Financial Leverage and Employee Death:
Evidence from China's Coalmining Industry

Huihua Nie and Huainan Zhao*

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Abstract

Examining a unique panel dataset of 22,076 firm-year observations for China's coalmining industry, we find that a firm's leverage significantly determines its coalmining fatality. We show, specifically, that leverage reduces a firm's safety investment and, hence, causes more fatalities. Our study draws important implications of financial policy to labor policy and calls for a more corporate-finance-based analysis on the well-being of employees.

JEL classification: G30, G32, J81

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* Huihua Nie is from the School of Economics, Renmin University of China, E-mail: niehuihua@gmail.com; Huainan Zhao is from Cranfield University School of Management, E-mail: huainanzhao@gmail.com. Special thanks to Ting Jiang for his detailed comments on the paper and to Minjie Jiang for his excellent research assistance. We are also grateful to Vineet Agarwal, Kevin Amess, Sanjay Banerji, Xin Chen, Ziying Fan, Ning Gao, Igor Goncharov, Jieying Hong, Yanghua Huang, Qingyuan Li, Wen Li, Fangwen Lu, Di Luo, Simona Mateut, David P. Newton, Bei Qin, Wing Suen, Yongxiang Wang, Yaqiong Yao, Steven Young, and seminar participants at the Chinese Academy of Social Science, Lancaster University, Renmin University of China, Shanghai Jiao Tong University, University of Hong Kong, University of Nottingham, and Wuhan University for their helpful comments. Nie acknowledges financial support from the New Century Excellent Scholar Program at Renmin University of China.

1. Introduction

Coal mining is the most deadly job in China.[1] Its annual fatalities averaged 4,643 between 2000 and 2011, some 140 times higher than in the U.S.,[2] whereas China's annual coal production was just twice that of the U.S.[3] In total, China accounts for approximately 80 percent of coalmining deaths worldwide (Tu, 2007). While recent papers shed light on the determinants of China's coalmining fatalities,[4] they are confined to cases, small samples, or provincial-level studies which overlook the cross-sectional variations of firm characteristics.

In this paper, we conduct a comprehensive firm-level analysis to identify the determinants of China's coalmining fatalities. Prior studies in the U.S. have suggested a negative relation between a firm's financial leverage and its employee benefits. High leverage reduces a firm's cash flow through high interest payments and the reduction in its internal (and external) resources would lead to an investment cut, especially the investment in employee benefits.[5]

[1] According to Tu (2007), the number of coalmining workers killed by mining accidents in China was over 250,000 since 1949. Wright (2004) note that coal mining accounts for less than 4% of the industrial workforce in China but over 45% of industrial fatalities.

[2] China's data are obtained from the State Administration of Work Safety (SAWS) website: http://www.chinasafety.gov.cn. The U.S. data are obtained from the Mine Safety and Health Administration (MSHA) website: http://www.msha.gov.

[3] BP Statistics Review of World Energy 2013, http://www.bp.com/en/global/corporate/about-bp/statistical-review-of-world-energy-2013/statistical-review.

[4] Wright (2004) and Tu (2007) attribute the high fatality rate to the hiring of low quality workers in local town/village owned mines. Wang (2006) points to ineffective monitoring by the state. Fisman and Wang (2014) show that executives' political connections significantly increase workplace fatalities. Jia and Nie (2015) find collusion between local government and coalmining firms to be responsible for the high death toll.

[5] High leverage not only directly reduces a firm's internal resources but also makes its external financing more difficult, since high leverage typically creates a debt overhang problem or leads to conflicts between shareholders and debtholders (risk shifting). As such, it reduces both a firm's internal and external resources.

Titman (1984) argues that firms' stakeholders such as their employees, who do not hold financial claims on the firms, bear many potential costs of debt. Maksimovic and Titman (1991) show that if firms want to commit themselves credibly to providing better employee benefits, they should have lower debt ratios than firms that do not implement employee friendly policies. Hanka (1998) finds that high leverage is associated with more frequent employment reductions, lower wages and reduced pension.[6]

Recently, Benmelech, Bergman, and Seru (2011) show that employment levels are sensitive to cash flow especially for highly-leveraged firms. Bae, Kang, and Wang (2011) find that firms that treat their employees fairly maintain low debt ratios. Agrawal and Matsa (2013) show that firms increase leverage following exogenous increase in unemployment benefits. Cohn and Wardlaw (2014) find that employee injury rates increase with leverage and negative cash flow shocks, and decrease with positive cash flow shocks.[7]

[6] In addition, the literature on trade unions shows that, due to bankruptcy concerns, a firm could strengthen its bargaining power with the trade union when negotiating workers' wages if the firm chooses to use more debt in its financing, suggesting a negative relation between leverage and employee benefits. See, for example, Bronars and Deere (1991), Perotti and Spier (1993), and Matsa (2010).

[7] Cohn and Wardlaw (2014) is the closest work to our study. They use establishment-level data from the U.S. Bureau of Labor Statistics's annual Survey of Occupational Injuries and Illnesses for 2002-2009, and examine a relation between employee injury rates and firms' financial resources. Our study, however, differs from Cohn and Wardlaw (2014) in several important ways. First, their study has a broad coverage on financial constraints/resources and workplace injuries, while our work is solely focusing on leverage and employee death. Second, they use employee injury data, while we use employee death data which is an extreme form of injury and can be more clearly defined. Third, the regulatory environment and institutional settings between U.S. and China are vastly different. Injuries or deaths are recognized and treated in entirely different ways. For example, punitive and reputational damages are far higher in the U.S. than in China. Fourth, their sample does not include the coalmining industry while ours is focused solely on this industry (in their sample, injury rates are highest in the candy and soda, fabricated products, and transportation industries). Overall, their

In the spirit of these earlier studies, we posit that a coalmining firm's leverage is significantly related to its employee fatality.[8] However, "China is an important counterexample to the findings in the law, institutions, finance, and growth literature" (Allen, Qian, and Qian, 2005) and, as echoed recently by the *Financial Times*: "Fair enough in theory. But China is where theories go to die."[9] Thus, given its completely different institutional framework and regulatory environment as compared to the U.S., the proposition may not hold for China. We therefore test what role, if any, leverage plays in determining China's coalmining fatalities.

