems or represent them collectively to submit grievances.

Last but not least, various regulations have been issued and implemented by the central government to ensure coal mining safety in China at different hierarchical levels. These regulations have had a positive yet sometimes delayed effect on safety performance (Kong, Cai & Guo, 2010). Since 2005, public monitoring and corruption punishment have become new key words in central regulations. Governments at all levels have had great difficulty enforcing the safety regulations as, in areas with few other sources of income, powerful forces are working for the survival of many unsafe small mines, especially TVMs. In the interests of the state mines and in an attempt to reduce competition, safety costs were foisted on small mines (Wright, 2004). Also, decentralization made collusion between regulators and coal mining firms more likely, as coal mine death rates rose in regulators' places of birth (Jia & Nie, 2017). Media exposure has been found to have a deterrent effect on collusion though.

In sum, the nature of IR has hardly evolved in line with the direction of industrial civilization during China's transition to a mixed economy since the 1980s. To apply the IR system to China's coal mining industry, it is proposed that the unilateral orientation of HRM practices, the discriminated-against workforce and the ambiguous role of the trade unions, and the weak enforcement of government regulations, together predict deteriorating safety performance in coal mining firms.

CASE STUDIES

We conducted field studies in two state-owned coal mines (Mine Z and Mine L) located in the city of Huaibei in Anhui Province, China. The coal-mining industry serves as one of the major pillars of the city's economy. Mine Z has a ratified production capacity of 2,200,000 tons per year and 4,443 employees. It was built and put into operation in 1961 with a designed capacity of 750,000 tons per year. It has a sound safety performance record, and serves as a safety model in the industry. Mine L was established in 1992, which started operating in 1998. It has a ratified production capacity of 450,000 tons per year and 1,120 employees. Its capacity was originally designed to be 300,000 tons per year, and it was technically improved and expanded in 2004. Mine L's safety performance is around the medium level for the industry.

Field studies, interviews and archival analyses were adopted. The fieldwork started on 18 February 2011 and lasted for two weeks, during which the author spent time in the workplace together with the managers and workers. Follow-up telephone interviews were conducted to obtain additional information after the field studies were completed. Before the interviews, we informed the interviewees of the pure academic purpose of the study and told them that their personal information would remain confidential.

We conducted 26 formal semi-structured interviews with the mine manager, the safety manager, the labor and wages department manager and personnel, the safety supervision department manager and personnel, the labor union chairman, the publicity department manager, the discipline inspection commission officer, the safety officer, the mining area leaders, team leaders and frontline workers (of various types: excavating, tunneling, mechanical, transportation, etc.) in both mines and in the group enterprise to which Mine L belongs. The labor and wages departments in coal mines function similarly to HR departments in modern enterprises, except that the former get more involved in dealing with labor relations issues. We conducted in-depth interviews with the managers and focus groups with the workers. We also ensured that the managers were not present during the workers' focus groups. Besides this, we also held several informal conversations with the staff, for example during dinners. From the archives, we obtained safety data, policy descriptions, training plans, compensation regulations, performance appraisal cards, and so on, from both mines. In addition, the author went down into Mine L on 21 February 2010, approached frontline workers and inspected the workplace, for example looking at the control station, the preparation area and the workers' underground lounge.

The occupational safety performance record of Mine Z was better than that of Mine L, as shown by the comparison of safety data between 1997 and 2010 given in Table 2. The loss of coal production and the ratio of death toll to total number of employees were much lower in Mine Z than in Mine L. Not only that, although safety performance has been enhanced in both mines since 2000, the extent of the improvement has been greater in Mine Z than in Mine L. Mine Z has achieved a sound record of zero accidents between 2004 and 2009, while Mine L has had some accidents within this period. Meanwhile, the number of 'three-violations'⁸ by workers in Mine Z was less than a quarter of the number in Mine L, despite

⁸ Three-violations refer to any violation behavior in the three aspects: a. violation of rules regarding command and order; b. violation of rules regarding operational procedures; c. violation of rules regarding workplace

the fact that Mine Z has four times as many employees as Mine L.

----- INSERT TABLE 2 ABOUT HERE -----

The effect of government regulations

According to the historical safety data for the two coal mines, their safety performance has risen significantly since 2000. In particular, death casualties and the number of severe injuries dropped rapidly after 2005, and the numbers remained at zero for several years after that. This phenomenon can be explained by the coal mining safety policies and regulations that have been issued by China's government since 2005. The following examples illustrate this.

China's State Council issued decree No. 446 of *Special Regulations on Prevention of Coal Mine Accidents* on September 3 2005, which was a very rigorous and strict decree. It directly impacted many safety aspects in the two coal mines, as both were required to increase their investment in safety training and strengthen their management and supervision. Starting from 2004, the Chinese government increased its investment in safety, in order to safeguard the intrinsic safety of the coal mining industry, namely improving automated manufacturing by upgrading intelligent equipment and thereby safeguarding the lives of coal mine workers. It widely upgraded intelligent and automatic mechanical equipment to reduce energy expenditure and enhance effectiveness. In fact, the Chinese government raised 1.5 billion RMB by issuing government bonds in order to re-engineer the production process. For the two coal mines, automated manufacturing could not be put into place immediately because the people who would use the new equipment needed time to adapt to it. For instance, granted 20 million RMB of government funding, which it combined with its own funds, Mine L spent 100 million RMB on the re-engineering of safety equipment, and this alone took two years to complete, between 2004 and 2006.

The Chinese State Council and local governments have imposed greater sanctions following accidents since 2005. In the case of an accident, the coal mine leader will be fined 30% of their salary plus the safety risk deposit, in addition to an administrative punishment. In response to an accident in which one worker died in Coal Mine L, the head of the government and the CCP committee secretary in the local district were dismissed, and all members of the management team, functional leaders, and the leader in charge of safety at the coal mine were given a penalty of 5,000 RMB each. As a consequence, the mine manager of Mine L received reduced compensation that year, of 50,000 RMB less than usual.

