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Regulating Death at Coalmines: changing mode of governance in China

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China has an appalling record of workplace safety in its coalmining industry. This article first traces the long-term trends of fatality at different types of coalmines, then analyzes why the number and rate of fatalities in the industry have remained so high, and finally discusses how the government has gradually overhauled its regulatory system to cope with the dreadful state of safety. Based on the case study, the article concludes that China's transition from state socialism has not resulted in a Hayekian night-watchman state but in a new regulatory state, which exerts controls over a wide range of economic and social affairs via standard setting, supervision, monitoring, and enforcement.

Looking back on the recent transformation of China's political economy, the liberalization of markets and the denationalization of ownership rank among the most important changes. What do these changes amount to with regard to the role of the state? As public ownership dwindles and market forces swell, one may expect a the state to retreat. Yet denationalization and liberalization that are supposed to 'hollow out the state' have actually been accompanied by the rise of new state institutions that exert controls over a wide range of arenas in both economic and social life, including telecommunications, electricity, insurance, banking, securities trading, food and drug industries, environment, workplace safety, and so on. In other words, rather than the withering away of the state, we have witnessed a change in the mode of state control.

From the early 1950s to the late 1970s, public ownership and state planning were the main modes of state control in China. It was believed then that only through public ownership and state planning could the state impose a desired structure on the economy and restrict behaviors that might threaten public health, safety, welfare, or well-being. The last 25 years, however, have seen a steady shift to an alternative mode of control whereby public ownership thins out and state planning makes way for market forces but the state is still intensively involved in economic and social affairs via standard-setting, supervision, monitoring, and enforcement, shortly summarized as 'regulation'.[1] Regulation in this sense is a distinct form of external

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1. Christopher Hood, Colin Scott, Oliver James, George Jones and Tony Travers, *Regulation Inside Government: Waste-Watchers, Quality Police, and Sleaze-Busters* (Oxford: Oxford University Press, 1999), p. 3. Also see Giandomenico Majone, 'From the positive to the regulatory state. Causes and consequences of changes in the mode of governance', *Journal of Public Policy* 17(2), (1997), pp. 139–167.

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market control exercised by public agencies that use more or less formal procedures to develop and implement rules prescribed in the name of 'public interest'.[2] Thus, China's transition from state socialism has resulted not in a Hayekian night-watchman state but in a new regulatory state.[3]

If denationalization and liberalization signal the advent of a new mode of governance, a number of questions arise. Why did this transformation happen? Does the transition to the regulatory state imply a redrawing of the boundaries between the economy and society on the one hand and the state on the other? To what extent has the transition triggered a process of institution building and re-building? Has the transition improved the performance and problem-solving capacity of the state? This is not the place to answer all of these questions. The main purpose of this article is to understand the context under which the Chinese regulatory state emerges and evolves, which may help shed light on other issues. The discussion below concentrates on a key regulatory area in today's China—coalmine safety. In many ways, coalmine safety is an excellent case for investigating China's regulatory reform.

First, workplace safety has emerged as an important concern in recent years. Following two decades of economic growth that has considerably improved people's quality of life, there is growing awareness of high accident risks in the workplace, widespread occupational health hazards, and the high economic costs of accidents and illnesses. Such awareness heightens people's expectation that the government will protect workers, especially those in hazardous occupations. As far as workplace safety

2. R. G. Noll, ed., *Regulatory Policy and the Social Sciences* (Berkeley: University of California Press, 1985); Robert Baldwin, Colin Scott and Christopher Hood, eds, *Socio-Legal Reader on Regulation* (Oxford: Oxford University Press, 1998), p. 3.

3. For almost a century, the regulatory state was just one of the distinctive features of American Exceptionalism: what the United States regulated, other countries often nationalized. See David Vogel, 'The hare and the tortoise revisited', *British Journal of Political Science* 33, (October 2003), pp. 557–580. But since the mid-1980s governance through regulation has ceased to be a peculiarity of the American administrative state but has become a central feature of governance reforms in the OECD countries [see Giandomenico Majone, 'The rise of the regulatory state in Europe', *West European Politics* 17, (1994), pp. 77–101; Steven K. Vogel, *Freer Markets, More Rules: Regulatory Refroms in Advanced Industrial Countries* (Ithaca: Cornell University Press, 1996); F. McGowan and H. Wallace, 'Towards a European regulatory state', *Journal of European Public Policy* 3(4), (1996), pp. 560–576; Martin Loughlin and Colin Scott, 'The regulatory state', in Patrick Dunleavy, Ian Holliday, Andrew Gamble and Gillian Peele, eds, *Developments in British Politics 5* (Basingstoke: Macmillan, 1997); John Braithwaite, 'The new regulatory state and the transformation of criminology', *British Journal of Criminology* 40, (2000), pp. 222–238; Michael Moran, 'From command state to regulatory state?', *Public Policy and Administration* 15(4), (2000), pp. 1–13; Michael Moran, 'Review article: understanding the regulatory state', *British Journal of Political Science* 32, (2002), pp. 391–413; Markus M. Muller, *The New Regulatory State in Germany* (Birmingham: Birmingham University Press 2002)], Latin America [Luigi Manzetti, ed., *Regulatory Policy in Latin America: Post-Privatization Realities* (Miami: North–South Center Press, 2000); Edmund Amann and Werner Baer, 'From the developmental to the regulatory state: the transformation of the government's impact on the Brazilian economy', Department of Economics, University of Illinois at Urbana-Champaign, 2003], East Asia [Kanishka Jayasuriya, 'Globalization and the changing architecture of the state: the politics of the regulatory state and the politics of negative co-ordination', *Journal of European Public Policy* 8(1), (2001), pp. 101–123], and developing countries in general [Paul Cook, Kirkpatrick Colin, Martin Minogue and David Parker, eds, *Leading Issues in Competition, Regulation and Development*, CRC Series on Regulation (Cheltenham: Edward Elgar, 2004)]. A study of 12 different sectors in 19 Latin American countries, for instance, finds that the overall number of regulatory authorities grew from 15 to 134 between 1988 and 2002. In the four years from 1993 to 1996 alone, 60 new authorities were established. All sectors and countries were affected by the process [Jacint Jordana and David Levi-Faur, eds, *The Politics of Regulation* (Cheltenham: Edward Elgar, 2003)]. What has happened in China is apparently a part of this global wave of regulatory revolution.

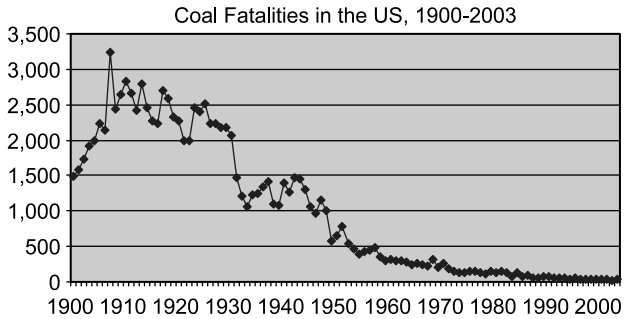

Figure 1. Coal fatalities in the US, 1900–2003.
Source: MSHA, 'Coal fatalities for 1900 through 2002'.

is concerned, deregulation has never gained a firm foothold in China. On the contrary, there is considerable public outcry for direct government intervention in this area.

Second, China has an appalling record of workplace safety and nowhere is the danger greater than in its coalmines, perhaps the world's deadliest. Official statistics indicated that there were 14,702 accidents in the workplace during 2004, which claimed 16,497 lives. Of the total number of deaths from workplace accidents, a whopping 24.8% of them (3,639) came from the coalmining industry alone, which meant an average of 10.1 fatalities per day.[4]

Third, coalmine safety reflects a country's regulatory capacity. Coalmining, particularly underground coalmining, is inherently dangerous, but effective regulation can markedly reduce the risk. In the early twentieth century in the United States, for instance, thousands of coalminers lost their lives every year. However, safety in America's coalmining industry made significant strides during the rest of the twentieth century and especially after 1978 when the Mine Safety and Health Administration (MSHA) began to operate under the new Mine Safety and Health Act of 1977 (see Figure 1). In 2004, only 28 fatalities were reported, compared to 3,639 in China. Measured in the number of miners killed for every million metric tons of coal produced, a Chinese miner is about 100 times (3.08 vs. 0.03) more likely to be killed at work than an American miner is.[5] As a matter of fact, the fatality frequency rates for coalmining have been at the low end of the unnatural death rates for the US and Australia in recent years, better than for such sectors as construction, the metallurgical industry, manufacturing, agriculture, forestry, fishing, and transport.[6] This shows the possibility of reducing accident rates drastically if concerted efforts are made.

Fourth, after years of official indifference, coalmine safety became a priority for China's national leaders in the late 1990s following a string of highly publicized gas explosions, roof falls, mine flooding, and other disasters. To cope with the dreadful state of safety in the country's coal industry, the government gradually overhauled its regulatory system with regard to occupational safety and health (OSH).

4. Liang Jiakun's speech at the News Conference of the State Council Information Office, 17 January 2005, available at http://www.chinasafety.gov.cn/zuixinyaowen/2005-01/17/content_67935.htm.

5. See http://www.msha.gov/stats/daily/d2004bar.pdf.

6. Wang Qingyi, 'Meikuang anquan: Guoji jingyan yu duice jianyi', *Zhongguo meitan* 29(4), (April 2003), pp. 44–53.

Consequently, fatality rates have begun to fall. This shows that China's institutional structure is open for innovation and that the Chinese government is capable of responding to deficiencies in its regulatory performance. In this sense, coalmine safety can be used to exemplify the strengths and weaknesses of the Chinese government in ensuring the compliance and effectiveness of regulation.

Besides this, coalmine safety falls into the category of 'social regulation', which the literature on regulation in China has rarely dealt with.

The first part of this article provides an overview of China's coalmining industry and briefly reviews the transformation of the industry from being dominated by the state sector and dictated to by mandatory planning to becoming diversified in ownership structure and compelled by market forces. This is followed by a detailed examination of China's dismal safety record in the coalmining industry. It demonstrates that fatality rates have fluctuated in the last 50 years but that the general trend is unmistakable: falling. More important, the rates have varied greatly across different types of mines. Whereas the safety record for large (state-owned) mines is as good as their counterparts in advanced countries, small (private or illegal) mines are effectively potential death traps. The following two sections analyze the causes of fatalities. Problems with both producers and regulators of the coal industry are discussed separately. In response to these problems, China has gradually revamped its OSH regulatory framework. The fifth section charts the changing role of the state in regulating coalmine safety. Inevitably, institutional innovations always lag behind the transformation of the industry, yet the adjustment of governance mode has been rather speedy. It would be unwise to deny the possibility of institutional innovations, but we should not underestimate the difficulties of the transition either. The final section summarizes the key features of China's emerging regulatory state.