To conduct this analysis, we hand collect coalmining accidents and deaths data from the State Administration of Work Safety (SAWS) and the State Administration of Coal Mine Safety (SACMS). We then merge these data with the Chinese Industrial Enterprise Database (CIED) to obtain firm-level data for coalmining firms. We form a unique panel dataset of 22,076 firm-year observations for 2001-2006. Our key finding is that a firm's leverage significantly determines its coalmining fatality.

Using multivariate regression analysis, we first establish a positive relation between leverage and coalmining death, which is robust under Poisson, negative binomial, and OLS estimation methods. We then investigate whether high leverage *causes* high fatality.

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results would probably be more applicable to developed countries, while our results are more indicative to developing countries.

[8] Anecdotal evidence seems to support this proposition. For example, the state-owned Huangling Mining Group in Shaanxi Province experienced three coalmining accidents in 2004 alone, which caused 25 deaths. Its debt-to-asset ratio was then at 114%, while the average debt ratio of our sample (4,848 coalmining firms) for that year was at 51%. In the Group's 2014 manager and employee representatives meeting, the firm acknowledged that high debt ratio was the biggest challenge faced by the firm. Information obtained from Huangling Mining Group's official website: www.hlkyjt.com.cn/info/1016/8233.htm

[9] "Shanghai markets: border games" - - *Financial Times*, April 11, 2014.

One might argue that it is the high death tolls that force a firm to borrow more in order to meet employee compensation, government fines, litigation and other associated costs. We show that, due to the ultra-low costs incurred, this reverse causality is unlikely to hold for China's coalmining firms. This also makes less likely an alternative hypothesis, that coalmining firms with limited financial resources may increase safety investment in order to avoid high costs of employee deaths.

Some unobservable firm characteristics could be responsible for our results. To partially address this, we identify an instrumental variable (provincial leverage) and apply the two-stage least squares (2SLS) regression in our analysis. Our results hold up to this test.

One might also argue that this year's coalmining fatalities could be affected by the previous year's death toll. Hence, we control for the number of deaths during the previous year and use the system GMM (generalized method of moments) regression method to test our results. The GMM results are consistent with our main findings.

Notwithstanding our evidence, leverage and deaths could still be related for other reasons which might be responsible for both the level of leverage in a firm and the number of fatalities. For instance, high leverage could be a result of poor management and/or fast asset growth and that could also cause high fatalities. We control for these additional factors and our results remain unchanged.

We investigate a channel through which leverage may potentially impact coalmining fatalities. Specifically, we examine how leverage affects firms' safety investment and, hence, impacts the death toll. We find that high leverage reduces safety investment and, consequently, causes more fatalities. This suggests that cash constraints

limit coalmining firms' ability to meet/raise safety standards and lends support to a causal interpretation between leverage and employee death.

Ours is the first paper, of which we are aware, to analyse coalmining deaths from a corporate financing point of view, while current literature focuses mainly on regulation, political connection, collusion, or property rights (e.g., Fisman and Wang, 2014; Jia and Nie, 2015). We document a channel through which a firm's leverage can affect the well-being of its employees.

Our work also draws new implications for the study of labor economics. Although current literature points out that managers try to weaken unions' negotiation power by increasing debt and lowering workers' wages (e.g., Bronars and Deere, 1991; Matsa, 2010), it does not discuss the issue that high leverage could also increase the risk to employees' lives. Our finding, together with Cohn and Wardlaw (2014), documents a significant relation between leverage and workplace injury or death.

The rest of the paper is organized as follows: Section 2 briefly introduces the characteristics of China's coalmining industry. Section 3 describes the data and presents sample statistics. Section 4 presents and discusses our empirical results. Section 5 concludes the paper.

2. Coal Mining with Chinese Characteristics

Coal is the dominant energy source in China, providing around 70% of the country's energy needs and underpinning China's meteoric economic rise during the past three decades (Wang, 2006).

Compared to coal mines in the U.S. and other major coal producing countries, China's coalmining industry exhibits some unique features. First, underground mines

(which are more dangerous) dominate surface mines. Second, the underground mines are very deep, with many old state-owned mines drilling beyond 1,000 meters at very high temperature. Third, over one-third of the mines fall into the category of 'high gas content,' one-third have seams that are prone to self-ignition, and one-half face high risk of dust explosions.[10] These features make coalmining in China not only more risky but also more expensive to invest in both production and safety equipment, and also more complicated when implementing safety procedures (Wang, 2006).

Coalmining firms in China are broadly classified into three categories: key state-owned mines, local state-owned mines, and township and village mines (TVMs) where the majority of accidents and deaths occur. The bulk of its labor force comes from poverty-stricken rural regions. Many coalmining firms take advantage of this vulnerability and push the workers into the most dangerous working conditions without adequate training and equipment.[11] The miners are poorly compensated with wages ranked among the lowest among all industries. Thus, being a coal miner is, in most cases, not a career choice but a sign of desperation.[12]

The industry places little value on the lives of their miners due largely to the low 'price' tag imposed on human life. Prior to 2005, the compensation for each coalmining death was between 30,000 and 50,000 RMB, with a maximum compensation of 80,000

[10] Source: http://www.chinasafety.gov.cn/file/2004-01/kjgh-3.doc.

[11] Employee interests are, in general, badly recognized in China. Lu, Zhong, and Kong (2009) show that, even for the 100 largest listed companies, 50 percent of them mentioned nothing about employees' safety and benefits in their annual reports. The situation is much worse for smaller companies.

[12] In the aftermath of the 2001 Xuzhou disaster where 92 miners were killed in an explosion, a woman who lost her husband said: "The mines won't stay closed, and when they open again, I will work in them too. It's not safe, but what else can I do? I don't think of it as good or bad. There's just no other way." - - *Washington Post*, September 9, 2001.

RMB ($10,000 USD).[13] In 2005, starting with Shanxi province (the epicentre of coalmining accidents) and gradually followed by other provinces, the compensation was raised to 200,000 RMB ($25,000 USD), a mere quarter of the annual salary of an experienced U.S. coal miner (Tu, 2007).