On June 7 2006, SAWS and six other ministry bureaus released a document called *Instructions on Strengthening Safety Management of State-owned Key Coal Mines*, which aimed to ensure the steady improvement of safety issues and facilitate sustainable development of the coal mining industry through the strengthening of safety management for state-owned key coal mines so as to avoid major devastating accidents. This policy had important implications for Mine Z, a state-owned key coal mine, and improving safety there. Mine L, a state-owned local coal mine, learned of this regulation and took relevant actions as well. On July 19 2010, the State Council issued a document titled *Notice on Improving Firm Safety in Production Work*. This regulation gave safety management a higher status ensuring that both mines made every effort to work towards the organizational safety targets.

Regulations later began to draw greater attention to internal firm management in particular. On September 7 2010, SAWS released the document *Regulations on Safety Supervision and*

conducts.

Inspection of Coal Mine Leaders, which strictly regulated leaders' behaviors. For example, they were required to accompany workers in the underground workplace by their performance management system. In response to this, both Mine L and Mine Z strictly implemented the regulations to make sure safety in production was properly supervised and inspected. Mine Z designed an evaluation system based on mine leaders entering the mine pits, and ensured that there were leaders in the mine pits 24 hours a day. The senior leaders of the mine were required to complete at least five shifts per month, other leaders (mostly technical heads) no fewer than six. For uncompleted quotas, penalties were applied, and even the deduction of the safety deposit for senior managers. Similar practices were adopted in Mine L, where the senior managers were required to complete at least five shifts per month, of at least eight hours per shift. The difference in the regulations on leaders entering the mine pit at the two mines stemmed from the fact that Mine Z gave more autonomy to the leader of the shift, who was able to decide to reward workers if they had done an excellent job, e.g., 50 yuan per time. One worker from Mine Z said:

'I really welcome leaders entering the coal mine pit to supervise. If we do well, we can get money; that's a great job!'

Problems also arose in the implementation of the above system, as only those leaders who had expertise in mining would discover problems during their shifts. Those with little knowledge of mining would require a period of training before it was safe for them to enter the mine pits. Usually, their main job was to chat with workers in the pit to find out about any problems.

Leaders from the two coal mines both expressed positive feedback regarding the government supervision of safety management and inspection. Generally speaking, the overall number of accidents had dropped with the vertical management by SAWS. Meanwhile, superiors from government bodies such as SAWS, SACMS, and the local coal bureau came to the coal mines from time to time to conduct safety inspections. Actions for improvements were suggested, followed by inspection, either comprehensive or specialized, e.g., on transportation, depending on the requirements for that particular period of time. It was indicated by the leaders that an inspection team from the group to which the coal mine belonged also came to conduct inspections regularly. Nevertheless, challenges regarding inspections were also raised in the interview, such as staffing levels that were too low to meet all the inspection needs for the region. Specifically, only around 15 staff were allocated by SAWS to the city to conduct inspections, while there were over 70 coal mines (30 state-owned, and 40 village mines) in the city, making it hard for inspection staff to conduct systematic and thorough checks at times.

Given the fact that both mines were state-owned and located in the same geographic area, also under the supervision of the same local safety bureau and affected by the same macro regulation environment, the implementation of these supervision measures and regulations varied a lot between the two mines, which could be explained by the different internal HR and labor relations practices being used to standardize and evaluate the workers' behaviors. Below is a comparative analysis of the HR and IR practices in the two mines, together with workers' responses.

Recruitment and selection

Neither mine was found to examine applicants' safety qualifications, focusing only on their

physical condition.

“As long as they meet the requirements for age and education, anyone (male) can be recruited as a coal worker.”

The above quote was from the HR manager in Mine L. For some job positions experiencing a high shortage of supply, the education background could be relaxed, with applicants of junior high school education or lower being accepted. The selection criteria in Mine Z included a physical check (to determine whether they can cope with the underground environment, and have neither high blood pressure nor heart disease), a physical fitness test, an underground examination, and an educational background check. Mine L mainly recruited its labor force from the general society, with fixed selection criteria, including age (between 25 and 40), physical condition and educational background. The minimum educational standard in both mines was junior high school level (Grade 9). In the physical examination, the applicant might be asked, for example, to carry a pillar weighing 75-100 kg to walk a certain distance. Over 90% of the applicants are rural migrants, often characterized by a high level of mobility and turnover.

In terms of the allocation of workers to special positions, we will use the position of security guard as an example. There was a shortage of security guards in Mine L, and workers in other job occupation may occasionally serve as security guard. In contrast, although there were not many security guards in Mine Z either, they were working efficiently and effectively to control the number of behavioral violations.

Although the selection criteria of both mines had been enhanced since the new millennium, the qualifications of coal workers were still relatively low compared to other industries. Some coal miners in Mine L were elementary school dropouts in the past, having only finished Grade 3, or even being illiterate. Meanwhile, around 5% of the workers in Mine Z were illiterate or semiliterate due to historical reasons. Due to the shortage of workers, stricter safety-related tests, such as personality tests, safety tendency tests, drug tests, and past safety and work experience check-ups, which were commonly used in Western countries, was not adopted in the selection processes for these mines (Lauver, 2004, 2007). The publicity department manager at Mine L commented on this:

‘Coal mining is an industry with the most dangerous work conditions and employs workers of the lowest qualifications. In such circumstances, the occurrence of accidents is inevitable.’

Training and development

Before 2000, training was regarded as window-dressing and was perfunctory. With the establishment of SACMS and its local branches, both mines began to implement rigorous training. On 26 September 2005, SAWS and SACMS printed and distributed a notification of ‘Coal Mine Safety Training Supervision Inspection Measures (Trial)’⁹, strengthening the supervision of safety training and making it a ‘compulsory exercise’. Both mines had since emphasized the importance of safety training, so that it made up a high proportion of occupational training.