The coalmining industry in flux

Overview

Making up 11.6% of the world total, China's coal reserve is present in 60% of China's 2,200 counties and underlies a total of 550,000 square kilometers or nearly 6% of the land area of the country. Of the 31 provincial units in China, 27 currently have some forms of coalmining or quarrying activity. However, the coal reserve is distributed very asymmetrically across the country. About 70% of China's total coal production in 2002, for instance, came from eight Northern provinces—Shanxi, Shandong, Henan, Inner Mongolia, Shaanxi, Hebei, Liaoning, and Heilongjiang (see Figure 2).

China is rich in coal but poor in oil and gas. Although China has made great efforts to explore and develop its petroleum and natural gas reserves, coal has been, still is, and will continue to be the dominant energy source in China.[7] As Figures 3 and 4 show, coal has provided around 70% of China's

7. Philip Andrews-Speed, 'Reform of China's energy sector: slow progress to an uncertain goal', in Sarah Cook, Shujie Yao and Juzhong Zhuang, eds, *Chinese Economy under Transition* (London: Macmillan, 2000), pp. 111–130. Philip Andrews-Speed *et al*., 'Regulating energy in federal transition economies: the case of China', in G. MacKerron and P. Pearson, eds, *The International Energy Experience: Markets, Regulation and the Environment* (London: Imperial College Press), pp. 91–102.

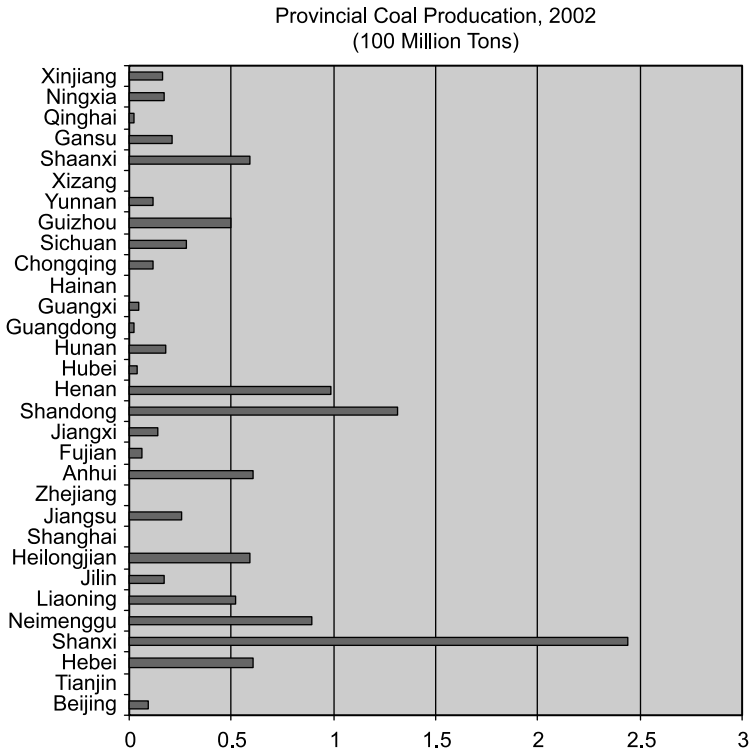

Figure 2. Provincial coal production, 2002 (100 million tons).
Source: National Bureau of Statistics, *China Statistical Yearbook 2003* (Beijing: China Statistical Press, 2003), p. 510.

energy needs, and thus underpinned China's massive and meteoric economic rise over the last 25 years. There has not been much change in the structures of energy production and consumption during the period. Clearly, the coal industry is extremely important for China. Without coal, China's industries would literally grind to a halt, and China's economic miracle would evaporate overnight.

China began shaft mining at least 1,800 years ago.[8] However, the level of production was rather low prior to 1949. After the foundation of the People's Republic, coal production began to accelerate. The average annual growth rate of coal production between 1950 and 2003 was as high as 8.8%, a speed unprecedented in Chinese history and extraordinary in the world history of coal development. In 2004, China produced 1.917 billion tons of coal, maintaining its position as the largest coal-producing country, accounting for one third of the world's total (Figure 5). Yet, supply still failed to keep pace with China's ever-growing need for energy. With economic growth at 9.5% in 2004 and planned economic growth of 8% p.a. in the next five years, the demands on coal will

8. Editorial Committee, *Zhongguo meitanzhi zonghejuan* (Beijing: Meitan gongye chubanshe, 1999), p. 222. Also see Elspeth Thomson, *The Chinese Coal Industry: An Economic History* (London: Routledge/Curzon, 2003).

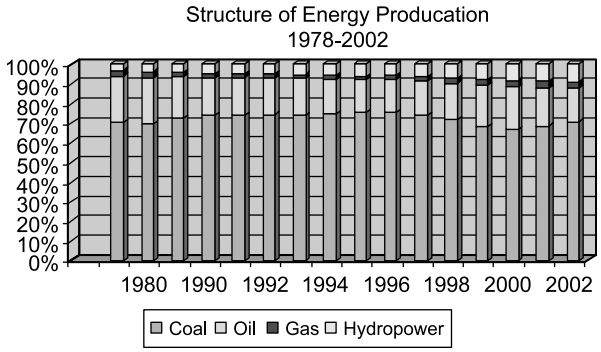

Figure 3. Structure of energy production, 1978–2002.
Source: China Statistical Yearbook 2003, p. 265.

be enormous. In his speech to the annual session of the National People's Congress (NPC) on 5 March 2005, Premier Wen Jiabao declared the country would increase the production of coal, electricity and oil products to 'ease the energy squeeze'. China has been desperately searching for alternative fuel sources, but coal will remain the mainstay for the foreseeable future.

The rise of small-scale mines

Before economic reform, coalmines were largely state-owned, state-run, and exempted from market competition. There were small mines (TVE mines) operated by township (commune) and village (brigade) from the beginning, but their overall output was generally below 5% of the total production before 1970. During the late years of Mao's era, the share of TVE mines began to grow. By the eve of economic reform, it had reached the level of 15%. However, the real upsurge did not come until the 1980s, especially after 1983 when the central government adopted a policy of encouraging coalmining activities wherever possible and by whatever means. At the time, the Chinese coalmining industry was under considerable pressure to increase

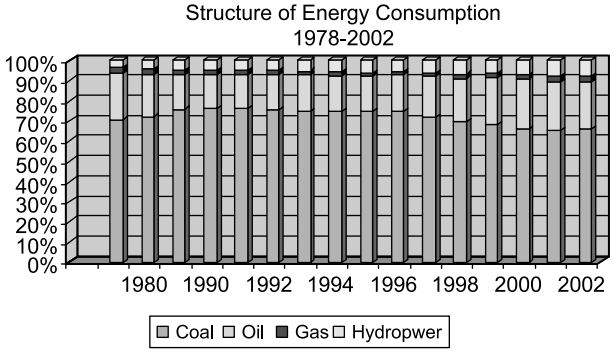

Figure 4. Structure of energy consumption, 1978–2002.
Source: China Statistical Yearbook 2003, p. 265.

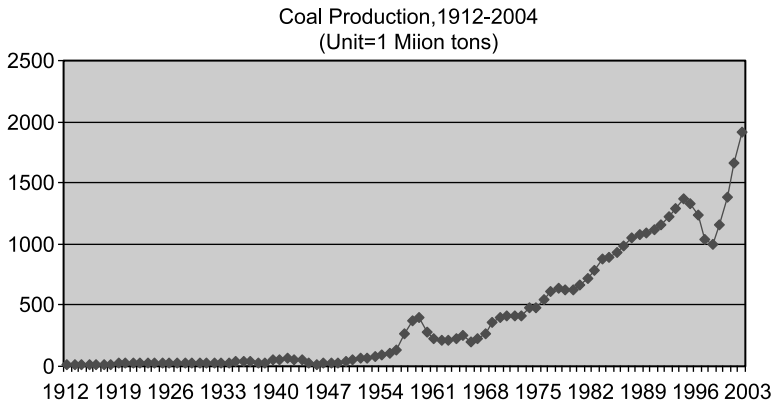

Figure 5. Coal production, 1912–2004.
Source: *Zhongguo meitanzhi zonghejuan* (Beijing: Meitan gongye chubanshe, 1999), pp. 223–241; *China Statistical Yearbook 2003*, p. 510.

production levels to meet the demands of the country's growing economy. Following the central agenda, local governments gave the green light to just about anyone who wanted to sink a shaft: townships, villages, individual cadres and farmers.[9] The rush for coal resulted in a rapid proliferation of TVE mines. Whereas there had been only around 10,000 TVE mines in 1980,[10] the number swelled to over 100,000 by 1991.[11]

In terms of the number of workers, the size of TVE mines varied significantly, from the self-employed to those with several thousand workers. Mines owned by townships and villages usually had more than 20 workers, but the majority of TVE mines owned by individuals were very small, normally with less than ten workers. The economic impact of small-scale mining, however, was far from small. While TVE mines had accounted for 18.3% of China's total coal production in 1980, the share soared to around 50% in 1995–1996. Over 70% of the increase in China's coal production during the period came from TVE mines.

TVE mines no doubt played an important role in China's fast growing economy. However, their drawbacks were also quite visible. Many of the small mines were not licensed. Even those registered small-scale mines often sank shafts without permission or randomly dug tunnels on the edges of state-owned coalfields. Thus, the rapid increase in the number of small coalmines caused illegal mining of coal resources and increased overall waste. In addition, legal or illegal, with few exceptions, working conditions in such pits were dreadful. Serious problems with regard to health, safety, hygiene, and the environment were ubiquitous. Many did not even follow the most rudimentary safety guidelines, like providing adequate ventilation in mineshafts. They flourished precisely because they flouted laws and

9. Originally, TVEs were conceived as enterprises to be run by townships or villages. They have now been expanded to include a wide range of cooperative and individual enterprises run by rural residents.
10. *Zhongguo meitan gongye nianjian 2002* (Beijing: Meitan gongye chubanshe, 2002), p. 288.
11. *Zhongguo zhiye anquan shengchan nianjian 1991* (Beijing: Minzhu chubanshe, 1992), p. 434.

regulations. Hence, the result of the propagation of small-scale mines was intensified competition for resources, chaotic production, endless disputes, and increasing hazards and accidents.