According to data published by the State Administration of Coal Mine Safety, coalmining deaths are mainly a result of gas explosions (40%) and roof falls (30%). In order to prevent such accidents, firms need to make significant investment on safety equipment and training. Because the government controls coal prices so as to subsidize the power producers, the profitability of state-owned coalmines remains low. This limits their ability to make adequate safety investment. For smaller town and village mines, safety standard/investment largely gives way to profit maximization.[14]

Thus, despite the central government's repeated pledges, China's coalmining industry has persistently underinvested in safety measures. In 2006 (our sample ending year), safety measures for China's coal mines were underinvested by at least 68.9 billion RMB ($8.6 billion USD),[15] and the investment made was only about 1.9% of the total coal sales revenue.[16]

[13] The exchange rate between the U.S. dollar and the Chinese RMB was around 1 US dollar to 8 RMB during our sample period (2001-2006).

[14] Many TVMs did not even follow the most elementary safety guidelines such as the installment of gas ventilation in mines. As a result, a small spark could set off a huge explosion (Wang, 2006).

[15] "68.9 billion are short paid for coal mine safety," *Safety and Health*, Issue 3, 2006, p.24.

[16] "People's Republic of China: Coal mine safety study (Final report)," 2008, Asian Development Bank, TA 4849-PRC.

3. Data and Descriptive Statistics

3.1. The Sample

We hand collect the data on coalmining accidents and fatalities from the State Administration of Work Safety (SAWS) and the State Administration of Coal Mine Safety (SACMS) of China. Since 2001, the SAWS and SACMS started to publish coalmining accident news bulletins on their official websites, which include the dates of coalmining accidents, the names of the firms involved, the death tolls for each accident, and the total casualties (the number of deaths plus the number of people injured and missing) for each accident.

We collect these data for each coalmining firm across 22 provinces for the period 2001-2006.[17] Our sample ends at 2006, since SAWS and SACMS only publish data on accidents involving more than 3 casualties from 2007, which leaves the bulk of accidents/deaths unreported.[18]

We obtain all firm-level data from the Chinese Industrial Enterprise Database (CIED),[19] which is constructed by the National Bureau of Statistics and is the largest official database of Chinese industrial firms. The CIED covers all state-owned and sizable non-state-owned enterprises,[20] which accounts for 90% of the total sales of all industrial firms in China.[21]

[17] Not all the 31 provinces in China have coal mines or coalmining firms. Nine provinces or provincial-level cities are not included in the sample, since they either do not have any coalmining firms or only have an insignificant number of coalmining firms. The nine provinces are: Shanghai, Tianjin, Tibet, Zhejiang, Jiangsu, Guangdong, Guangxi, Qinghai, and Hainan provinces.

[18] The average death toll per accident is 1.8 in our sample.

[19] The CIED contains 130 firm-level data items. It is also called China Annual Survey of Industrial Firms or China Annual Survey of Manufacturing Firms by some studies. For recent studies which use this database, see, for example, Hsieh and Klenow (2009) and Song, Storesletten, and Zilibotti (2011).

[20] The sizable non-state-owned enterprise refers to firms with annual sales of no less than 5 million RMB ($625,000 US dollars).

We take all the coalmines' firm-level data from CIED and merge it with the coalmining accidents data hand-collected from SAWS and SACMS. We form a panel dataset of 22,076 firm-year observations for 2001-2006.

We also collect some provincial-level data which, we believe, are important to our analysis. Coal price in each province is obtained from the China Coal Industry Yearbook. The GDP per capita for each province is collected from the China Statistical Yearbook. The measure of the level of corruption for each province is taken from the China Procuratorial Yearbook. The number for total circulation of newspapers is obtained from the China Statistical Data of Press and Publication.

Table 1 presents the annual distribution of coalmining accidents and fatalities for the full sample. It shows that the number of coalmining firms increased year on year. The number of firms in 2006 (5,898) was three times larger than in 2001 (1,747). The number of firms with coalmining accidents also increased year on year except for 2006. The number of accidents reached over 350 per year during 2003-2005, followed by a sharp decline in 2006 (84 accidents).[22]

The number of fatalities from 2001 almost doubled every year to 2003 (755 deaths), then fell gradually and dropped to 267 in 2006. The death toll was around 2 deaths per accident (except for 2006) despite the variations in other indicators. Although we have seen some improvements in 2006, it was the worst year in terms of deaths per accident (at 3.2). This indicates that it is no easy task to deal with the fatality problem in

[21] According to the first National Economic Survey conducted in 2004, the total sales for all industrial firms were at 218 billion RMB, while the total sales for all CIED firms were at 196 billion RMB.

[22] As noted in Sections 2 and 4, starting from 2005 the death compensation has been raised 2.5 times from $10,000 to $25,000 and the total fine has been raised 7 times from $18,750 to $125,000. The higher level of compensation and fine is likely to be one of the main reasons driving down the coalmining accidents and deaths in 2006.

the coalmining industry. Overall, there are 998 firms involved in 1,531 accidents and 2,814 deaths averaging about 2 deaths per accident.

[Table 1]

3.2. Main Variables

We first define the main variables used in this study. All variables are constructed at annual frequency and measured as of the end of the year.[23] We adjust all the relevant variables to the 2001 prices by using various price indices obtained from the China Statistical Yearbook.

The main dependent variable *employee death* is the total number of coalmining deaths per firm per year. We focus on the *number* of death rather than the death rate (e.g. death per thousands of employees) in our study, since punishment and social impact are based on the absolute number of deaths and not on the death rate.

According to government classification, an accident with fewer than 3 fatalities is defined as "general", 3-9 as "relatively serious", 10-29 as "very serious", and 30+ as "extremely serious". Suppose we have two coalmining firms: the first employing 1,000 coalminers and having a death toll of 10; the second employing 100 coalminers and having a death toll of 1. Clearly, although both firms have the same death rate (1%), the former (with 10 deaths) is classified as "very serious" and have a more severe impact on society. Both the government and the public are much more concerned about the

[23] Definitions for all the variables used in this study are provided in Appendix Table A1.

absolute number of deaths and do not necessarily pay attention to how many workers are employed by the firm. [24]

Our main variable of interest is the firm's *debt ratio* which is defined as the firm's total liabilities divided by its total assets. We initially observe a positive relation between debt ratio and employee deaths (Appendix Table A2).

Other firm-level explanatory variables can be classified into three groups. The first group, in addition to the debt ratio, contains other financial indicators. The *tax rate* is the total amount of taxes effectively paid by a firm divided by its total sales. The *subsidy rate* is the total amount of government subsidies received by a firm divided by its total sales.

