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Challenging the emerging narrative: Critical examination of coalmining safety in China, and recommendations for tackling mining hazards

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ABSTRACT

Coal mining remains a dangerous occupation worldwide, and in China where this industry is strategically important for the country's economic development, its safety track record is particularly gruesome. Between 1990 and 1999, thousands of small and large-scale accidents in Chinese underground coalmines have caused over a reported sixty thousand fatalities. To tackle this significant problem, several laws were passed in support of mining safety, and two major institutional innovations were adopted in the late 1990s and early 2000s: the establishment of the State Administration of Coal Mine Safety (SACMS) and the State Administration of Work Safety (SAWS), the former is subsumed under the latter. Since the establishment of SAWS/SACMS, a new safety narrative has emerged, which posits that significant safety improvements have occurred over the last decade in Chinese coalmines, and that these improvements are the result of effective government policy and safety regulations.

The findings in this work, based on publically available official data, challenge this new safety narrative on several fronts. For example, we found evidence of significant under-reporting of fatality numbers in coal mining accidents. We also found that mining accidents are sometimes (mis)classified as "natural disasters", and as a result, their fatality numbers are not tallied in the official statistics. We assessed that the official fatality statistics may underestimate the actual fatality numbers by a factor ranging from 3 to 5. More importantly, we found it doubtful that safety improvements have occurred in operating Chinese coalmines since 2000. We inferred that the reduction in total fatality and accident numbers could be explained by the closure of small mines or the exclusion of their fatality statistics. We concluded with some recommendations and a list of coal mining hazards prioritized for targeted safety interventions and improvements.

1. Introduction: the new safety narrative of coal mining in China

Mining remains one of the most hazardous occupations worldwide, and underground coalmines are especially notorious for their high accident rates, compared with surface mines for example where more benign and visible hazards lurk. Underground coalmines are prevalent in China and account for over 90% of its coal production.

Coal in China is of vital importance and it is the backbone of the country's energy policy. The economic development in China and its co-requisite, energy production and availability, has been fueled to a large extent by coal. As such, there has been and will continue to be significant economic and political pressure for coal production.

The Chinese coal mining industry, which is unwieldy and fairly heterogeneous in terms of the characteristics of its stakeholders, has been on a roller coaster of economic and policy reforms over the last few decades, and it has not yet reached steady state. These reforms reflect to some extent the general changes that have taken place in the country in its transition from a planned economy to a market-driven economy, and more broadly the changes in mode of influence/intervention of the political sphere on the economic sphere.

It is against this backdrop that safety in Chinese coalmines has to be examined and understood. It is generally agreed upon that the safety track record of Chinese coalmines is appalling by any measure considered.

In addition, Chinese coalmines hold the dreadful world record for the most frequent number of accidents causing over a hundred deaths each. Table 1 provides a list of some of these disasters, which occurred after 2000.

Some of these disasters have received worldwide media attention, and comparisons have been made between the current situation in Chinese coals mines and that in the US before the 1970s. It

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is sobering to think of the human tragedies behind these numbers and the traumatic consequences that these disasters must have left in many communities and households.

An important trend before the 1970s in the US coalmines is the significantly high variability or frequency of peaks of the fatality rate per workforce, in sharp contrast for example with the variability of the fatality rate during the 1990s (see Fig. 1).[1] This high variability is the result of major catastrophic events or mining disasters, each of which claimed the lives of a large number of miners (Saleh and Cummings, 2011). Variability, not just average values, is an important feature of fatality rates and a good measure, among several others, of the (sustainable) efficacy of the regulatory regime and safety legislation.

The frequent mining disasters in China with significantly large number of fatalities attracted media attention nationally and internationally. The result was that the **safety conditions in Chinese coalmines could no longer be ignored or rationalized as necessary sacrifice or cost of economic development (they are not)**. In addition to being morally reprehensible, the situation developed some potential for social unrest and was turning into a reputation risk and an embarrassment for the leadership at different government levels.

This prompted strong action on the part of the central government. For example, several laws were passed in support of mining safety, e.g., the Mining Safety Law in 1993, the Coal Law in 1996, and the Administrative Inspection Law in 1997; these are briefly reviewed in Wang (2006) and Homer (2009).[2] More importantly for the purpose of the present work, two major institutional innovations occurred in the late 1990s and early 2000s, innovations which were meant to regulate and improve safety conditions in the workforce in general and coalmines in particular: the establishment of the State Administration of Coal Mine Safety (SACMS) and the State Administration of Work Safety (SAWS), the former is subsumed under the latter and is solely dedicated to coalmines safety (developing regulations, conducting inspections, etc.). SAWS has significant political clout and high administrative rank, reporting directly to the State Council, the highest executive organ of the country. Prior to SAWS/SACMS, mining safety was subsumed under the Ministries of Fuel or Coal, which were responsible for production, and as such had an intrinsic conflict of interest in arbitrating between safety and production pressures (Wang, 2006; Homer, 2009).