Transformed state-owned mines

As the deepening reform process allowed more room for non-state mines to boom, the problems of the state-owned coalmines, including some of the country's 'key' mines, worsened. Due to their heavy 'social burdens' (e.g. operating their own school systems, hospitals, cultural facilities, and the like) and relatively aging labor force, starting from 1984, more and more state-owned mines became unprofitable. By 1992, most state-owned mines, including over 90% of key mines, were in the red, with total losses approaching RMB 5.75 billion. After the government decided to liberalize gradually its price control over coal in 1993, the ensuing increase in coal price in the domestic market and coal exports helped many state-owned coal producers to improve their cash flow and reduce their deficits. In 1997, the coalmining industry as a whole turned profitable for the first time in many years. However, the recovery proved to be ephemeral. Due to over-production, the price of coal plummeted for the following three consecutive years, which put the whole industry in the red again.

The harsh reality forced the government to undertake drastic actions. Large mines now were subject to conversion from traditional SOEs into 'modern' (western-style) companies, and a number of them were listed on domestic or international stock exchanges. In the meantime, owing to exhausted coal resources, hundreds of medium-size state-owned mines were forced to shut down. The government also approved bankruptcy declarations from dozens of state-owned mines that could no longer be sustained financially. Simultaneously small state-owned mines were allowed to be privatized. Even those mines formally remaining in the state sector might be run as private ones as they subcontracted individual shafts to managers or whoever paid rent.

In any event, due to the competition from small mines and the removal of state subsidies, state-owned coal enterprises now had to lower production costs, readjust their product mix, and produce according to market demand. The arrival of supply-and-demand economics in China's mines solved some old problems from the command economy but created new ones. In particular, mine managers became more concerned with meeting the demands of market forces than with the maintenance of safety procedures. This was true even in key state pits that had formerly achieved excellent safety records.[12]

From 1997 to 2001, the government closed down more than 50,000 small coalmines, which reduced the overall coal output capacity from 1,374 million tons to 999 million tons, a drop of 27%. The crackdown against illegal small mines continued in the following years. As a result, the state coalmining sector has become profitable since 2001.

12. Tim Wright, 'Competition and complementarity: township and village mines and the state sector in China's coal industry', *China Information* 14(1), (2000), pp. 113–130.

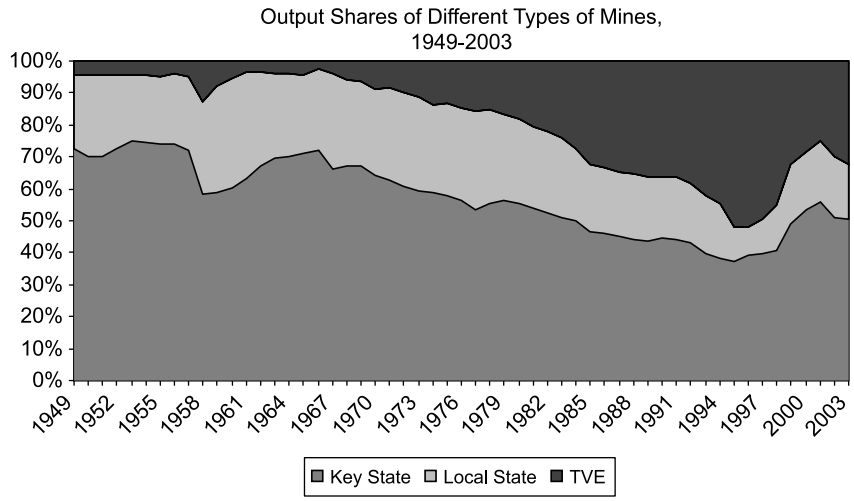

Figure 6. Output share of different types of mines, 1949–2003.
Source: *Zhongguo meitanzhi zonghejuan*, pp. 223–241; *Zhongguo meitan gongye nianjian*, various years.

At present, there are 656 key state coalmines and 2,024 local state coalmines. Besides these, there are 21,759 registered TVE mines.[13] Together, the number of coalmines in China exceeds the sum total of mines in all other countries.[14] Figure 6 depicts the changing structure of coal production by different types of mines between 1949 and 2003. Apparently, the share of production by the state sector had substantially declined before it bounced back around 1997.

Coalmine safety[15]

Coalmining is inherently dangerous. It exposes miners to hazards well in excess of those working in other occupations. Accidents, for instance, may occur from fall of roof materials, excessive heat and humidity, poor lighting, fires, floods, elevator failures, use of unsafe equipment, and haulage. Those kinds of accidents may kill or maim one or two workers at a time. More dangerous hazards are explosions caused by high concentrations of airborne dust or methane gas, which could kill dozens or even hundreds of miners at once.

Figure 7 identifies the major causes of coalmine fatalities in China in 2001. The relative importance of each cause may slightly alter from year to year, but the overall distributional pattern of major causes has been rather stable with gas explosions and roof falls being the two most frequent causes of fatal accidents in Chinese coalmines.

13. State Administration of Coal Mine Safety Supervision, '2003 nian guoyou meikuang anquan pinggu qingkuang huizongbiao', and '2003 nian xiangzheng meikuang anquan chengdu pinggu qingkuang huizongbiao', available at http://www.chinasafety.gov.cn/file/2004-01/sg1.xls.

14. *Zhongguo meitan gongye nianjian, 1994*, p. 303.

15. Tim Wright's recent article deals with only China's coal safety record during the reform era. See Tim Wright, 'The political economy of coal mine disasters in China: "your rice bowl or your life"', *China Quaterly* 179, (September 2004).

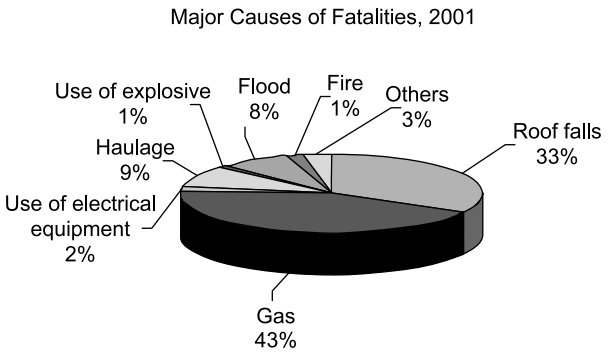

Figure 7. Major causes of fatalities, 2001.
Source: *Zhongguo meitan gongye nianjian* 2002, p. 58.

Mao's era

Fatal accidents have been a common occurrence ever since China began modern excavation of coal in the 1870s.[16] The average fatality rate at the Fushun coalmine of Liaoning between 1907 and 1919, for instance, was as high as 123 miners killed per million tons of coal produced.[17] The most horrific coalmine disaster occurred at Benxi, Liaoning, in 1942, which took the lives of 1,594 miners.[18]

After the foundation of the People's Republic in 1949, the Chinese government has strived to reduce the number of fatalities in the coalmining industry. Despite the considerable efforts in the last five decades, the number and rate of fatalities have remained exceptionally and unnecessarily high.

A summary of fatalities in state-owned coalmines from 1949 to 1978 is given in Figure 8. In the first eight years of the People's Republic when coal production grew steadily (Figure 5), the number of fatalities fluctuated around 700 each year. Coal production doubled within a year in 1959 and increased by another 37% in the following year. The sharp upsurge of production, however, was accompanied by an even sharper upsurge in fatalities. In 1959 and 1960, 5,098 and 6,036 miners lost their lives, respectively. The two years stood out to be the worst in the history of the PRC. The high levels of fatalities during the Great Leap Forward period probably had to do with the fact that zealous local governments hastily created hundreds, if not thousands, of new coalmines without much safety awareness. After the fanaticism of the Great Leap Forward faded away, state coalmines saw a decreasing trend in fatal accidents. But, as the Cultural Revolution began in 1966, the downward movement was halted and then reversed with the number of fatalities climbing from around 1,000 in 1965 to more than 4,500 in 1978.

Measured by the fatality rate per million tons of coal produced, we observe a slightly different picture. Coal safety under the communist regime started with remarkable improvements in the first three years. Afterward, there seem to have

16. *Zhongguo meitanzhi zonghejuan*, p. 222. Also see Tim Wright, Patrick Hannan and Denis Twitchett, *Coal Mining in China's Economy & Society 1895–1937* (Cambridge: Cambridge University Press, 1985).
17. *Zhongguo meitanzhi zonghejuan*, p. 404.
18. *Dangdai zhongguo de meitan gongye* (Beijing: Zhongguo shehui kexue chubanshe, 1989), pp. 231–232.

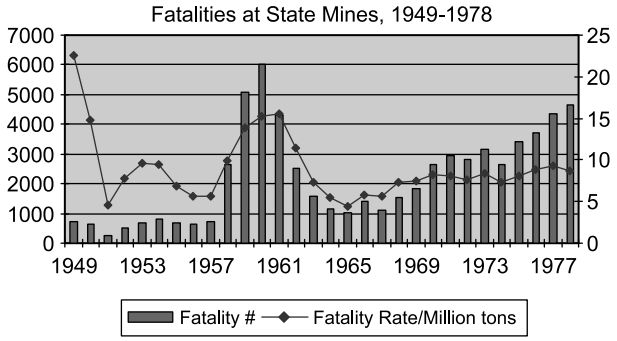

Figure 8. Fatalities at state mines, 1949–1978.
Source: *Zhongguo meitanzhi zonghejuan*, pp. 406–407.

been three 'peaks' prior to the reform period, namely, 1952–1954, 1958–1961, and 1966–1970. The last peak came about when the high tide of the Cultural Revolution effectively paralyzed the public authorities in the country. Once the public authorities were restored, the fatality rates became more or less stabilized in the 1970s. By the end of Mao's era, the fatality rate of the state-owned coalmines was substantially lower than that in 1949, but still much higher than the best record achieved in 1965, 4.43 deaths per million tons of coal produced.

The reform era

Whether measured by the absolute number of fatalities or by the fatality rate per million tons of coal produced, one thing is clear from Figures 9 and 10: fatal accidents at state mines have declined during the last quarter of a century. The reduction was most dramatic in the 1980s. In 1979, 2,183 miners died in workplace accidents at key state mines and 1,970 at local state mines. In 1990, the corresponding numbers went down to 978 and 1,016. Moreover, the fatality rate decreased to record-low levels at key state mines in 1991–1992. Since the early 1990s when the marketization and denationalization of the coalmining industry began to accelerate, however, the number and rate of fatalities have for the most part stopped falling. In fact, Chinese experts on workplace safety regarded the periods of 1992–1993 and 1999–2000 as the fourth and fifth 'peaks' of industrial accidents, following the three pre-reform 'peaks' identified above.[19] Although the two new 'peaks' were not as steep as the previous three, they attracted much more attention, because China's coalmines came under increased scrutiny during the 1990s. Thus, the popular impression that fatalities were rising was largely due to freer media coverage.