The second group controls for key firm-specific characteristics. *Size* is defined as the natural logarithm of total assets.[25] *Age* is the natural logarithm of the number of years since the formation of the firm. *Return on equity* (ROE) is the net profit divided by the book value of equity. *Asset turnover rate* is defined as total sales divided by total assets. If a firm produces more, it is likely to have more accidents.

The third group controls for equity ownership.[26] *State ownership* is the percentage equity ownership by the state. *Private ownership* is the total percentage equity ownership by all individual investors. *Foreign ownership* is the total percentage equity ownership by foreign investors.[27]

[24] In unreported results, we use death rate (death per thousand employees) as the dependent variable and run similar regressions as performed in the study. We observe a positive relation between leverage and death, though it is only marginally significant.

[25] Alternatively, we control for the total number of employees as a proxy for size, and results are similar.

[26] In addition to the three different ownerships controlled in the study, others include collective ownership and legal-person ownership.

[27] Foreign ownership also includes investors from Hong Kong, Macau, and Taiwan, since they are treated as foreign investors under Chinese law.

In addition to the firm-level measures, we also construct four provincial-level variables to control for the variations across different provinces. *Coal price* is the natural logarithm of average coal price per ton in each province. As mentioned earlier (Section 2), the low coal prices imposed by the government is a key driving force behind the underinvestment in safety measures and thus a key determinant of coalmining death.

GDP per capita is the natural logarithm of average GDP per capita for each province. *Corruption* is measured as the corruption cases filed per 10,000 government officials in that province, similar to Fisman and Gatti (2002), Adsera, Boix, and Payne (2003), and Glaeser and Saks (2006). High level of corruption increases the possibility of collusion between local government and firms.

Media exposure is the per capita print of newspapers in each province, as in Besley and Burgess (2002), Nie, Jiang, and Wang (2013). Large circulation of newspapers facilitates the flow of information especially bad news such as coalmining deaths. Egorov, Guriev, and Sonin (2009) argue that the media can play a significant role even in an authoritarian system since they help the government monitor the behaviour of bureaucratic officials.

3.3. Descriptive Statistics

Table 2 presents the descriptive statistics for the explanatory variables. The average debt ratio is 51.6% (median = 51.4%) with a standard deviation of 0.30. The debt ratio is 28.3% for the 25^{th} percentile and rises to 74.0% for the 75^{th} percentile.

The tax effectively paid to total sales is, on average, at 9.7% with a standard deviation of 0.06. In our case, how much tax is effectively paid by a firm not only

captures a firm's profitability but also likely to reflect its connection with the government. Closely connected firms, in China, are likely to pay less tax or receive more tax credit. Thus, tax rate might capture a firm's degree of connection with the government.

The average subsidy received is rather low at 0.5% of total sales (standard deviation = 0.04). Even this low figure is driven by relatively few firms receiving very large subsidies, since the rate at the 75th percentile is still at 0%. We take a closer look at the data and find that large state-owned coalmining firms receive most of the subsidies. Subsidy rate could also, therefore, proxy for government connection.

[Table 2]

The average size of a coalmining firm is 179 million RMB ($22 million USD), which is two times larger than the average size of 85 million RMB for all the industrial firms recorded in CIED database for the same period. The average firm is 15 years old with the oldest 58 years and youngest 1 year old. While the average ROE is 39.7%, the median is just 16.5%. The average asset turnover rate is 2.0 with a median of 1.1.

In terms of equity ownership, individual investors, on average, collectively own 36.3% of the firm compared to 16.7% state ownership. This is mainly because 80% of the sample firms are classified as non-state-owned firms by CIED. In addition, foreign investors, on average, own just 0.3% of the firm.

The provincial-level data show that the average coal price is 372 RMB ($47 USD) per ton (median 300 RMB) with a standard deviation of 257. The average GDP per capita is 7,346 RMB ($918 USD), while a large disparity exists: the minimum is just 2,524 RMB and the maximum is 23,988 RMB. The degree of corruption for each province is similar. There are, on average, 4.6 corruption cases filed for every 10,000

government officials (standard deviation = 1.5). The level of media exposure (per capita print of newspapers in a year) is not even, with a mean of 19.1 and a standard deviate of 14.6.

Appendix Table A2 presents the correlation matrix for the firm-level variables. It shows that leverage is positively correlated with tax rate, subsidy rate, firm size, age, ROE and state ownership, while negatively related to asset turnover rate, private and foreign ownerships. This suggests that if a firm is large, old, receiving more subsidies from the government, or largely owned by the state, it is more likely to have a high debt ratio.

One interesting relationship is between leverage and ROE, since a potential driver behind a firm's choice of high leverage is to maximize ROE. However, the correlation between the two is merely 0.005 which suggests, at best, a weak relation. Appendix Table A3 shows that when the debt ratio increases from 25^{th} to 99^{th} percentile, the ROE remains mostly constant.

In untabulated results, we run multiple regressions with the ROE as the dependent variable and debt ratio and other control variables as the explanatory variables. We find that the coefficients on debt ratio are statistically insignificant for all the regressions.[28] Thus, a coalmining firm's leverage decision is not as simple as profit maximization.[29]

[28] Results are similar if we use return on assets (ROA) or return on sales (ROS) as the dependent variable instead.

[29] Some argue that high leverage simply reflects the close relationship between a coalmining firm and the government, which not only enables the firm to obtain an operating licence under low safety standard but also helps it to obtain more bank loans. This would suggest that it is, in fact, the political connection or collusion with the government that causes the coalmining fatalities, rather than the high leverage itself. We recognize that political connection or collusion imperils production conditions in coal mines (e.g., Jia and Nie, 2015), but we argue that high leverage is not simply a reflection of strong political connection or collusion. If high leverage largely reflects a close relation with the government, then those high-levered coalmining firms should be more likely to earn high profits since, in China, if you are blessed by the government, you can expect to enjoy lower funding

Identifying the determinants of the debt policy of Chinese coalmining firms is, however, beyond the scope of this paper.

Table A2 also shows that coalmining fatality is positively related to leverage, subsidy rate, firm size, age, state and foreign ownerships, while negatively related to tax rate, ROE, asset turnover rate, and private ownership. It would be interesting to see how many of these relations are held in a multivariate regression analysis, which is the focus of the rest of the study.