However, significant differences appeared in the processes and effects of training in the two mines. In Mine Z, the Labor and Wages Department played an active role in the planning, regulating and supervising of training processes. The Career Education Office organized

⁹ Policy issue number: Safety Supervision General Coal Mine No. [2005]135.

examinations for workers, with one small examination every month, and a larger one every quarter. In Mine L, meanwhile, a career education team was formed, with the mine manager as the team leader. The Labor and Wages Department passively implemented the plans this team makes. In terms of training content, in Mine Z, workers were not only familiar with the textbook (i.e., they should grasp at least one question per day, and study at least one case per week), but also exercised the theoretical knowledge through technology competitions, underground drills, and the mentoring system. In Mine L, however, some exercises were not completed as planned due to poor time management of training, which was often scheduled during workers' leisure time. Because of their low educational level, some workers were unable to take complete notes during the classes and thus could not fully understand the information they were given. In terms of appraisals of the effects of the training, Mine Z adopted a strict system, with a high qualifying standard. Rewards were given to workers who attain high scores in the examinations, and for mentors who trained apprentices successfully. In Mine L, meanwhile, penalties were widely used when the training is unsuccessful.

In addition, the workers' perceptions of the training varied between the two mines. Workers in Mine Z were generally satisfied with how the training content relates to their job, the rewards for successful training and felt that the arrangements are reasonably timed. Workers in Mine L also regarded training as an important way to enhance skills, but felt that some of the training practices did not apply to their roles. One mining team leader said:

'Reading is an ineffective way for some workers to learn due to their low qualifications. Some workers do not have extra time to devote to training as they are older and have parents and kids to take care of. Some workers obtain their job qualification certificates through mechanical memorizing. It is vital to know how to use the knowledge, though.'

We found that the workers regard their skills, knowledge, and abilities as the fundamental determinant of unsafe production and occurrences of 'three-violations'. Not every worker could detect hidden hazards, such as roof collapses and sudden flooding in old tunnels. Some workers in Mine L expressed that their present skills did not meet the demands of safe production. One worker said:

"For some safety knowledge, everyone knows it in theory, but may still be unable to use it in practice. Sometimes, you feel it is no problem as no omens take place, but the roof may fall down suddenly."

In contrast, workers in Mine Z regarded adequate skills as a necessary condition to be met before starting work. They were adamant that new workers must accompany their mentors, and should not be allowed to work on their own. One worker said:

'Although I've worked [in mining] for over five years, I am still a new worker. That is because the geographical environment varies from place to place. It requires a new round of learning in order to work in a different environment.'

Through training and development, workers have developed their own safety initiative, concerning a shift from 'the mine wants me to be safe' to 'I want to be safe', which requires the workers themselves to promote safety. Due to the lower salaries and higher turnover in Mine L, it was a little difficult to motivate the workers to take responsibility for safety themselves. In order to enhance their workers' safety consciousness, Mine Z has adopted a sophisticated system of safety practices, a system of refining every work procedure used in daily production, ensuring that every worker remembers the standardized process of

workflow. One mining worker in Mine Z said:

‘Complying with safety rules is my own responsibility and it has become a habit. At work we automatically follow the correct workflow that I have memorized by heart. In the past I was often injured at work, although they were all little wounds. But now it seldom happens, as I am thinking of these safety procedures and regulations all the time.’

Workers’ compensation

To link the workers’ safety performance to their remuneration and rewards, both mines added a safety wage as part of the total compensation package. The system of a safety risk deposit was also adopted, under which an amount of money was collected from workers, and would only be returned to them if he performed his job safely and had no violations in a specified time period. Since 2005, Mine L has adopted safety salaries, which accounts for 30% of total compensation. The mine manager of L said:

‘In 2011, over 10 million yuan out of 40 million yuan’s total compensation has been used for safety compensation. If workers violate work rules or get into an accident, economic penalties would be taken accordingly. The safety goal for 2010 was zero serious injury for the whole coal mine, zero minor injury for each work unit, zero serious three-violation behavior for each work group, and zero normal three-violation behavior for each individual worker. If the goals could not be met, relevant groups or individuals would be penalized. In our coal mine, a safety accident with one death toll would cause the deduction of 2650 yuan per individual from every worker. And this value increases with the intensity of the accident.’

Naturally, differences in these two mines existed in terms of pay and the workers’ perceptions of the compensation practices. The average salary in Mine Z was higher than that in Mine L. For example, the salary of a frontline coal digger was around 4,000 yuan per month in Mine Z, but only around 2,000 yuan in Mine L. Low salaries reduced workers’ safety motivation. One worker in Mine L said:

‘If the salary is only 2,000 yuan per month, I do not care about deductions for violations as, whatever happens, the mine will still offer us enough money to live, at some minimum standard¹⁰. However, if the salary is as high as 4,000 yuan per month, then the deduction for violations will also be high, e.g., 1,000 yuan per time, which is a big amount. Workers are most afraid of money deductions, which produce negative emotions.’

Another worker (also a group leader) in Mine L commented:

‘Honestly speaking, what matters most is money to frontline workers. For the group I am leading, it used to work quite well. However, the production capacity could not improve after its personal restructuring, and the core reason lied in the low salaries that cannot motive people. For the big state-owned coal mine, workers enjoy better salary and welfare, so the problem will be less there.’

In contrast, the workers in Mine Z had more neutral attitudes towards their wages. Indeed as the group leader in Mine L said, since Mine Z is a so-called big state-owned one, workers have fewer problems in their compensation and thus fewer complaints. One frontline worker in Mine Z said:

‘Salaries are earned by our own abilities, and are related to the amount of work we accomplish.’