While the trends for both key state mines and local state mines have been parallel, nevertheless the fatality rates have been consistently higher for the latter

19. 'Kuangshan anquan guanli huhuan zhidu chuangxin', available at http://news.xinhuanet.com/misc/2002-07/09/content_474599.htm.

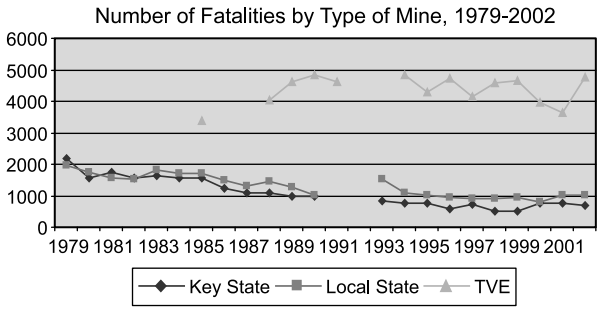

Figure 9. Number of fatalities by type of mine, 1979–2002.
Source: *Zhongguo meitanzhi zonghejuan*, pp. 406–407; *Zhongguo meitan gongye nianjian*, various years.

than for the former. The safety record of key state mines in 2004 was comparable to Japan's in the mid-1980s, but the record of local state mines in the same year only resembled Japan's in the mid-1970s, a time lag of roughly ten years.[20]

Figures 9 and 10 also compare the number and rate of fatalities between TVE mines and the two types of state mines. Both were alarmingly high in TVE mines, being several times higher than those of state mines. Clearly, work in small mines was much more dangerous than that in their larger state-owned counterparts. During the 1980s and 1990s, when thousands of legal and illegal small mines mushroomed across the vast land of China, the government found it extremely difficult to regulate them. Operating beyond the radar of safety agencies, those small mines became effectively potential death traps. Fatal accidents took place there on an almost daily basis. Every year for the entire 1990s, 4,000–5,000 miners perished in accidents that occurred at TVE mines. The fatality rate observed in small TVE mines, on average, was almost ten times greater than that in state mines. These small mines were responsible for approximately three-quarters of occupational deaths in the coalmining industry during the same period.[21]

International comparison

Even though coalmining is an industry that involves high-risk activities and, as such, a high incidence of occupational fatalities is expected, the industry worldwide has strived to reduce the number and rate of fatalities for well over 100 years. As a result, the danger of the occupation has been markedly reduced in most coal producing countries. Table 1 shows the numbers of fatalities per million tons of coal produced in

20. For the information about Japan's coalmine safety, see Kiyoshi Higuchi, 'Coal mining technology of Japan—historical improvement and international contribution hereafter', available at www.e-convention.org/imhc/papers/Higuchi_e.pdf.

21. The actual number of fatal accidents in TVE mines could be much higher as many accidents might not be properly reflected in Figures 9 and 10 due to widespread underreporting. TVE mine owners, often with the aid and knowledge of local officials, have a strong incentive to cover up deaths at their enterprises.

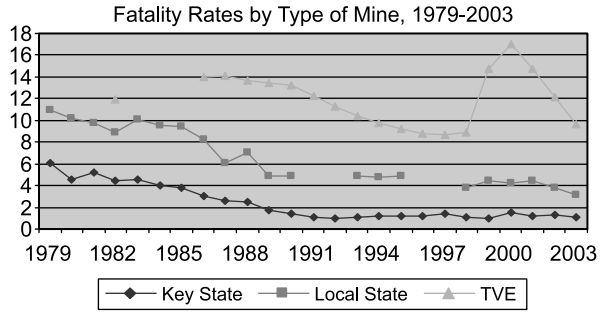

Figure 10. Fatality rate by type of mine, 1979–2003.
Source: *Zhongguo meitanzhi zonghejuan*, pp. 406–407; *Zhongguo meitan gongye nianjian*, various years.

seven main coal-producing countries. While China's safety performance has improved, its present safety levels are arguably the worst in the world. At the beginning of the twenty-first century, deaths per million tons of coal mined ranged from 0.03 per year in the USA to 0.08 in South Africa to 0.29 in France to 0.46 in India and to around 4 in China. In other words, China's fatality rate was about 130 times higher than the US, 50 times higher than South Africa, and nine times higher than India.

Problems with the regulated

If the experience of other countries proves that effective regulation can substantially reduce fatal accidents, then why have the number and rate of fatalities in China's coalmining industry remained so high? More specifically, why did the safety improvement observed in the 1980s loose momentum in the 1990s? To answer these two related questions, we have to look at both sides of safety regulation: the regulated and the regulators. It is probably only possible for coalmines to become safe if actors (including operators and workers of mines) in the industry are willing to comply with the safety rules and regulators are able to enforce obedience to those rules. This section deals with the issue of willingness on the part of the regulated, while the next section examines the issue of capacity on the part of the regulators.

Before doing so, a brief remark on arduous geographical conditions of coalmines in China is in order. Compared to coalmines in the United States, Australia, and other major coal producing countries, China's coalmining industry in general has four features. First, underground mines dominate and surface mines are rare. Obviously strip mining is safer than underground mining. Second, mines are very deep, averaging around 400 meters now and increasing about ten meters downward every year. Many old state mines are drilling at depths beyond 1,000 meters with extremely high temperatures. Third, workable

Table 1. International comparison of coal mine fatality rates

	China	USA	Japan	S. Africa	India	Germany	France
1950		1.27	19.90		9.30	5.13	5.1
1955		0.94	15.60			4.31	2.56
1960		0.83	11.72		4.81	2.46	2.01
1965		0.54	6.75				1.85
1970		0.47	4.26		3.05	1.08	1.64
1975		0.26	3.57			0.78	0.74
1980	8.17	0.17	1.22	0.89	1.33		
1981		0.21	7.00		1.26		
1982		0.16	1.36	0.99	1.28		
1983		0.09	1.00	1.49	1.24		
1984		0.16	5.99	0.68	1.09		
1985		0.08	4.90		1.21		
1986		0.09	0.93		1.11	0.48	
1987		0.08	0.64	0.54	0.85	0.39	
1988	6.78	0.06	0.54	0.30	0.93	0.34	
1989	6.67	0.07	0.68	0.30	0.84	0.41	
1990	6.10	0.07	0.24	0.28	0.54	0.26	
1991	5.21	0.07	0.12	0.24	0.63	0.32	
1992	4.65	0.06	0.49	0.23	0.69	0.45	
1993	4.78	0.06	0.28	0.25	1.18	0.22	
1994	5.15	0.05	0.15		0.75	0.29	
1995	5.03	0.05	0.32		0.54	0.26	0.12
1996	4.67	0.04	0.00		0.48	0.25	0.37
1997	5.10	0.03	0.47	0.60	0.54	0.19	0.15
1998	5.02	0.03	0.47		0.47	0.19	0.15
1999	5.30	0.03			0.45		0.00
2000	5.86			0.13	0.46		0.29
2001	5.13		0.00	0.08			
2002	4.64	0.03					
2003	4.17						
2004	3.08						

Source: Author's databank.

seams are in the main very thin. Finally, over one-third of mines fall into the category of 'high gas content', one-third have seams that are prone to self-ignition, and a half face the high risk of dust explosion.[22] Together, those features not only make coalmines in China more vulnerable to occupational hazards and risks but also make it relatively more expensive to invest in both production and safety equipment, and more difficult to introduce and implement safety procedures.

Problems with operators of state mines

Reforms that have opened China to market forces have had an enormous impact upon the coalmining industry. Once shielded by 'soft budget constraints', starting

22. State Administration of Coal Mine Safety Supervision, *Meikuang lingyu yanjiu baogao, 2004–2010*, 22 December 2003, available at http://www.chinasafety.gov.cn/file/2004-01/kjgh-3.doc.

from the late 1980s, state mines had to compete on both domestic and international markets. Competition forced them to increase productivity and reduce costs. Under such circumstances, pressures to contain production costs and improve productivity on the one hand and to establish and maintain safe systems of work on the other were deemed contradictory. As the pursuit of profit became the overriding concern, managers of state mines often regarded safety as an unnecessary distraction from their main task. In order to become and stay profitable, many state mines closed down or sold off parts of their business deemed inefficient or unprofitable and undertook massive layoffs and vast reorganizations in the 1990s. For the same reason, state mines also became less willing than before to provide a safe working environment if doing so incurred great expense. In the meantime, it was a common practice for mine managers to be subcontracted to run the mines on a short-term profits basis. Under such subcontracts, these state mines were effectively operated as if they were private entities. The only difference was that the subcontractors enjoyed merely temporary control rights, not outright ownership over these mines. Lacking a long-term interest in the mines and those who worked there, the subcontractors had few incentives to invest in safety or halt production to fix serious safety hazards.

Before 1988, much of the investment in safety in state mines came from budgetary allocation. During the Sixth Five-Year Plan period (1981–1985), for instance, a total of 1.15 billion yuan was spent on upgrading existing safety equipment or installing new safety equipment,[23] which contributed to a continuing downward trend in the reported fatality rate at state mines for the decade of the 1980s. After 1988, this cash allocation disappeared. Instead, a so-called 'maintenance charge' at the rate of 0.5–1.0 per ton of coal extracted was introduced and the income went into special funds.[24] Supposedly, a certain percentage of the funds had to be set aside for safety investment. For several years, this new system worked fine because the government still could manipulate the price of coal and control the funds.[25] After 1993, when the price of coal was gradually liberalized and the autonomy of state-owned enterprises was greatly expanded, the government was no longer able to control effectively how the funds were used. Especially when an excess of coal production depressed the price of coal in the mid-1990s, state mines that had already run at a heavy loss were desperate to reduce costs by whatever means. One choice was to sacrifice safety. During the Ninth Five-Year Plan period (1996–2000), state mines were supposed to invest RMB 4.2 billion on the 'one tunnel, three preventions', or RMB 840 million per year on average. The actual amount invested, however, was only RMB 400 million per year or less than half. Due to insufficient investment in safety, many shafts did not have adequate ventilation and monitoring systems. Other

23. *Zhongugo meitanzhi zonghejuan*, p. 405.
24. The rate has changed since the introduction of the charge.
25. For instance, in 1992, the government introduced a 'co-ordinated and planned increase' in the price of coal by RMB 1.00 per ton and the increased revenue was allocated to gas and dust prevention measures. As a result, 86 state mines where serious gas-related disasters had taken place were able to improve their ventilation, monitoring and other safety facilities. Consequently, gas-related accidents in state-owned key mines were reduced. Li Wenjun, 'Quanguo meikuang anquan shengchan zhuangkuang fenxi jiqi fazhan duice', *Zhongguo meitan* 27(6), (June 2002), pp. 53–55.

safety equipment used in production was often too old to be effective, and newer and safer alternatives were simply too expensive for many medium, and even large, states mines.[26]

Problems with operators of TVE mines

At TVE mines, especially those small private-owned mines, there is an even stronger temptation for managers to cut corners on safety. This is so, not so much because they are unscrupulous, as because they are rational. First, the existence of fixed costs and economies of scale in reducing occupational hazards implies that it is relatively more expensive for small mines to conform to safety regulations than larger mines. In this sense, TVE mines' small size does not allow them to make the same efforts in improving occupational safety as large enterprises. Second, due to a government crackdown against small-scale mines in recent years, their operators are uncertain about how long they will be able to stay in business. Therefore, they strive to make a quick profit and are inclined to skimp on safety equipment to cut costs. Third, the high labor turnover experienced by those mines is a disincentive for them to invest in the safety training of workers. Besides, most owners and managers of small mines themselves are originally farmers and have little knowledge about, and training in, OSH,[27] which means that they are not well placed to plan and implement adequate safety measures, even if they take positive attitudes towards safety.