4. Financial Leverage and Employee Death

In this section we perform multivariate regression analyses in an attempt to establish a casual relation between leverage and coalmining deaths. Each specification includes an intercept, which is omitted from the tables.

4.1. Baseline Regression Results

Our dependent variable, the number of coalmining deaths, is the annual total number of deaths for a coalmining firm. This variable is nonnegative and takes on relatively few values including zero, known as the *count* variable. In our case, 99% of the observations take the values of zero, one, two, and three.

A count variable does not follow a normal distribution since it is not a continuous variable taking on a large range of values. The distribution can be significantly different from normal if the variable only takes on very few values. Given normality is the

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and production cost and better marketing and sales channel than your competitors, which should result in high profits. However, our data show that leverage is negatively related to profitability (ROE, ROA, or ROS). This is at odds with the above proposition. Thus, high leverage is not simply a result of strong political connection or collusion.

standard distributional assumption for linear regression, a linear model is, therefore, not the best approach for our study.

Since the nominal distribution for count data is the Poisson distribution, a Poisson regression model is more appropriate for our analysis. In addition, the economic interpretation is straightforward under the Poisson regression, which also helps us assess the economic significance of our study.

In Table 3, we run Poisson regressions on coalmining death by controlling for a large set of explanatory variables defined in Section 3.2. In specification 1, we run the regression without controlling for any fixed effects. The coefficient on the debt ratio is 0.372 which is statistically significant at the 1% level. In specifications 2 and 3, we control for year fixed effects, and year and province fixed effects, results are similar. In general, specification 3 suggests that a 10% increase in the debt ratio leads, on average, to a 4.3% increase in the number of death toll.

In specification 4, we control for both year and firm fixed effects where, as a result, we lose 90% of the observations. This is because that controlling for firm fixed effects in Poisson regression can cause large losses of observations in an unbalanced panel dataset such as ours. In order to be included in the firm fixed-effects Poisson estimation, a firm must appear in at least two years in the data and must have positive death tolls in at least one of these years. Nonetheless, the coefficient on debt ratio remains positive and significant at the 1% level.

[Table 3]

Due to the large losses of observations, we do not, therefore, control for firm fixed effects in the rest of the Poisson estimations. Instead, we use the province fixed effects

when firm fixed effects are absent. Hence, specification 3, which controls for both year and province fixed effects, is the standard estimation model going forward.

Table 3 establishes an initial positive relation between leverage and coalmining death. One concern is, however, that high leverage firms may experience financial distress and our results could, therefore, simply pick up a special firm circumstance under financial distress rather than reflect a general scenario with moderate leverage.

To address this, we sort our sample into three subsamples based on the level of leverage. Low leverage subsample comprises firms with a debt ratio below the 25^{th} percentile; moderate leverage is between 25^{th} and 75^{th} percentile; high leverage consists of firm above the 75^{th} percentile.

Table 4 reports the subsample regression results. It shows that the positive relation between leverage and fatality is highly significant for both low and moderate debt subsamples, while it is insignificant for high debt ones, which suggests that our result is not a special firm circumstance under financial distress but a general scenario with moderate leverage.

[Table 4]

4.2. Endogeneity Issues

We have, so far, observed a positive relation between a firm's leverage and the number of employee deaths. This seems to suggest that high debt burden leads to high coalmining fatalities. However, endogeneity issues prevent us from drawing a conclusion that high leverage *causes* high fatality. Leverage and coalmining death could still be related for other reasons, which might be responsible for both the level of leverage in a firm and the number of fatalities. We discuss and test these issues below.

4.2.1. Reverse Causality

One form of the endogeneity problem is reverse causality. One might argue that it is the high death tolls that force a firm to borrow more in order to meet employee compensation, government fines, litigation and other associated costs. In addition, Pouliakas and Theodossiou (2013) show that employees require a compensating wage premium for exposure to injury risk. Thus, coalmining firms may also have to bear a high cost of wages which could as well drive up its leverage.

While this could be true for many developed countries where the costs for an employee's life can be extremely high,[30] we argue this is less likely to be the case for China. First, the bulk of coalmining firms' labor force is peasants coming from poverty-stricken rural regions. Many firms take advantage of this vulnerability and compensate the workers poorly by paying them the lowest industrial wages.

Second, in terms of the costs of human life, prior to 2005, the compensation for each coalmining death was between 30,000 and 50,000 RMB, with a maximum payment of 80,000 RMB ($10,000 USD) and a maximum total fine of 150,000 RMB ($18,750 USD). From 2005, starting from Shanxi province (the epicentre of coalmining accidents) and gradually followed by other provinces, the compensation level was raised to 200,000 RMB ($25,000 USD) plus one million RMB ($125,000 USD) fine for each coalmining death.

[30] Take the U.S. for example. In April 5, 2010, a massive explosion happened at the Upper Big Branch coal mine in West Virginia which led to 29 miners' deaths. Each family of the victims was offered case settlements for $3 million. The families were also entitled to receive other benefits including health insurance coverage, life insurance (five times the annual salary of the mineworker), college tuition, and ongoing weekly paychecks (until widows remarry). http://www.npr.org/templates/story/story.php?storyId=126397976.
In terms of fines made by the government, a Massey Energy subsidiary was fined $2.5 million by a U.S. District Judge for a fire that killed two West Virginia coal miners on January 19, 2006. http://www.insurancejournal.com/news/southeast/2009/04/17/99728.htm.

Using 2005 data from China's official Xinhua News Agency,[31] the death toll per million tons of coal was at about 3 people and the gross profit for one million tons of coal produced was about 100 million RMB. Thus, even under the new scheme (post 2005), the total compensation and fine for the 3 deaths was at 3.6 million RMB ($450,000 USD), which was less than 4% of the gross profit. For 2001-2004, the bulk of our sample, using the maximum compensation of 80,000 RMB and a total fine of 150,000 RMB per death, 3 deaths would cost a firm just over half million RMB ($62,500 USD), which is less than 1% of its gross profit.[32]

Further, as discussed in Section 2, given the special features of China's coal mines, it is more expensive to invest in safety equipment and more complicated to implement safety procedures. Firms would, therefore, have little incentive to invest in safety given the ultra-low costs of employee's life.