¹⁰ The minimum wage standard in this city is RMB 1010 yuan per month, with few raises in recent years. (data on July 1 2013)

The safety risk deposit was lower in Mine L than in Mine Z. A coal digger in Mine Z must deposit 1,000 *yuan* per month, while the corresponding amount in Mine L is 350 *yuan*. In cases of severe accidents or serious violations, Mine Z carried out more rigorous punishments. Moreover, there was also a team safety deposit in Mine Z, which meant that if one worker violated the safety regulations, all of his fellow team members were to be punished, including his direct supervisor (cases are different depending on the level of severity, such as occupational injury, serious three-violation behavior, etc). However, in Mine L, it was only when a major accident occurred, or the number of cases of ‘three-violations’ exceeded a certain threshold, that the whole team would be punished, and even then the punishment was not as rigorous as in Mine Z. In addition, safety rewards were allocated in Mine Z, to encourage workers to conform to safety rules voluntarily through positive motivation. Rewards were rarely used as motivational tools in Mine L.

Labor relations

As SOMs, Mine Z and Mine L shared some similarities in their labor relations. Although China’s union density in the state sector has declined since 1990 (Liu, 2010), the trade unions in these two SOMs fulfilled their duties well in providing the workers with protective equipment and annual occupational health checks. However, as Mine Z had greater funds and capacities, it had invested more into its workers’ social welfare in terms of pensions, medical insurance (including cover for occupational injuries and diseases), and unemployment insurance. Thus, there were fewer labor disputes in Mine Z, the workers had more enthusiasm for their jobs, and they were devoted to safe production. The relationship between the workers and managers in Mine Z was, on the whole, constructive. Most of the workers we interviewed in Mine Z mentioned they were satisfied with their jobs. Even among those who were unsatisfied, their issues were not as serious as those seen in typical labor conflicts. The Labor and Wage Department manager in Mine Z said:

‘When they [workers] have questions, for example about wage payments or occupational diseases, they will go to the Labor and Wages Department for help. Usually, these questions are answered clearly. After this, if labor problems still exist, they will go to the Board of Arbitration, which consists of various relevant personnel from the trade unions and the Labor and Wages Department, and the firm’s law consultant’,

In Mine Z, workers were encouraged to have informal meetings to discuss job-related issues. The regular monthly safety meeting included reflective learning from past accidents and a system termed ‘three violations’, as well as reviews of accidents in nearby coal mines. One miner explained:

‘Everyone operates according to the safety specifications. If you do not behave like this, you will be marked out as different and become isolated.’

In regard to workers involved in the ‘three-violations’ system, safety officers would be assigned to talk to them and explain the violation risks. One young mining worker from Mine Z commented:

‘I think the relationship between colleagues is very important. Although there is a generation gap between workers of different ages, we spontaneously consult with older workers and team leaders about professional questions.’

Moreover, workers’ suggestions on safety were listened to by the top managers on the Democratic Reception Day and other occasions.

Labor problems in Mine L, meanwhile, appeared to be mainly connected to the workers' wages. Workers in this mine were very sensitive to their wages, and tended to become quite negative when they were unsatisfied with their pay. Some workers also expressed objections about management practices, such as unreasonable scheduling of their time. There was no sophisticated grievance system for dealing with workers' complaints in Mine L, meaning that workers usually had to go directly to the mine manager to voice their complaints. The trade unions had not played the role they should have in this regard. The mine manager of Mine L said:

'Nowadays, workers are very straightforward. If they are unsatisfied or have questions about their wages, they will go directly to their team leaders, sometimes the mine manager.'

Both mines had a whistle-blowing system in place, encouraging public monitoring and inspection of violation behaviors, e.g., the three-violation system, gambling and theft in the coal mine. The monitoring also covered misconduct by the leaders, e.g., taking charge of others' shifts, concealing accident information, not entering the mine pits for shifts, etc. In Mine L, rewards were given to those who reported violations, e.g., 300 *yuan* for reporting a three-violation behavior, 1,000 *yuan* for reporting a serious three-violation behavior. Centers dealing with three-violation, gambling and theft reporting had been established, and a special phone was provided in the Discipline, Inspection and Supervision office. Reporting could be done by phone, email, letter, face-to-face or any other reliable means.

In terms of workers' participation in decision-making, the two mines exhibited some differences. In Mine Z, the workers' congress provided a voice on behalf of the workers. Every worker was encouraged to report hidden dangers to her/his work unit after the completion of a shift, and use the level-of-warning system, meaning they could be actively involved in issues related to their safety. The Labor and Wage Department manager in Mine Z added:

'All decisions in our coal mine must be supported and voted for by the workers' congress. The delegates in the congress were selected from the wider pool of all workers and they discuss the mine's policies at their meetings. One proposal on a fixed salary for the workers did not get through at the workers' congress, as the workers thought it was too low, and requested an increase of 200 yuan.'

It seemed, on the other hand, that the workers in Mine L were not that interested in taking part in decision-making, feeling it was not their business. One worker's remarks were quite representative here:

'We ordinary workers do not have the right to participate in decision-making, and can only listen to the orders given. Our group leader is responsible for allocating work tasks, and can resolve any small issues. However, when larger issues emerge, our group leader cannot cope with them and they require leaders at a higher level to resolve them.'

----- INSERT TABLE 3 ABOUT HERE -----

A comparison of the HR and IR practices in the two mines is provided in Table 3. Mine Z adopted safety-oriented HR practices, performed much better at personnel recruitment and selection, training, compensation, and labor relations, and as a result could better motivate its workers to engage in safety behaviors and enjoyed a better safety performance record than Mine L.

DISCUSSION AND CONCLUSION

In this paper, we have outlined a straightforward theoretical framework of an IR system's influence on occupational safety in China's coal mining industry. Based on the results of the safety performance and field studies of two SOMs, we have particularly examined the influence of government regulations, HR and IR on safety performance.