Indeed, most small coalmines in China are badly designed and miners often have to work under tough and dangerous conditions with their bare hands or primitive equipment. Many mines in some of China's most gaseous regions fail to follow even the most basic safety procedures such as the installment of gas ventilation and monitoring equipment. A spark is all that is needed to set off a huge explosion.[28] Pervasive and serious under-investment in small TVE may partially explain why their fatality rates are much higher than those observed at large and medium-size state mines.

Problems with workers

Prior to the reform, workers at state coalmines had been relatively well paid. This situation remained largely unchanged during the 1980s. Entering the 1990s, most state mines began to suffer heavy losses due to the removal of state subsidies as well as growing competition. Consequently, as many as two million coalminers were laid off from bankrupted or troubled state-owned operations. By the late 1990s, most old workers who had once enjoyed 'iron-bowls' either retired or were sent home.

26. *Ibid*.; Yang Daming, 'Woguo meikuang anquan shengchan xianzhuang yu duice', *Keji daobao* no. 7, (2001), pp. 57–60; Wang Lin, Li Yuming and Zhu Jianfang, 'Meikuang anquan shengchan xianzhuang fenxi jiqi duice', *Hebei meitan* no. 6, (2002), pp. 4–6; Liu Qingfeng and Zhao Wenwei, 'Meikuang anquan shengchan de xianzhuang chengyin jiqi duice', *Meikuang anquan* no. 2, (2002), pp. 53–55.

27. A survey of 446 managers of TVE mines in Jiangxi Province in 2001 revealed that two-thirds of them had only junior high education. See Wang Yingjie, 'Moqing dishu duizheng shizhi', available at http://www.modernsafe.com/ShowArticle.asp?ArticleID = 164. Among the 8,512 managers of TVE mines who took qualification exams in 2002 and 2003, only 49% of them passed. See *People's Daily*, (18 September 2003), p. 5.

28. Wei Maohe, 'Xiangzheng meikuang anquan shengchan zhengzhi duice', *Laodong baohu zhazhi* no. 8, (2001), pp. 35–36; Wu Qiang and Yang Daming, 'Lun Woguo xiangzheng meikuang de anquan shengchan guanli', *Keji daobao* no. 10, (2002), pp. 47–50.

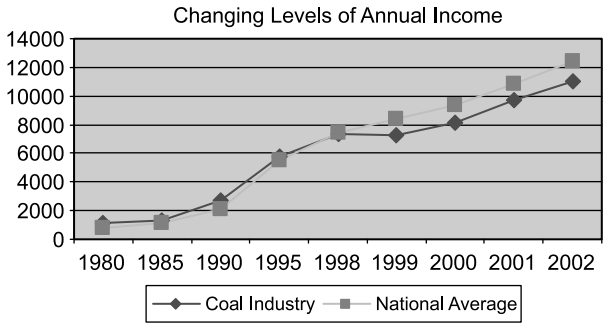

Figure 11. Changing levels of annual income.
Source: Wu Yin, 'Meitan gongye xingshi yu fazhan', (11 April 2003), available at *www.zgmt.com.cn/2003/gclt2003/wu.ppt*.

Replacing them was a new workforce who was mainly composed of inexperienced young farmers with short-term contracts or with no contracts at all.[29] One indicator of the changing profile of the workforce at state mines was a decline of annual income for coalminers relative to the national average (Figure 11).[30] By the end of 2002, the income of coalminers ranked second to last among 49 types of occupations.[31] Disheartened by the falling relative income, many of the remaining skilled workers and technicians have left the industry. The falling relative income also discouraged well-educated persons from going into the industry.[32]

While the workforce with sufficient expertise and the institutional knowledge at state mines were largely gone, the overwhelming majority of workers at TVE mines were farmers with at best a basic education to begin with. Some of them came from within the mining areas where few alternative sources of employment were available. Others were migrants drawn from remote and impoverished places. Clearly, becoming a coalminer at TVE mines was less a career choice than an act of desperation. Poverty compelled them to accept unusually hazardous working conditions, including working in illegal single shaft mines that operated in isolated areas where there were few chances of being discovered by safety inspectors. They normally received little formal training before heading below ground and thereby lacked the knowledge and skills to prevent accidents from occurring and to deal with them when they did occur. Moreover, typically employed on piece-rates, they tended to work more hours per day and thus had longer exposure to hazards than those working at state mines.

29. Yang Xinhua and Qin Xuegui, 'Meikuang anquan shengchan wenti fenxi jiqi duice qiantan', *Shanxi keji* no. 2, (2002), pp. 43–44; Li Xianjie and Wang Fengmin, 'Meikuang anquan shigu yuanyin fenxi jiqi fangfan duice', *Neimenggu meitan jingji* no. 5, (2001), pp. 2–4.

30. Project Study Group, 'Meitan zhigong laodong baochou xianzhuang ji duice', *Zhongguo meitan* 29(9), (September 2003), pp. 6–29.

31. CCTV, 'CCTV forum: Kuangnan de jingshi', available at http://www.ccgov.org.cn/bgov/gzgdbtt/g2003110054.htm.

32. He Aimin, 'Dangqian meikuang anquan cunzai de zhuyao wenti ji duice', 25 March 2004, available at http://www.jxmkaqjc.gov.cn/2004-3/2004325101532.htm.

No doubt, the presence of vast numbers of untrained seasonal and migrant workers, the prevailing contract system, and unstable employment have contributed to safety problems at both state and TVE mines.

Problems with local governments

Local governments at the levels of county and township are supposed to be regulators of coalmine safety, but in fact, they often act as if they were the operators of mines in their jurisdictions.

As indicated by Figure 2, China's richest coal resources happen to lie beneath some of its poorest provinces (e.g. Guizhou, Sichuan, Shanxi, Henan, Shaanxi, Anhui, and Neimenggu) and its 'rust belt' (e.g. Heilongjiang and Liaoning). Coalmining is the life-blood of many areas in those provinces. It creates not only jobs but also local tax revenue. In some cases, TVE mines provide the only major source of income. Strapped for cash, local governments often depend upon taxes from small mines to meet their running costs, including their own salaries. The need for jobs and tax revenue thus easily outweighs safety. Local governments often turn a blind eye to the flouting of safety regulations in an attempt to generate funds for desperately needed basic services.

Moreover, the close relationships between government officials who grant operating licenses to coalmines and local entrepreneurs who operate mines are open to abuse since there is no check on the power of local officials and owners who benefit from the mining. It is not uncommon for local government officials to sit secretly on the board of directors of small mines or take kickbacks from mine owners. Collusion between them makes safety enforcement nearly impossible.[33]

In recent years, the central government has pushed very hard to improve coalmine safety. However, it is not easy for Beijing to enforce safety directives on cash-strapped local governments. Although many thousands of unsafe small-scale mines were closed down each year by the central authorities, they often sprang up again after inspectors had left. Illegal shoddy mines were able to evade central control largely because local authorities paid only lip service to safety issues and did not really take instructions from Beijing seriously.

Problems with regulators

Since the foundation of the PRC, 'safety first' and 'prevention as priority' have been the guiding principles for the development of the coalmining industry. However, the principles cannot bring about safety by themselves. It is imperative to put in place a mechanism for standard setting and enforcement so as to ensure that mines are indeed safe.

China's first national agency that focused on coalmine safety was the Division of Safety Inspection under the Ministry of Fuel Industry, established in October 1949. Following the Soviet model, in 1953 China began to introduce an elaborate system of mines' inspection at three levels: national, regional, and areal . By the end of 1955, all ten mining regions and 27 mining areas had established inspecting agencies.

33. *Ibid*.; Wei Maohe, 'Xiangzheng meikuang anquan shengchan zhengzhi duice'.

During the height of the Great Leap Forward this system was regarded as an unnecessary obstacle to increased production and was thereby abolished. The national agency of coalmine safety was resumed under the Ministry of Coal Industry in 1962 but agencies at lower levels did not re-emerge until the following year. However, soon after the Cultural Revolution broke out, which threw the whole country into turmoil, the system of mines inspection was again shut down. After an interval of 12 years (1966–1977), a system of coalmine safety inspection recommenced at the national, provincial and regional levels in 1978. Five years later, in 1983, the Ministry of Coal Industry issued the Ordinance on Coalmine Safety Inspection, which assigned the responsibility for safety enforcement to the department of inspection within the ministry, the bureaus of inspections at the provincial level, the divisions of inspection at key state mines, and the sections of inspection at the county level. By 1990, there were altogether about 31,000 inspecting officers at various levels throughout China. The structure of the system remained more or less unchanged until 1999.[34]

The pre-1999 system had two characteristics that need to be emphasized. First, it covered only state mines, with TVE mines excluded. Second, all inspecting agencies were subordinate units within the administrative organizations in charge of coal production at the same levels. Before the reform, when the state not only owned but also ran those mines and the mines did not have to assume sole responsibility for their own profits or losses, the system worked quite effectively. This is evident from Figure 8: whenever the system was functioning (1953–1957 and 1961–1965), the fatality rate declined. Conversely, whenever the system crumpled, the rate soared.

Two changes after the reform eroded the effectiveness of the system. One was the proliferation of TVE mines and the other was the replacement of ‘soft-budget constraints’ with ‘hard-budget constraints’ for state mines.