Thus, for Chinese coalmining firms, the reverse causality scenario noted above is less likely to hold.[33] In addition, an alternative hypothesis that coalmining firms with limited financial resources may choose to invest more in safety in order to avoid high costs of employee death is also unlikely to hold.

[31] The Xinhua News Agency is the official press agency of China. It is subordinate to the State Council and reports to the Communist Party's Propaganda and Public Information Departments. Xinhua's website is: http://www.news.cn/english/

[32] Tu (2007) uses the 2005 fatality data in China and finds that the penalty represents only 1% of the gross profits earned by the mine owners. Similarly, the Asian Development Bank 2008 report (TA 4849-PRC) states that: "the penalty imposed by the new regulation (on compensation to coalmining death) represented only 1% of the gross profits collected by mine owners."

[33] In untabulated results, we run multiple regressions with debt ratio in year t as the dependent variable and the number of coalmining deaths reported in year t-1 (and other control variables) as the explanatory variable. Our results show that coalmining death in year t-1 does not significantly affect the firm's debt ratio in year t.

4.2.2. Omitted Variables

Some unobservable firm characteristics could be responsible for our results. To partially address this, we identify an instrumental variable (IV) and use the two-stage least squares (2SLS) regression method in our analysis.

Specifically, we use the value-weighted debt ratio for all firms in a province as the instrumental variable (IV) for a firm's debt ratio in that province.[34] Our choice of the instrumental variable is based on two points: First, if a province has, on average, a high (low) level of leverage, it is likely that this overall high (low) leverage will affect the leverage decisions of individual firms (instrument relevance). Second, it is exogenous to the coalmining death of any particular firm (instrument exogeneity).

For instrument relevance, the influence can be passed on through at least two channels: first and foremost, virtually everything in China is politically connected. The overall leverage in a province is likely to reflect the political intention of the provincial government. Given that debt, in China, is predominantly in the form of bank loans, if a provincial government embraces a high or low debt policy, it would guide the banks to lend more or less to its firms. Second, if a province has an overall high level of leverage, banks in that region can achieve economy of scale more easily. As a result, they are able to reduce operating costs, which, in turn, feed into more lending in that area.

Table 5 specifications 1 and 2 reports the two-stage least square (2SLS) regression results. The first stage results indicate that the provincial-level average debt ratio significantly affects the individual firm's leverage, which is consistent with our earlier

[34] In the economics literature, it is common to use an average indicator from an area as the instrumental variable (IV) for firms in that area. For example, Fisman and Svensson (2007) use industry-location averages as an instrument for firm-level bribery. Also see a review by Krueger and Angrist (2001).

argument. The second stage results show that, consistent with the main evidence, the coefficient on debt ratio is positive and significant at the 5% significance level.

[Table 5]

Another concern is that one year's coalmining fatalities could be affected by the death toll in the preceding year. To address this problem, we control for the number of deaths in the preceding year, which also captures some persistent and unobservable factors.[35] We use the system GMM (generalized method of moments) regression in this analysis, as it is the most suitable approach for examining dynamic panel data. It uses only internal instruments to cope with potential endogeneity of the debt ratio (Arellano and Bond, 1991 and Blundell and Bond, 1998).[36]

Specification 3 shows the GMM regression results. Similar to other tests, the coefficient on debt ratio is positive, though significant at the 10% level. The insignificance of the lagged death could be partially due to our unbalanced panel dataset. As can be seen, we lose half of the observations by introducing the lagged variable.

4.2.3. Alternative Explanations: Management Quality and Asset Growth

Poorly-managed firms are more likely to be less profitable or even loss-making and may have to increase borrowing to finance their operations. They may suffer from high fatalities because of poorly-organised production lines and poor oversight or being less likely to hire well-qualified workers. Firms with rapid growth in assets are likely to issue more debt to finance their expansions. Rapid growth may also cause more deaths

[35] For example, both the coalmining firm and the government may take some immediate actions following the coalminers' deaths at year t-1, which may affect the results at year t.

[36] If we assume the debt ratio is endogenous and is correlated with the contemporaneous error term, we can use the second and further lagged debt ratios as instruments for the first-differenced equation, and use the lagged first-differenced debt ratios as instruments for the level equation.

due to lack of adequate number of workers (overburdening) or appropriate supervision and training.

To test these alternative explanations, we control for management quality and asset growth in the analysis. Following Morck, Shleifer, and Vishny (1990) and Masulis, Wang, and Xie (2007), we use operating income growth as a proxy for management quality.[37] In line with Cooper, Gulen, and Schill (2008), we use the annual percentage change in total assets as a measure of asset growth.[38] In addition, we also measure the growth of fixed assets,[39] which would be more important to coalmining firms since investment in fixed assets may directly improve the working environment and reduce the number of accidents. Results are shown in Table 6.

[Table 6]

Specifications 1 to 3 control for management quality, total assets and fixed assets growth, respectively. We lose a large number of observations and hence power in these estimations. Since the measures of management quality or asset growth requires data from year t-2, which is a significant restriction on our unbalanced panel dataset. Nonetheless, we find that the coefficients on debt ratio are highly significant across all three models. Management quality and total assets growth are insignificant, while fixed assets growth negatively and significantly relates to coalmining death.

In specification 4, we control for both management quality and total assets growth. Both factors are insignificant, while leverage remains significant at the 1% level. We control for both management quality and fixed assets growth in specification 5. Our key result on leverage is unchanged, and fixed assets growth again negatively and

[37] (Operating income$_{t-1}$ – Operating income$_{t-2}$)/Operating income$_{t-2}$

[38] (Total assets$_{t-1}$ – Total assets$_{t-2}$)/Total assets$_{t-2}$

[39] (Fixed assets$_{t-1}$ – Fixed assets$_{t-2}$)/Fixed assets$_{t-2}$

significantly relates to coalmining death. Although management quality is significant in this specification, it is not robust across different specifications.

All in all, given the well-known difficulties in addressing the endogeneity problem with regard to leverage, it is hard, if not impossible, to find a clean instrument for it. Consequently, alternative explanations cannot be ruled out completely.

4.3. A Channel: Leverage, Safety Investment, and Coalmining Fatality

In this sub-section, we examine how leverage affects firms' safety investment and hence impacts death tolls. High leverage reduces a firm's resources and leads to a reduction in its investment.[40] The investment cut would likely to hit the safety investment particularly hard, since its benefits are difficult to quantify and it is normally not contractually obligated.