Theoretical implications

The strategic HRM framework explains the nature and direction of the relationship between HR practices and occupational safety (e.g., Lai et al., 2011; Lauver, 2007; Zacharatos et al., 2005). Although current HR practices in China's coal mining firms are far from scientific, and fail to provide a high-performance work system, and neither do the single HR functions complement each other in such a way as to yield employee commitment (Han & Yu, 2006; Li, 2006), our field studies have revealed some exploratory attempts at improvement, contrasting the cost-control-oriented HR practices in Mine L with the safety-focused HR system in Mine Z, in terms of recruitment and selection, training and development, worker compensation and labor relations. It can be seen that both firms have added more safety elements into their HR practices since 2000, e.g., mandatory safety training and safety risk deposits, which has led to a steady increase in safety performance in the new millennium. However, safety-oriented HR practices have produced a better safety record in Mine Z than Mine L over the years of comparison, while some cost-reduction-oriented practices, e.g., a contracted employment relationship, have brought the organization more flexibility (Kochan et al., 1994), and negatively influenced occupational safety. One possible explanation is the fact that contracted temporary workers such as rural migrants are those with the lowest level of education, and they have received less training than their permanent counterparts, as revealed in our study.

Our study also presents some explanations of the mechanism through which HR practices can contribute to safety performance (Ford & Tetrick, 2008; Zacharatos et al., 2005). Naturally, if humanity-oriented values were adopted in coal mines, working schedules were arranged properly, and safety knowledge was conveyed to the workers through training by practice, workers' competence would be enormously enhanced. More importantly, if workers were encouraged to participate in decision-making and discussions on job-related issues, they would be more likely to engage in safety behaviors voluntarily, within a favorable safety climate. We have also found that workers' initiative in ensuring safety and the perceived safety climate are connected to occupational safety, which supports findings in the western context (Ariss, 2003). In addition, our paper supports the configurational perspective in strategic HRM research, which says that the internal consistency of the organization's HR policies and practices should achieve the highest degree of horizontal fit (Wright & Snell, 1998). In our paper, Mine Z performed quite well in every HR function while Mine L did not achieve such synergies, which indicates the importance of the complementary effects of HR practices in fostering firm performance.

In terms of the institutional factors that impact organizational management practices and firm outcomes (Poole, 1986), our evaluation of safety performance since the foundation of the People's Republic of China has provided insightful criteria regarding the effect of government regulations, with additional detailed examples from the case studies. Government institutions have served as the basis of the fluctuating safety trends and developments in

China's coal mining industry. Not only that, but our study contributes to the national business system theory that ownership relations affect the cooperation and control inside and between business organizations (Harzing & Van Ruysseveldt, 2006; Whitley, 1992). State and other forms of ownership co-exist in coal mining firms, although there is no agreement on which form of ownership might outperform the others in predicting safety advantages. Since 2008, the government has encouraged state-owned enterprises to merge and acquire small ones, favored them in regulations, and awarded them contracts and subsidies. It was then decided to close down many small and private coal mines, and state-owned coal mines began to merge and acquire other types. However, it has been found that the number of accidents has not decreased in big state-owned coal mines, but some of the accidents in those mines have tended, on the contrary, to be very severe. It has been inferred that ownership restructuring should be accompanied by investment in economic power and management schemes.

Practical recommendations

We have employed the IR system (Dunlop, 1993) as an antecedent of occupational safety involving the role of management organizations, worker and trade unions, and government agencies. In terms of recommendations for coal mine leaders, it is suggested they should move from the traditional personnel management paradigm to a modern HRM system, and build safety-oriented systems to safeguard coal miners' well-being. Coal mine managers should make applicants' safety qualifications a top selection criterion, aim to attract enough talent to fill special job positions pertaining to safety, and allocate safety personnel more efficiently. Managers should also increase the proportion of training devoted to safety, emphasize practice and underground operations in training, and use motivational tools to improve training outcomes. Workers' compensation should be integrated into the safety management plan, with competitive wages paid to the workers. In particular, managers should increase the percentage of safety-linked wages included within the total compensation, with rewards for safety performance and penalties for accidents and violations. Team compensation should be linked to the collective safe behavior of team members. Managers should implement strict regulations on labor protection, occupational disease prevention, and social welfare management. In addition, more advanced safety equipment and technology should be used in the workplace, to create and maintain safe working conditions for workers. Not only that, but it was expressed by the coal mine leaders in this study that intrinsic safety – namely safety that is ensured without reliance on the behavior of workers – was key to safe production, and that this could only be achieved by sophisticated management schemes and sufficient investment in automated equipment and technology, that must in turn be ensured by central and local funding.

Workers' participation and voice should not only be highlighted in corporate management processes, but also safeguarded by institutions such as relevant government regulations (e.g., labor rights protection) and the company's executive board. When workers are able to organize and participate in supervision management via the safety council, government regulations will yield better outcomes. In any case, when joined together, workers will at least be able to refuse to work in very hazardous situations without the fear of losing their jobs. Only when workers are treated with dignity and respect, and enjoy a stable, recognized and fair occupation, will the mining industry be able to break free of hazards, blood and tears. Ironically, in circumstances where the legal standards have not taken effect, workers have to

rely on the ethics of media exposure and public supervision. There are reports on coal mining accidents and the media have helped to unpack and release the news, eventually helping workers to fight for and gain their labor rights (Juan, 2009). This calls for China's trade unions, as workers' collective groups, to actively participate in the labor conflict resolution process¹¹. Amendments should be made to the legislation to empower workers to set up genuine enterprise-level unions (Liu, 2011), so that trade unions can serve workers independently, while the law preserves their right to stand down and strike. Possible suggestions include excluding senior corporate executives from union membership and leadership, securing unions' financial independence from enterprise management, and providing safeguards for the election of trade union leaders and their removal from office.