Compartmentalization

As indicated by Figure 12, the number of TVE mines grew rapidly in the 1980s and much of the 1990s. During this period, however, the safety administration of TVE mines was quite fragmented, which was a serious obstacle to the development of a clear and comprehensive strategy for promoting safety at TVE mines and to its effective implementation. The State Council authorized the Ministry of Coal Industry to take on the duty of ‘professional management’ over TVE mines in 1986.[35] But such ‘professional management’ was limited to ‘overall planning, organizational coordination, service provision, and supervision’. The Ministry of Agriculture was entrusted to oversee all kinds of TVEs, including TVE coalmines. Each TVE bureau underneath, from the ministerial level down to the township levels, was supposed to have an OSH unit.[36] In the meantime, the Ministry of Labor was responsible for enforcing OSH legislation and promoting OSH management in

34. *Dangdai zhongguo de meitan gongye*, pp. 231–235; *Zhongguo meitanzhi zonghejuan*, pp. 399–401; *Zhonguo anquan shengchan nianjian, 1979–1999* (Beijing: Minzhu chubanshe, 2000), pp. 118–121.

35. State Council, ‘Guanyu xiangzheng meikuang shixing hangye guanli de tongzhi’, (13 December 1986).

36. In 1984, the Ministry of Agriculture issued ‘Xiangzheng meikuang anquan shengchan ruogan zhanxing guiding’.

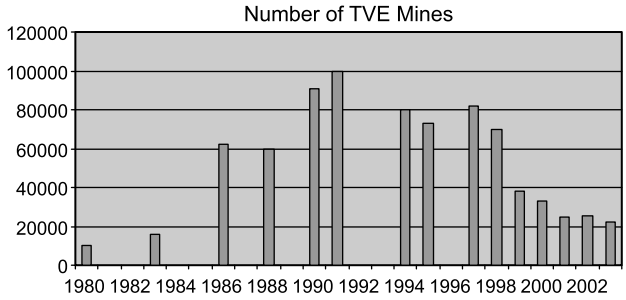

Figure 12. Number of TVE mines.
Source: *Zhongguo meitan gongye nianjian*, various years.

all enterprises, including the mining industry.[37] In addition, the Ministry of Geology, the Ministry of Public Security, the Ministry of Public Health, and other government departments were also to a certain degree involved in the administration of safety at TVE mines.

Having different agencies responsible for safety did not help to enhance safety. On the contrary, a segmented framework was an obstacle to the development of a coherent and consistent approach to safety issues. Since the distribution of duties between different government agencies was not clearly defined, it was difficult for them to coordinate their actions. While their actions might be consistent with their own areas of responsibility and interests, the potential for contradiction between them was high. Compartmentalization not only led to conflict and shirking, but also undermined the importance of safety by diminishing incentives to treat safety related problems seriously, weakening enforcement efforts and leaving gaps in regulation and coverage.

Obsoleteness

Starting in the 1980s, SOE reforms gradually transformed the nature of state mines. While they were still state-owned, they were no longer state-run. As 'soft-budget constraints' were replaced by 'hard-budget constraints', they were expected to be financially independent. The possibility of bankruptcy thus hung over state mines like the sword of Damocles. In order to survive fierce market competition, they often chose to ignore safety in search of greater profit. Precisely when the existing system of safety inspection became obsolete and a mechanism of third-party enforcement was badly needed, the guiding principle of OSH enforcement changed from 'state monitoring, administrative department managing and mass checking' to 'enterprise responsible, state monitoring, administrative department managing and mass checking'.[38] It was ironic that state mines, which had just recently acquired incentives to pursue profits at the expense of safety, were given a primary role in ensuring safety. The result was predictable: the noticeable declining trend of the

37. Ministry of Labor, 'Xiangzheng meikuang kuangjing anquan shengchan tiaojian hege zheng shishi banfa', (9 June 1990); 'Guanyu xiangzheng meikuang kuangzhang anquan zige kaohe fazheng wenti de fuhan'.

38. Zhang Rongji, 'Goujian xinzhi bixu zhengshi lishi zunzhong xianshi', available at http://www.anquan.com.cn/article/ShowArticle.asp?ArticleID = 3420.

fatality rate at state mines observed during the 1980s came to a end in the 1990s (see Figure 10).

Frequent government restructuring

Frequent government restructuring in the 1990s further complicated the task of coalmine safety inspection. When the decade began, the coalmining industry was overseen by the Ministry of Energy. In 1993, the Ministry of Energy was abolished and the Ministry of Coal Industry, which had been closed down in 1988, was resumed. Barely five years later the State Council made a decision in 1998 to restructure the government again. As a result, the Ministry of Coal Industry was downgraded to a bureau within the State Economic and Trade Commission (SETC). The Bureau of Coal Industry no longer directly controlled any mines, as the management of the final 94 key state mines was shifted to local government departments in the same year.[39] In the following years, government restructuring speeded up. At the end of 1999, the State Council decided to set up the State Administration of Coal Mine Safety alongside the Bureau of Coal Industry. For the first time, China's mechanism of coalmine safety inspection was institutionally separated from its mechanism of coalmine production administration. In 2000, a new round of government restructuring did away with the Bureau of Coal Industry altogether, which brought to an end the history of state administration of coal production.

All those changes in the 1990s may well be necessary. Yet, they led to considerable confusion within the system of coalmine safety inspection. Those who worked in the system were in a constant state of anxiety throughout the process, especially in the last three years of the decade, not sure about whether they would lose their jobs and where they would be transferred. Consequently, the chain of responsibility for safety matters became less clear, overall accident statistics became less accurate, and safety rules were not enforced as strictly as before.[40]

Shortage of trained inspectors

Another key obstacle to effective enforcement was an acute shortage of trained inspectors to enforce safety rules. In the 1990s, there were about 30,000 coalmine inspectors within the industry, the majority of whom were employees of specific state mines.[41] In addition, the Ministry of Labor had a network of about 12,000 OSH inspectors at the provincial, prefectural and county levels, who covered all industries, including coalmining. The number of inspectors was apparently insufficient in a country that had as many as 100,000 coalmines to police. Inadequacy of inspection resources was most severe at lower levels. At the county level, for instance, the coal bureau and the labor bureau each typically had four or five inspectors. They were responsible for raising safety awareness, training managers and workers, helping

39. State Council, 'Guanyu guoyou zhongdian meikuang guanli tizhi youguan wenti de tongzhi'.

40. Zhang Rongji, 'Goujian xinzhi bixu zhengshi lishi zunzhong xianshi'; 'Yichang youguan meitan changliang de diaocha zhengzai gedameitan qiye jingji zhankai', available at http://www.chinacoal.org.cn/coal/jryw/040323x2.htm.

41. *Zhongguo anquan shengchan nianjian*, 1979–1999, p. 120.

mines to set up safety management systems, as well as inspecting workplaces. Most townships could not afford to hire full-time OSH inspectors. Even if they could, the technical training for such inspectors was rather poor. Due to the lack of competent manpower at the county and township levels, inspectors typically investigated only upon complaint. Rarely were the inspectors in a position to routinely and randomly inspect most mines. Perhaps most collectively and individually owned small mines were outside the scope of inspection. As inspections were carried out for only a small proportion of the operating mines, safety monitoring in most cases was reduced to a mere formality.

Toothlessness

Furthermore, regulatory agencies in China often acted as 'toothless tigers', unable to achieve their stated goals because of the low level of punishment imposed upon non-compliant mines.

To maximize compliance with coalmine safety rules, regulators should adopt a 'carrot and stick' approach. It is ideal if advisory and persuasive measures can attain compliance, but deterrence must be part of an effective enforcement strategy. When regulated organizations are profit maximizers, they are not expected to comply with a regulatory provision unless they judge that benefits of compliance exceed the costs of non-compliance. Hence, offenders should be punished with sufficient severity so that they and other potential violators will perceive that the costs of future violations exceed the perceived benefits. Only by doing so may compliance be incorporated by firms as an organizational norm.

In China, however, enforcement was dominated by persuasion and mild administrative sanctions (e.g. issuing Notes for Compliance or imposing fines) while prosecutions were rare. Mine safety inspectors did not have the power to order production to stop. Faced with a very low ratio of inspectors to premises to be inspected, the inspectors really did not have much choice other than avoiding the time consuming process of preparing and conducting costly prosecutions. Thus, prosecutions were brought only in response to serious injuries and fatalities. The fines for safety breaches were generally quite low. When mine owners/managers were found to operate their mines in violation of certain safety standards, they might be fined as little as RMB 5.00.[42] Even when unsafe operations resulted in injuries and fatalities, the penalties for the responsible owners/managers were far from severe. A collection of 'typical coalmine accidents' from 1997 to 2000 revealed that the maximum fine for offenders was no higher than RMB 50,000.[43] The government repeatedly threatened to sack managers of mines where more than ten people were killed, but such threats had little bite as far as TVE mines were concerned because they had few overhead costs.

42. *Zhongguo meitanzhi zonghejuan*, pp. 401–402. Also see the Ministry of Labor, 'Zhonghua renmin gongheguo kuangshan anquanfa shishi tiaoli', (30 October 1996), which provided that the maximum amount of fine should not be higher than RMB 50,000.

43. Zhao Congguo, 'Qianxi woguo meikuang anquan guanlu fangmian de buzhu', *Meikuang keji* no. 2, (2002), pp. 41–42.

Since the penalties for safety breaches were so mild, mine owners and managers did not have to take administrative sanctions seriously and their attitudes towards safety did not have to change, which contributed to a high level of fatality rate.

China's emerging regulatory system

Starting from the mid-1990s, the Chinese government began to release systematic information on coalmine fatalities[44] and allow the media to cover lethal accidents more extensively.[45] In the wake of a spate of reported coalmine tragedies, popular anger over the death tolls was mounting, which in turn put growing pressure on the government to do something about the dreadful state of safety in the country's coal industry. The government has responded by devoting considerable effort towards adapting its regulatory system to the country's transformed economy. By 2004, a new system had taken shape. What follows highlights important features of the emerging system.

Upgrading safety legislation

The current system in which coalmine safety is overseen has its origins in the years following the formation of the People's Republic of China in 1949. The first set of rules of safety operation for the coalmining industry was published in October 1950. In the following four decades, the Ministry of Coal Industry formulated a series of national standards concerning safe and healthy working environments for mines under its management. In addition, the ministry promulgated, from time to time, administrative decrees to deal with urgent safety issues.[46] Meanwhile, other ministries, such as the Ministry of Labor, the Ministry of Agriculture, and the Ministry of Geology, were also involved, to various degrees, in creating and administrating OSH rules for the industry, especially after non-state mines thrived in the 1980s. Furthermore, individual provinces often passed their own decrees on OSH that were applied at provincial level.[47] Since safety rules were developed in a piecemeal fashion and were applicable to enterprises, locations, and processes of a specific kind, they often resulted in a haphazard patchwork of different administrative arrangements for similar concerns, overlapping responsibilities, and compartmentalization of limited resources. By the 1990s, it became increasingly evident that such a legacy of the planned economy was not suitable for China's fast changing socio-economic environment.