Since the establishment of SAWS/SACMS, significant safety related works[3] have been undertaken by these agencies, and a **new safety narrative has emerged**. The following statements are illustrative of this narrative:

(i) "Coal mines in China have become safer places to work... the fatalities per million ton of coal mined [has been significantly] reduced" (World Bank, 2008).

Table 1
Deadliest coalmine accidents post 2000 in China.

Location	Death toll	Date
Sunjiawan, Shanxi	214	February 14, 2005
Huayuan, Shandou	172	August 17, 2007
Dongfeng, Heilongjiang	171	November 27, 2005
Chenjiashan, Shanxi	166	November 28, 2004
Muchonggou, Guizhou	159	September 26, 2000
Daping, Henan	148	October 20, 2004
Jixi, Heilongjiang	124	June 20, 2002
Daxing, Guangdong	121	August 7, 2005
Liuguantun, Hebei	108	December 7, 2005
Xinyao, Shanxi	105	December 5, 2007
Xinxing, Heilongjiang	104	November 21, 2009

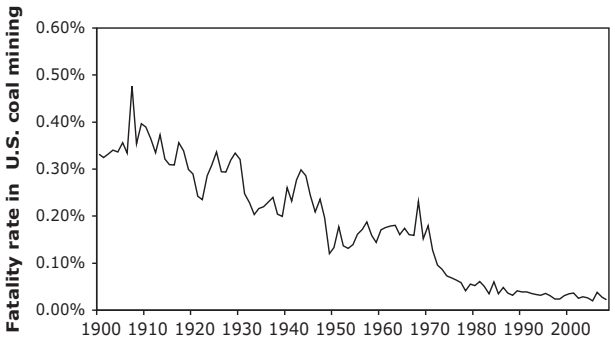

Fig. 1. Evolution of the fatality rate in the U.S. coal mining between 1900 and 2008. *Data source:* U.S. Mining Safety and Health Administration (Saleh and Cummings, 2011).

(ii) "Considerable progress was made in reducing mortality in [Chinese] coal mines" (Shen et al., 2012).
(iii) "Currently, the safety situation in the coal mining industry has much improved ..." (Lu and Li, 2011).
(iv) "The rapid decrease of deaths in recent years showed [the] efficiency of the administration, along with the government undertaking more aggressive, effective, and comprehensive measures..." (He and Song, 2012).

The new narrative posits (1) that significant safety improvement have taken place in Chinese coal mines, and (2) that these improvements are the result of the effectiveness of government policy, regulatory efforts, and actions to improve mining safety (World Bank, 2008; IEA, 2009).

This narrative has several components or sub-narratives, one of which is the alleged central importance of the fatality to production ratio, or "death per million tons (Mt) of coal" metric as a reflection of safety improvements and a measure of the regulatory efficiency in tackling safety problems in coalmines. For example, Yu and Chen (2013) note that, "the death [rate] per million tons is considered as the key index to the quality of coal mine safety management". The rationalization of this metric is presented as follows:

> "*The aim of safety inputs is to reduce the fatalities and injuries per million tons of coal. Mortality rate per million tons of coal can reflect a country's safety status of coal mines directly, and the efforts that a country makes on safety management [...]. Moreover [this metric] can be compared easily and exactly between countries.*"
>
> [Feng and Chen (2013)]

We argue later that this is a flawed view of the aim of safety inputs. The government also sets safety objectives in terms of reduction of the death per million ton of coal, which further

[1] The effectiveness of proper safety regulations is demonstrated in this figure around 1970. In 1969 Congress passed the Federal Coal Mine Health and Safety Act. This Coal Act of 1969 as it is known for short required for example four annual inspections of every underground coal mine, and it significantly increased federal enforcement powers in coalmines (MSHA, 2009). The effect of this legislation can be seen in Fig. 1 in both the dramatic reduction in fatality rate after 1970 and the reduction in variability (or peaks) in this rate. It is important to keep in mind that while these are simple statistics, they reflect a significantly important reality of lives saved or miners not killed and families not mourning. As such, effective safety legislation has both a political and economic underpinning, but it also comes with an important moral responsibility.

[2] In addition, in early 2003, the then Vice-Premier Wen Jiabao visited an underground coalmine, shared dumplings with the miners, and "urged officials to give priority to improving coal safety" (Wright, 2004). This may have been a clever communication effort, but it was also an important first step in signaling the growing safety awareness of the government's senior leadership.

[3] Issuing safety regulations and standards for example, and strengthening coalmine inspections.