It has been recommended that the government should do more work in publishing regulations and rules on punishing unsafe behaviors (Zhou & Xu, 2006), especially highlighting the importance of public monitoring and the punishment of corruption, and that they should make earnest endeavors to implement the regulations and legislation, despite the pressure of local protectionism and corruption among local government officials and coal miners. The government should take earnest steps to invest in safety equipment and technology in both state-owned and township-and-village coal mines as quickly as possible. It may be unwise to close private coal mines and retain state-owned ones given the massive demand for coal; production should be fostered instead of suppressed. The central government could set up a safety rating system for all coal mines, and specify that only those with the lowest safety rating would need to close in the event of safety incidents. In case of coal mine closure, steps should be taken to reorganize the workers and equipment so as to ensure re-opening and recovery of production as soon as possible. Considering the safety deposit that has widely been adopted in coal mining firms, the central government could think of issuing policies that provide a certain proportion of these safety funds from taxation, which would be returned to coal mines with good records and no accidents. The government might also encourage coal mines set up special accounts for safe production with local banks as a mandatory practice, to safeguard funds for special purposes.

Admittedly, the reasons for and antecedents of coal mining safety are wide-ranging and there are other factors that have not been the focus of our study, e.g., the demand and supply of coal, geological conditions, economic trends and global competition. In order to prove a causal relationship between the claimed human factors and occupational safety, we need to collect longitudinal data from coal mines at the establishment level, and evaluate the correlations between HR and IR practices and safety performance over different time spans. Moreover, although we have conducted a descriptive analysis of safety evaluations and government regulations over the years, future research should use regression to investigate the effect of institutional variables and other categories of firms on firm performance, e.g., ownership structure, firm size, labor force characteristics, as well as industrial and regional attributes.

In conclusion, the current employment relationship in China's coal mining industry is rather unhealthy, unbalanced and unstable. The shortcomings of the governmental role lie in the poor implementation of central policies at the local level, as local units always have their own

¹¹ Scholars have also studied labor-related non-governmental organizations (NGOs) in China, which play a bridging role between labor and state, while functioning in favor of workers and aiding them fundamentally and significantly (Li, 2015).

strategies for catering to new policies, while continuing to do the wrong things exactly as they did before. The corruption between local government officials and coal mines is a problem, especially in areas where the local economy has largely been supported by the taxation of coal mines and where there are lower transaction costs. Various barriers to inspection also serve as obstacles preventing the regulations from being as effective as they were designed to be. Coal mine managers have invested as little as possible in workers' well-being due to organizational imprinting and their ambiguous gains from interest-sharing, although our field studies have demonstrated some positive progress towards a safety-oriented HR and labor relations system. Workers are still in a very weak position as they have little voice or engagement in the management and supervision process, and even worse, they are not entitled to proper labor protection, nor is there a strong workers' group/trade union to safeguard them in times of hazards or accidents. The coal mining safety supervision system is currently in an interim state of adopting a multi-stakeholder framework that will involve not only the power of government supervision and legislative authorities, but also contributions from the public, media and NGOs, and preferably an inspection group independent of any shareholder groups. However, the imbalance of power among different social groups of the IR system will not be altered in the short run.

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Figures and Tables



Note:

1. Control variables include, employee personality (i), values (i), past experience (i) and job characteristics (i).
2. The 'i' in the brackets means research at the individual level, the 'o' stands for research at organizational level, and the 'n' refers to research at the national level.

Figure 1. Human Resource Management, Employment Relations, and Occupational Safety: A Literature Review