Given the manifest inadequacies of piecemeal and compartmentalized arrangements and highly specific regulations, a main thrust of regulatory reform in China

44. *Zhongguo meitan gongye nianjian* did not disclose accident data before 1996. Since then, the yearbook has provided detailed information on fatal accidents.

45. Both *People's Daily* and *Xinhua News Agency* maintain special sections on their Web pages that list all coalmine accidents.

46. For instance, the Ministry of Coal Industry circulated 15 such decrees from 1980 to the mid-1990s. See *Zhongguo meitanzhi zonghejuan*, pp. 397–399; and *Zhongguo anquan shengchan nianjian, 1979–1999*, pp. 119–120.

47. For a complete list of rulings on the coalmining industry and coalmine safety stipulated by central government, see http://www.3jjj.com/bwfg.asp, and for local rulings, see http://www.3jjj.com/dffg.asp.

since the early 1990s has been to consolidate, harmonize, and upgrade miscellaneous administrative rulings into generic laws of wider ambit. Key new laws that deal directly or indirectly with coalmine safety are listed below.[48]

- The Mine Safety Law (1992): the objective of this law is to protect the safety and health of mine and quarry workers.
- The Labor Law (1995): its Chapter VI (Articles 52–57) deals specifically with OHS, and Chapters XI and XII provide additional protection for workers with regard to OHS.
- The Coal Law (1996): four chapters of the law (Chapters III, VI, VII and VIII) are related to OHS.
- The Administrative Inspection Law (1997): it provides the legal foundation for administrative supervision and inspection in general.
- The Law on the Prevention and Cure of Occupational Diseases (2001): the law stipulates the responsibilities of enterprises with regard to safe and healthy working conditions.
- The Ordinances on Coalmine Safety Inspection (2000): it provides the legal foundation for safety supervision and inspection in the coalmining industry.
- The Trade Union Law (1992 and 2001): Chapter III stipulates the rights of unions and their members, including the rights to refuse to operate if management fails to provide a safe working environment (Articles 24 and 26).
- The Work Safety Law (2002): China's first comprehensive legislation addressing workplace safety in general, the law specifies the rights and duties of employers, employees, trade unions, local governments, and OHS regulators. Detailed punishments are provided in Chapter VI.
- The Regulations on Licenses for Safe Production (2004): promulgated by the State Council, the regulation aims at promoting industrial safety in hazardous occupations through issuing 'safe production licenses'.

Enacted by the National People's Congress or the State Council, those laws and regulations provide a legal framework under which the state can regulate coalmine safety more effectively.

Upgrading institutional arrangements

To enforce those new safety laws in a consistent and impartial manner and, where appropriate, to hold people accountable for their failure to meet the requirements of the laws, China has overhauled its coalmine safety inspectorate in recent years.

Based on a decision made by the State Council at the end of 1999, the State Administration of Coal Mine Safety (SACMS) was established under the State Economic and Trade Commission to oversee the country's coalmine safety in 2000. Its functions overlapped with those of the State Administration of Work Safety (SAWS), another institution under SETC. In fact, only in name are the two institutions separated. They have since operated as a single institution and have become known as the SAWS/SACMS. In the same year, the Bureau of Coal Industry,

48. The list is by no means exhaustive.

China's last administrative body in charge of coal production, was abolished. To strengthen supervision of workplace safety, the 10th National People's Congress went a step further in 2003, deciding to upgrade the rank of the SAWS/SACMS to the level directly under the leadership of the State Council. Finally, in February 2005, the SAWS/SACMS was renamed the General State Administration of Work Safety/State Administration of Coal Mine Safety, with its administrative rank being elevated from vice-ministerial to full-ministerial level.[49] The status of China's coalmine OHS institution has never before been so high as it is today, which symbolizes how great an importance the government is attaching to coalmine safety in the country. The upgrading also provides an institutional guarantee for safety regulations to be more effectively implemented.[50]

In addition to its high administrative rank, the SACMS distinguishes itself from its predecessors in other two aspects. First, while China's coalmine safety inspecting agencies in the past were always subordinated to the administrative organizations in charge of coal production at the corresponding levels, the SACMS does not have to worry about coal production at all. It is 'independent' in that its sole function is to regulate and enforce safety and occupational health in China's coalmines, nothing else. In other words, without any economical and institutional connections with the coalmines that they are entrusted to oversee, the SACMS and its branches can now act independently as third-party enforcers of regulation from outside of mines. Second, the whole SACMS system is organized vertically. In the past, inspectors in provinces were primarily the employees of local governments. As a result, localism could easily undermine the effectiveness of safety enforcement. Now all coalmine inspectors, no matter where their positions happen to be, are appointed by the SACMS head office and all provincial bureaus and regional offices are financed fully by the SACMS. Thus, inspectors are empowered to resist interference from local governments and faithfully perform their assigned functions.

Strengthening monitoring and enforcement

The enforcement of regulation is crucial to its success—no regulatory goals can be achieved unless they can be successfully enforced. The enforcement of coalmine safety regulations involves a host of procedures, which include: collecting accurate data on operating mines and work-related fatalities and injuries; conducting periodical inspections of each and every mine; issuing directives to manage risk when risk is found to be at an unacceptable level; investigating into non-compliance and imposing sanctions upon offenders accordingly; and, if necessary, launching prosecutions against those who are responsible for fatal accidents.

After its establishment, to meet its regulatory objectives, the SACMS has been busy in institutionalizing those procedures. Key documents it has drawn up in the last three years or so are listed below.

49. SAWS/SACMS, http://www.chinasafety.gov.cn/misc/2005-02/28/content_77529.htm.

50. Apart from its headquarters in Beijing, the SACMS has 19 provincial bureaus and 49 regional inspecting offices with a total staff of 2,800. Provincial bureaus are normally staffed by 40–60 and regional offices by about 20–25. See Central Commission of Personnel Control, State Commission of Economic and Trade, State Bureau of Coal Industry, 'Meikuang anquan jiancha guanli tizhi gaige shishi fang'an', (21 December 1999).

- Circular on Collecting Information about Safety Inspection (30 December 1999)
- Guidelines on Law-making with Regard to Safety Inspection (19 December 2000)
- Guidelines on the Management of Safety Inspection Archives (29 December 2000)
- Interim Procedures on Special Equipment of Safety Inspection (25 April 2001)
- Models for the Management of Safety Inspection Archives (2 July 2001)
- Interim Procedures on Handling Fines from Safety Inspection (29 June 2001)
- Interim Procedures on the Management of Safety Certificates for Coal Products (20 November 2001)
- Procedures for Safety Inspection Statistical Reports (4 December 2002)
- Procedures for the Management of Safety Inspectors (13 June 2003)
- Guidelines on Administrative Appeals with Regard to Safety Inspection (20 June 2003)
- Procedures for Administrative Sanctions on Safety Violations (2 July 2003)
- Guidelines of Coalmine Safety Assessment (19 November 2003)

The Ordinances on Coalmine Safety Inspection gives SACMS inspectors a right to enter any coalmine at any time, without advance notice, to conduct an inspection. They may check mining equipment, instruments and labor insurance documents to ensure they meet state standards. During an inspection, they can determine whether a mine operator is in compliance with safety standards. Specified by numerous guidelines, these standards cover such safety concerns as prevention of rock falls, ventilation, electrical and equipment safety, and the like. During 2003, SACMS compliance specialists conducted 76,546 mandatory inspections at 24,945 mines, covering 96.76% of the registered mines (25,781) in the country. The SACMS requires its provincial bureaus and regional offices to report to the Beijing headquarters at least twice a month in the form of semi-monthly bulletin. Such bulletins are made available on the SACMS website so that everyone in the industry can learn from them. Whenever a violation of safety is found, inspectors may issue various kinds of warning to the mine operator and set a time within which the mine operator must correct the condition. In 2003, China's coalmine inspectors issued about 184,900 notes of 15 different types. If SACMS compliance officers find potential safety perils during their inspections, they may order mine operators to correct the hazards within a reasonable time. During 2003, a total 374,400 of such hidden troubles were identified, of which 301,900 were reportedly removed in a timely fashion. Another major duty of SACMS inspectors is to investigate all fatal accidents and certain types of other serious incidents. In 2003, they looked into 3,134 cases and initiated prosecutions against 412 persons for failing to meet safety obligations.[51]

Rationalization of small mines

The excessively large number of small coalmines has long been a thorn in the side of China's regulators. Small mines' backward facilities and reckless methods of

51. '2003 nian meikuang anquan jiancha zhifa qude shixiao', available at http://www.chinasafety.gov.cn/anquanjianguanjiancha/2004-02/05/content_2158.htm.

excavation have endangered the lives of not only their own employees but also workers at adjacent larger state mines as they often make inroads into the latter's territory.[52]

In response to the high rate of accidents in small-scale mines, the government's initial reaction was to promote 'ten-word principles'—support, reform, rectification, cooperation, improvement—to ensure safe production.[53] However, such a lenient policy did not work. The mid-1990s witnessed rising fatality rates at TVE mines. By then the government realized that it was not possible to regulate small mines effectively unless their total number was to be reduced to a manageable level. In 1997, the government began to 'rectify' small coalmines that had failed to meet basic safety standards. More than 10,000 mines were closed within a year. At the end of 1998, the government stepped up its effort, requiring all unregistered mines and those small mines operating within the territory of large state mines to be shut down.[54] In the next two years, another 37,000 mines were forced to end their business. The government introduced yet another drastic measure to eradicate unsafe mining practices in 2001. This time, all TVE coalmines were ordered to stop production. They would not be allowed to resume production until they met stipulated safety standards.[55] By the end of 2003, the number of TVE mines had been reduced to around 22,000, which means that nearly 60,000 of the 82,000 small coalmines nationwide have been closed since 1997.[56] As Figure 10 shows, the sweeping closing and overhaul of small coalmines have greatly curtailed fatality rates.[57] More important, the massive program of closures has made it more likely than ever that small mines will be brought under the umbrella of regulations.

Changing regulatory style

Here the concept of regulatory style refers to the mode by which regulations are enforced. In the past ten years or so, there has been a significant change in the style of coalmine safety regulation in China, moving from enforcement through self-rectification to enforcement by third parties.