Although we do not have data on firms' investment in safety equipment, this investment should be shown in firms' investment in fixed assets. However, not all fixed assets are related to safety and we, therefore, choose the per capita investment in productive fixed asset as a proxy for investment in safety equipment; it is the closest measure we can obtain from our dataset. We posit that high leverage reduces safety investment and hence causes more fatalities.

Table 7 reports the results. Specification 1 is the linear regression with the investment in safety equipment as the dependent variable and all other variables as the explanatory variables. It shows that high leverage reduces the investment in safety equipment. It also shows that high coal prices lead to a high level of safety investment. Since the Chinese government controls coal prices to subsidize the power producers,

[40] Denis and Denis (1993) and Lang, Ofek, and Stulz (1996) find that firms with high leverage tend to invest less.

our evidence suggests that the low coal prices imposed by the government is also one of the key driving forces behind the underinvestment in safety measures.

Specifications 2 and 3 are Poisson regressions with the number of deaths as the dependent variable. Specification 2 shows that investment in safety equipment significantly reduces the death toll. In specification 3, we add debt ratio as the explanatory variable, the coefficient on safety investment remains significantly negative, while the results for leverage stay the same.

Overall, Table 7 identifies a channel through which leverage impacts coalmining fatality. Specifically, we show that leverage reduces safety investment which, in turn, leads to higher death tolls. This evidence suggests that cash constraints limit coalmining firms' ability to meet/raise safety standards and lend support to a causal interpretation between leverage and employee death.

[Table 7]

4.4. Robustness Tests

In this subsection, we conduct robustness tests on our main results where we try different estimation methods, use alternative measures for coalmining death, account for state ownership status, changes in costs of employee life, and the geographical differences in coal mines.

4.4.1. Negative Binomial and OLS Models

Another natural treatment for count data as dependent variable is the negative binomial model. In Appendix Table A4, we run negative binomial regressions similar to the Poisson regressions performed in Table 3. We find that all the coefficients on debt ratio

are positive and significant at the 1% level. In Appendix Table A5, we run OLS regressions similar to that of Table 3.[41] Our main results stay the same while at a lower significance level.

4.4.2. Alternative Measures of Employee Death

In Table 8 we use alternative measures for employee death. First, the government classifies that an accident with a fatality fewer than 3 as general, 3 or more as relatively or very serious. In Specification 1 we set a dummy variable 'Death3' as our dependent variable,[42] which equals one if an accident involves 3 or more deaths and zero otherwise. Second, instead of using the total number of deaths per firm per year, in Specification 2, we use the fatality number per accident as the dependent variable.[43] We find similar results under these alternative measures.

[Table 8]

4.4.3. State-owned vs. Non-state-owned Coalmines

It is well known that the Chinese non-state-owned enterprises have many difficulties in getting debt financing from the banks and the majority of coalmine accidents occur in such firms. It is, therefore, important to group the firms by state ownership status and study them separately. Although we have controlled for state ownership in our regressions, it may still be inadequate since it only captures the linear effects. In Table 9,

[41] Although a liner model for count data might not provide the best fit over all values of the explanatory variables, Wooldridge (2013) suggests that it is, nonetheless, always informative to perform a liner analysis.

[42] Fisman and Wang (2014) also investigate a control sample using only major accidents which caused 3 or more deaths to prevent their results being skewed by the under-reporting problem.

[43] Table 1 shows that the average death toll per accident for the full sample is about 2 people.

we sort the sample into state-owned and non-state-owned firms and run separate regressions. Our main results stay the same regardless the state ownership status.

[Table 9]

4.4.4. The Value of Human Life: Changes in Compensation and Fine

As stated earlier, prior to 2005 the maximum compensation for each coalmining death was 80,000 RMB ($10,000 USD) and the maximum fine was 150,000 RMB ($18,750 USD). From 2005, the maximum compensation and fine were raised to 200,000 RMB ($25,000 USD) and one million RMB ($125,000 USD), respectively.

In Table 10, we divide the sample into two sub-periods: low (2001-2004) and high (2005-2006) compensation and fines periods, and run two separate Poisson regressions. Our results are not affected by this new classification.

[Table 10]

4.4.5. Geographic Difference: The Shanxi Effect?

Shanxi province is China's centre for coal production and the epicentre for coalmining accidents, which accounts for a quarter of our total firm-year observations. It is possible that we may just pick up a Shanxi effect and our results may not hold for other regions. In Table 11, we sort our sample into Shanxi province and other regions, and run Poisson regressions separately. Our results show that the leverage effect is significant at 1% for both subsamples, while the economic impact is larger for Shanxi province.

[Table 11]

4.5. Limitations of the Study

First, the vast majority of our sample firms are non-public. There are just 25 listed coalmining firms in China.[44] We are, thus, not able to collect the market-based public data for our sample firms, and have to rely on the information provided by the Chinese Industrial Enterprise Database. The encouraging news is that the CIED is an official dataset which is constructed by the National Bureau of Statistics and is widely used for academic research in China. Researchers outside China also use the CIED dataset. For instance, Hsieh and Klenow (2009), and Song, Storesletten, and Zilibotti (2011).

Second, other explanatory variables, that might be important for explaining the coalmining deaths, are not available to us. For example, *the status of the coal mines*, information at the individual mine level could be more useful than the firm level data; *the quality of worker*, firm with better trained and more experienced workers may have fewer accidents/deaths; *the number of hours worked*, firm imposing on long working hours may induce more accidents.

Third, non-state-owned small and medium mines account for the bulk of the sample. It is widely perceived that small and medium coalmining firms may under-report their death tolls. In addition, state-owned firms may also have incentives and even means to manipulate data on death tolls. This is indeed a concern to us. There are, however, also good reasons to have confidence in the reporting system.