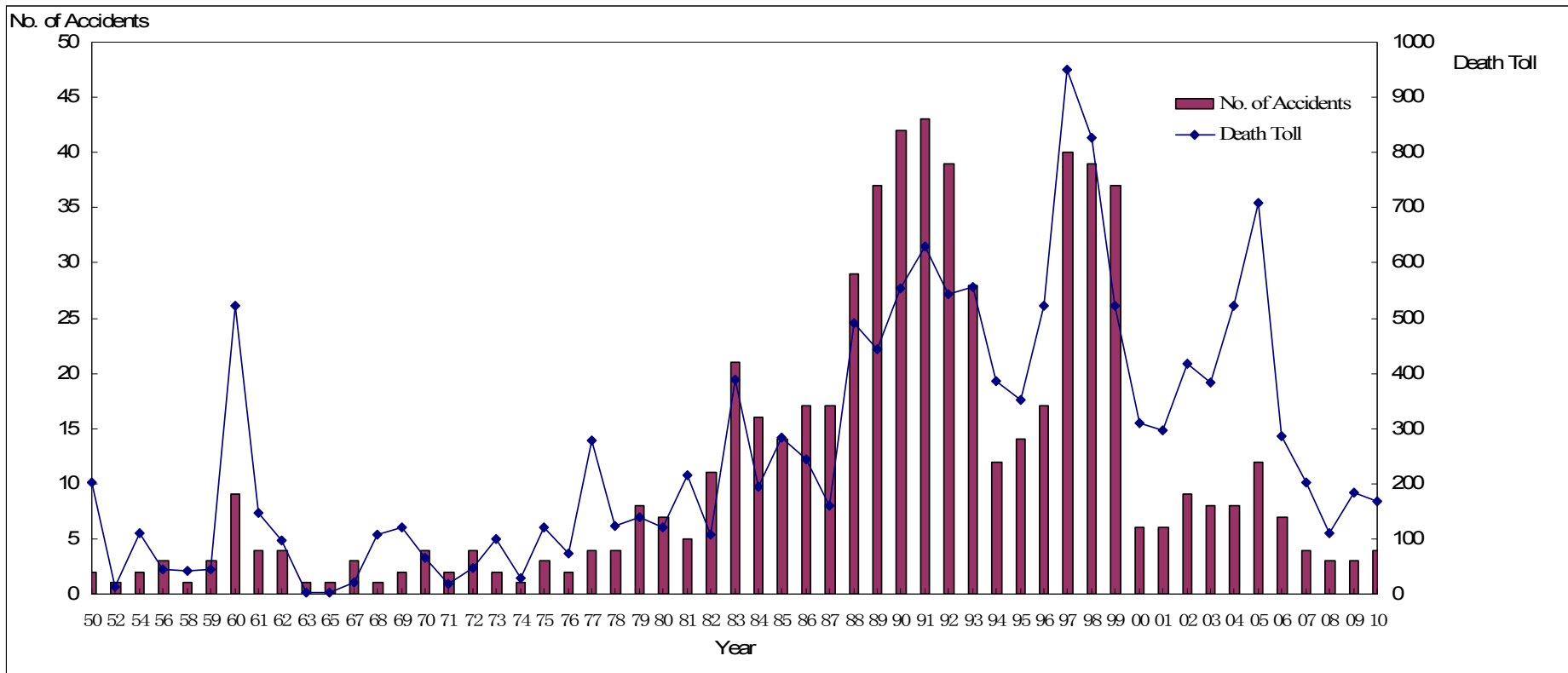


Figure 2 Annual Numbers of Accidents and Death Toll in China's Coal Mining Accidents (1950-2010)

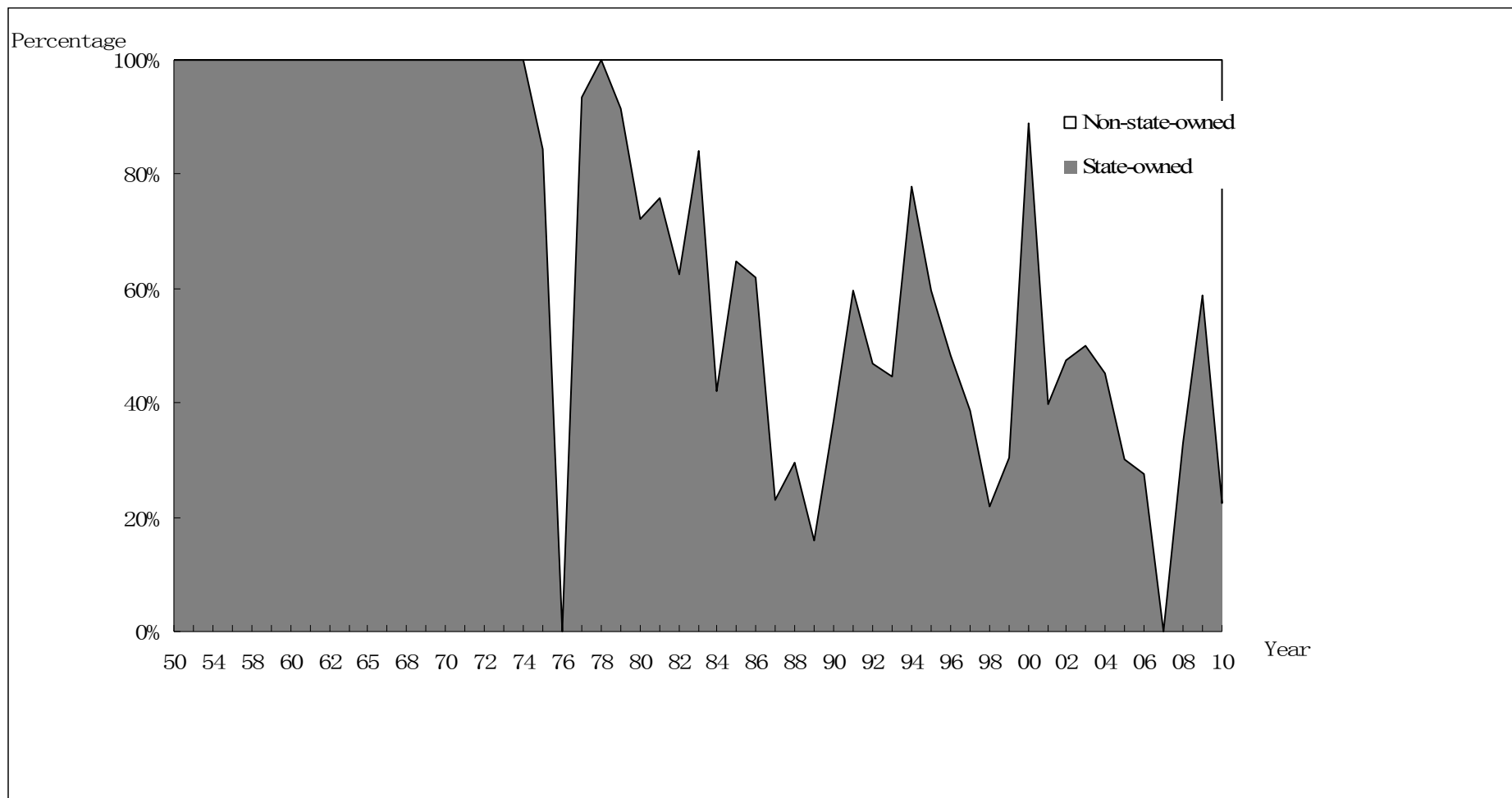


Figure 3 Annual Death Toll Percentages for State-owned and Non-state-owned Coal Mines (1950-2010)