For more than four decades after the foundation of the PRC, the primary safety responsibility lay with those working within the coalmining industry. Central ministries and provincial governments provided standards to guide coalmines to achieve their production targets safely. These standards were extremely detailed

52. Their behavior also results in wasting valuable mining resources and damaging the environment. Besides, a glut of coal in the middle through to the late 1990s caused severe losses for large state mining companies. See *Quanguo meitan hangye guanjing yachan wenjian ziliao xuanbian* (Beijing: Meitan gongye chubanshe, 1999).

53. See Vice Premier Zou Jiahua's speech at the National Conference on TVE Coal Mines, 29 March 1994: *Zhongguo meitan gongye nianjian 1995*, pp. 113–117.

54. State Council, 'Guanyu guanbi feifa he buju buheli meikuang youguan wenti de tongzhi', (November 1998).

55. Office of the State Council, 'Guanyu guanbi guoyou meikuang kuangban xiaojing he xiangzheng meikuang tingchan zhengdun de jinji tongzhi', (June 2001); 'Guanyu jinyibu zuohao guanbi zhengdun xiaomeikuang he meikuang anquan gongzuo de tongzhi', (September 2001).

56. Some have suggested bringing the total number of small mines down to 5,000 by the end of the Tenth Five-Year Plan period. See Wu Qiang and Yang Daming, 'Lun Woguo xiangzheng meikuang de anquan shengchan guanli'.

57. However, the resultant leap in coal prices has led to the owners of hundreds of illegal and small coal operations reopening their mines to cash in on the bonanza, despite running the risk of prosecution.

and technical, prescribing specific requirements to be fulfilled by managers,[58] team leaders,[59] engineers, and workers[60] for creating and maintaining a safe workplace.[61] These statutory standards were enforced mainly by internal safety officers through various forms of reward/punishment.[62] On the one hand, if a mine suffered from safety problems, it might be ordered to conduct 'self-rectification' and those who were responsible might receive reduced salaries as a punishment. Disciplinary penalties (including dismissal) might also be applied in cases that incurred injuries and deaths. On the other hand, if a mine was able to substantially reduce the number and rate of fatalities, all those working at the mine might be rewarded with bonuses.[63]

This form of enforcement worked fine when the coalmining industry was dominated by SOEs and when SOEs did not have to worry about profits or losses. However, the removal of 'soft-budget constraints', the growing pressure of market competition, and, above all, the rise of TVE mines made this mode of enforcement obsolete. Even though measures to mitigate safety hazards may have a beneficial effect on productivity and profitability in the long term, markets typically impose short-term horizons, and profits often take precedence over factors that concern the safety of those working within the mine. Since a profit maximizing mine simply would not have much incentive to comply safety standards if non-compliance were unlikely to be detected or punished by external enforcers, it becomes imperative to introduce a new mode of enforcement, one that makes clear that non-compliance is likely to be detected and harshly penalized.

In 1997, the Ministry of Coal Industry issued 'Procedures of Administrative Penalties for the Coal Mining Industry',[64] which deviated from the previous approach of enforcement by focusing on punishment alone, no longer employing reward. However, at that time, the function of enforcement was still performed by internal safety officers from within the industry, which hindered the effectiveness of enforcement due to the contradictory roles of their bosses. In 2000, as soon as the SACMS became an independent enforcing agency of coalmine safety rules, the State Council promulgated 'Ordinances on Coalmine Safety Inspection', Chapter IV of which was entirely devoted to 'penalties'.[65] Each violation of the safety standards identified is supposed to result in some form of punishment proportional to the seriousness of the transgression. Most offenses receive monetary penalties, ranging from RMB 30,000 to RMB 150,000. The amounts depend on several criteria, including the seriousness of the violation and the mine operator's negligence involved in the occurrence. Mine owners may be deprived of their operational licenses if they refuse to comply with the safety regulations. In cases where mine

58. Ministry of Coal Industry, 'Guanyu dui geji anquan shengchan diyi zerenren de jixiang guiding', (1987).
59. Ministry of Coal Industry, 'Guanyu kuangjing qudui banzhuzhang anquan zhize de zhiling', (1988).
60. Ministry of Coal Industry, 'Meikuang zhigong anquan jishu peixun guiding', (1994).
61. Examples include 'Meikuang anquan zhuangbei jiben yaoqiu', (1983); 'Meikuang anquan guicheng', (1986); 'Xiangzheng meikuang anquan guicheng', (1987); 'Fangzhi mei yu wasi tuchu xize', (1995).
62. Ministry of Coal Industry, 'Anquan jianduyuan guanli zhanxing guiding', (1994).
63. Ministry of Coal Industry, 'Guanyu zai guanche zhixing meitan zongchengbao fang'an zhong qieshi gaohao anquan gongzuo de tongzhi', (1985); 'Guanyu meikuang qiye anquan shengchan jiangchengzhidu de jueding', (1986); 'Guanyumeikuang qiye anquan shengchan jiangcheng zhidu de buchong tongzhi', (1986); 'Guanyu tongpei meikuang anquan shengchan jiangcheng de zhanxing guiding', (1996).
64. Ministry of Coal Industry, 'Meitan xingzheng chufa banfa', (1997).
65. State Council, 'Meikuang anquan jiancha tiaoli', (2000).

operators fail to give timely reports of coalmine accidents, tamper with the scene to play down the scale of an accident, or interfere in or reject an investigation of an accident, they may even face criminal charges.

Improving safety equipment

In recent years, the government has also pumped billions of yuan into investment for improving mine safety through technical innovations and the purchase of safety equipment for major state-owned coalmines. During the three years of 2001–2003, for instance, a total of RMB 5.6 billion was invested in 232 safety improvement projects. In 2004, the government decided to infuse the industry with another RMB 4.0 billion for the same purpose. Shanxi Province, the largest producer of coal in China, has pioneered a province-wide information network that can transmit vital information (e.g. hidden perils, accident alarms, security surveillance, on-line safety training, and data distribution) instantly between the control center and individual mines throughout the provinces. Completed by 10 April 2004, this system is expected to help improve coalmine safety for Shanxi. Other coal-producing provinces are likely to follow suit. At the beginning of 2005, the government committed another 3 billion yuan to technological renovation on work safety, gas management in particular, at state-owned major coalmines.[66]

Conclusion

The last quarter of a century has witnessed a sea change in the relationship between the state and the economy in China. As this case study of the coalmining industry shows, sectors that were once owned and run by the state have gradually been denationalized and marketized. Twenty years ago, Tang Tsou coined the concept of a 'totalistic state' to characterize state–society/economy relations in China for much of the twentieth century. The defining attribute of a totalistic system, according to Tang Tsou, was limitless state penetration into socioeconomic life.[67] Apparently, the wave of marketization and denationalization has largely dismantled China's totalistic state; at least this is true in economic spheres.

However, the withdrawal of direct state control over the economy does not amount to a rise of self-regulating society. A modern society is a risk society where natural and humanly created hazards are ubiquitous and individuals are unable to secure protection from them separately.[68] Not only can market forces not help mitigate such risks, they may even generate new risks of their own. Karl Polanyi's was a true insight: 'market economy if left to evolve according to its own laws would create great and permanent evils'.[69] Therefore, wherever denationalization and marketization take place, what Michael Power calls the 'remanagerialization of risk'

66. *Xinhua News Agency*, 'China takes steps to halt coal mine disasters', Beijing, (23 February 2005), available at http://news.xinhuanet.com/english/2005-02/23/content_2625059.htm.

67. Tang Tsou, Ershi shiji zhongguo zhengzhi: Cong hongguan lishi yu weiguan xingdong jiaodu kan (Hong Kong: Oxford University Press, 1994), pp. 69–72.

68. Ulrich Beck, *Risk Society: Towards a New Modernity*, trans. M. Ritter (London: Sage, 1992); Anthony Giddens, *The Consequences of Modernity* (Cambridge: Polity, 1990).

69. Karl Polanyi, *The Great Transformation: The Political and Economic Origins of Our Time* (Boston: Beacon Press, 1944), p. 130.

Table 2. Totalistic state vs. regulatory state

	Totalistic state	Regulatory state
Scope of intervention	Comprehensive	Selective
Legal nature of rules	Administrative decrees	General laws
Applicability of rules	Regulatees	Regulatees + regulators
Position of enforcers	Internal	Third-party
Mode of enforcement	Persuasion + administrative chastisements	Monetary and criminal penalties

becomes imperative.[70] For this reason, what replaces China's 'totalistic state' in the wake of denationalization and marketization is not a Hayekian night-watchman state, but a regulatory state.

What exactly have changed? By summarizing the findings presented in the sections above, Table 2 highlights the contrast between the totalistic state and regulatory state along five dimensions.

First, the regulatory state no longer meddles with production but aims only at steering economic activities to secure certain social and economic objectives (e.g. controlling negative externalities or unintended consequences of production process in this case, but also curbing monopoly and promoting competition).

Second, while the totalistic state relies upon the promulgation of administrative decrees to maximize its discretional power, the regulatory state tends to formalize and codify rules or standards into generic laws.

Third, unlike the totalistic state where only regulatees are subject to rules, the regulatory state obligates both regulatees and regulators to follow statutory rules.

Fourth, while a totalistic state integrates operational and regulatory activities, the regulatory state separates them. Under the totalistic state, rules are enforced from within by the operators of economic entities who are considered to be state agents. In contrast, under the regulatory state, rules are enforced from outside by law-backed, freestanding, and specialized agencies.

Finally, the totalistic state is patriarchal in that it enforces its rules mainly through persuasion and administrative chastisements, but the regulatory state is more congruent with modernism, placing the emphasis on the use of monetary and criminal penalties.

As far as the issue of coalmine safety is concerned, the Chinese government has changed its mode of governance in response to such trends as denationalization and marketization. Strategic adaptation to the new realities has resulted in a reduced role for the interventionist state and a corresponding increase in the role of the regulatory state. There are reasons to believe that the emergence of regulation as an art and craft of governance is not limited to this particular area but is a more general phenomenon. Were this conjecture to be confirmed by future studies in other policy areas, then the case of China would once again bear testimony to Karl Polanyi's deep insight on the dynamics of modern society: the expansion of market forces would sooner or later be met by a countermovement, which, by using legislation and other instruments of intervention, aims at protecting man and nature as well as productive organization.[71]

70. Michael Power, *The Audit Society: Rituals of Verification* (Oxford: Oxford University Press, 1997), p. 138.
71. Polanyi, *The Great Transformation*, pp. 130–134.