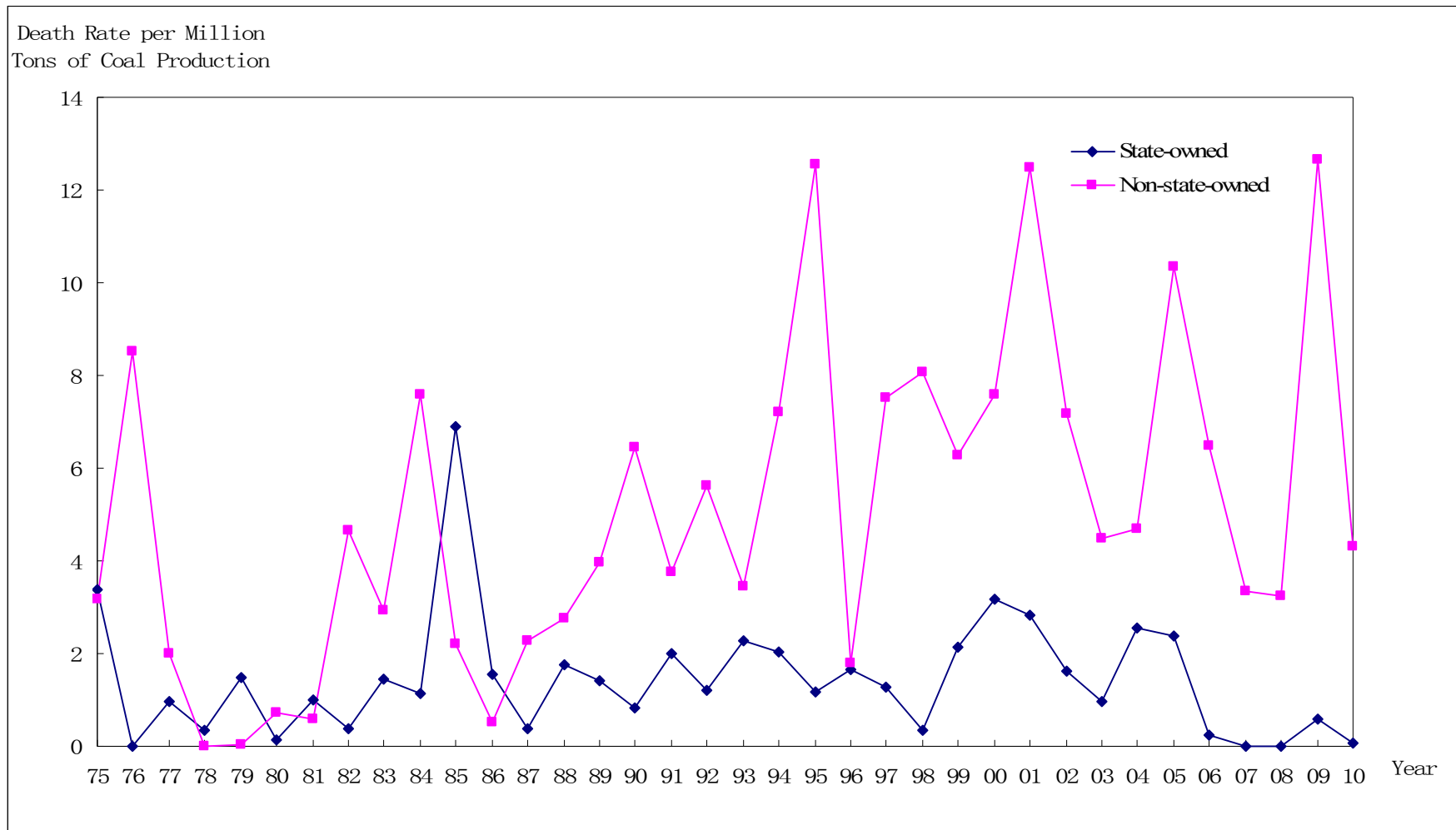


Figure 4 Annual Death Rates per Million Tons of Coal Production for State-owned and Non-state-owned Coal Mines (1975-2010)

Table 1. Occupational Safety Performance in State-owned and Non-state-owned Coal Mines

Ownership	No. of accidents	Percentage in number	Death toll	Percentage in death toll	Injury toll	Percentage in injury toll
State-owned	289	46.2	7708	53	2857	70.8
Non-state-owned	337	53.8	6842	47	1177	29.2

Table 2. Comparison of Occupational Safety Performance in Mines Z and L (1997-2010)

Year	Loss of coal production (million tons)		Ratio of death toll to total number of employees		Number of 'three-violations'	
	Z	L	Z	L	Z	L
1997	0.65	0	0.0002	0	n.a.	89
1998	1.54	0	0.0004	0	n.a.	125
1999	1.27	0	0.0004	0	n.a.	235
2000	0	0	0	0	n.a.	217
2001	0.5	8.33	0.0002	0.0029	n.a.	231
2002	0.97	8.7	0.0004	0.0026	n.a.	452
2003	0.5	0	0.0002	0	n.a.	436
2004	0	2.44	0	0.0011	n.a.	624
2005	0	0	0	0	108	528
2006	0	2.76	0	0.0009	162	510
2007	0	0	0	0	185	483
2008	0	0	0	0	155	462
2009	0	0	0	0	87	436
2010	0.46	2.42	0.0002	0.0009	92	340

Table 3. Comparison of Human Resource and Labor Relations Practices in Mines Z and L

HR & Labor Relations Practices	Similarities /Differences	Mine Z	Mine L
Recruitment and Selection	S	Selection criteria have been enhanced since 2000, but applicants still lack sufficient qualifications, due to skills shortage	
	D	Workers in special positions work efficiently	Lack of workers in special positions
Training	S	Emphasis on training enhanced since 2000, and percentage of training devoted to safety increased	
	D	The Labor and Wages Department plays an active role	The Labor and Wages Department plays a passive role
		Mainly practice-oriented	Mainly textbook learning
		Mainly use rewards to in response to training performance	Mainly use penalties in response to training performance
Compensation	S	Safety wages make up 30% of total wages, and benefits-related wages make up half of total wages	
	D	Higher wages (medium to high level within the industry)	Lower wages (low level within the industry)
		Safety wages were implemented earlier (in 2000)	Safety wages were implemented later (in 2005)
		Higher safety risk deposit	Lower safety risk deposit
		More severe punishment of accidents and serious violations	Less severe punishment of accidents and serious violations
		More severe team punishment	Less severe team punishment
		Safety benefits exist (positive motivation)	No safety benefits
Most workers are satisfied with their compensation	Most workers are not satisfied with their compensation		
Labor Relations	S	Providing labor protection equipment and occupational disease safeguarding	
	D	More social welfare for employees	Less social welfare for employees
		Less labor conflict	More labor conflict
	Formal employee grievance system exists	No formal employee grievance system	