Firstly, hiding or manipulating data on coalmining accidents/deaths is severely punished by the law. The State Law requires coalmining firms to report to their provincial governments and the relevant departments of the State Council immediately following coalmining accidents. Delayed reporting or underreporting are subject not

[44] See also Fisman and Wang (2014).

only to administrative penalties and but also criminal charges.[45] Secondly, the press is vigilant to coalmining accidents, especially the ones outside the accident-hit area. Given the rapid development of the internet and social network sites, it becomes much harder to hide or manipulate data.[46]

Last but not least, the CIED includes firms with annual sales of more than 5 million RMB ($625,000 USD) and drops them if they do not meet this criterion. The entering and exiting is not random and hence could have implications to our study. This should not, however, have a material impact on our results. In our study, we show that leverage reduces safety investment and causes high fatalities (i.e., the channel). If we include all the small firms (i.e., < 5 million RMB sales) in the analysis, the results should not change in a significant way unless high leverage is not causing a reduction in safety investment in small firms. In fact, there are good reasons to believe that small coalmining firms are more likely to cut safety investment when burdened with high leverage.

[45] See Article 92 of "The Production Safety Law" issued in 2002.

[46] Jia and Nie (2015) argue that if the coalmining death data are being manipulated, we should then observe a clustering of the number of reported deaths at some key classification thresholds such as 2 and 9; since the government defines coalmining accident with a fatality less than 3 as "general", 3 to 9 as "relatively serious", while 10 and more as "very serious". They find, however, this is not the case.

5. Conclusion

Past studies of China's coalmining fatalities focus on regulatory environment and institutional framework. Although they have shed light on the issue, they largely overlook its micro foundation at the firm level, presumably due to the difficulty in obtaining such a firm-level database.

In this paper, we bridge the gap by hand-collecting and constructing a unique dataset for China's coalmining firms. We show that leverage, a neglected factor in the coalmining safety studies but a fundamental element in corporate finance, significantly determines coalmining fatalities. Specifically, we document a channel through which a firm's leverage can affect the well-being of its employees.

While we focus on China's coalmining industry in this study, our intuition can be applied more widely across industries and other developing countries where workplace safety is a particular concern. Our study draws important implications of financial policy to labor policy, and calls for a more corporate-finance-based analysis on the well-being of employees.

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Table 1: Coalmining accidents and employee fatalities

This table presents the statistics on the annual distribution of China's coalmining accidents and employee fatalities for the period 2001-2006. The data on coalmining accidents and fatalities are hand collected from the State Administration of Work Safety (SAWS) and the State Administration of Coal Mine Safety (SACMS). The SAWS and SACMS publish information on the date of the coalmining accident, the name of the firm involving an accident, and the number of death tolls for each accident.

Year	No. of firms	No. of firms with accident	No. of accidents	No. of deaths	Deaths per accident
2001	1,747	74	106	251	2.4
2002	2,126	151	252	423	1.7
2003	2,549	209	368	755	2.1
2004	4,655	238	368	583	1.6
2005	5,101	250	353	535	1.5
2006	5,898	76	84	267	3.2
01-06	22,076	998	1,531	2,814	1.8

Table 2: Descriptive statistics

This table provides the coalmining firm-level and provincial-level data for the period 2001-2006. The firm-level data are obtained from the Chinese Industrial Enterprise Database (CIED), which is constructed by the National Bureau of Statistics and is the largest database for Chinese industrial firms. The CIED covers all state-owned and sizable non-state-owned enterprises, which accounts for 90% of the total sales of all industrial firms in China. For the provincial-level data: Coal price in each province is obtained from the China Coal Industry Yearbook. GDP per capita for each province is collected from China Statistical Yearbook; the measure for the level of corruption for each province is recorded in China Procuratorial Yearbook; the number of total circulation of media newspapers is obtained from China Statistical Data of Press and Publication. The sample is winsorized at 1% based on the debt ratio. All variables are defined in Appendix Table A1.

Variables	Obs.	Mean	S.D.	Min	25%	Median	75%	Max
Firm-level variables:								
Debt ratio	22,076	0.516	0.299	0	0.283	0.514	0.740	1.524
Tax rate	22,076	0.097	0.060	0	0.056	0.092	0.129	0.853
Subsidy rate	22,076	0.005	0.036	0	0	0	0	1.363
Firm size (RMB mil)	22,076	179.2	1,311	1.00	6.27	13.203	34.524	49,600
Firm age (year)	22,076	14.986	13.544	1	2	10	21	58
Return on equity (ROE)	22,004	0.397	5.847	-1.699	0.026	0.165	0.472	463.33
Asset turnover rate	23,076	1.964	3.257	0.015	0.587	1.126	2.296	202.381
State ownership	22,076	0.167	0.362	0	0	0	0	1
Private ownership	22,076	0.363	0.462	0	0	0	1	1
Foreign ownership	22,076	0.003	0.045	0	0	0	0	1
Province-level variables:								
Coal price (RMB)	121	372	256.74	61.83	205.97	299.97	444.16	1280.14
GDP per capita (RMB)	132	7,346	4262.87	2,524	4,887	6,073	7,893	23,988
Corruption	132	4.56	1.45	1.31	3.51	4.53	5.52	10.18
Media exposure	132	19.14	14.57	4.65	10.85	14.56	20.74	79.97

Table 3: The determinants of coalmining fatality: Baseline regressions

This table presents the Poisson regression results on the determinants of coalmining fatality. The sample consists of 22,076 firm-year observations for the period 2001-2006. The dependent variable is the total number of coalmining deaths per firm per year. All explanatory variables are defined in Appendix Table A1. All regressions include an intercept term, which is omitted from the table. P-values are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively.

Independent variables	Poisson (1)	Poisson (2)	Poisson (3)	Poisson (4)
Firm-level variables:				
Debt ratio	0.372***	0. 397***	0.430***	1.114***
	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Tax rate	-6.228***	-6.019***	-2.062***	-6.505***
	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Subsidy rate	1.710***	1.699***	-0.033	1.442***
	(<0.001)	(<0.001)	(0.883)	(0.002)
Size (ln)	0.360***	0.369***	0.416***	-0.099
	(<0.001)	(<0.001)	(<0.001)	(0.261)
Age (ln)	0.416***	0.406***	0.307***	0.108**
	(<0.001)	(<0.001)	(<0.001)	(0.039)
Return on equity (ROE)	0. 0005	-0. 002	-0.003	-0.0005
	(0.905)	(0.619)	(0.363)	(0.871)
Asset turnover rate	-0.069***	-0. 055***	-0.052***	-0.071*
	(<0.001)	(0.003)	(0.005)	(0.086)
State ownership (%)	0.591***	0. 531***	0.229***	0.131
	(0.004)	(<0.001)	(<0.001)	(0.285)
Private ownership (%)	0.185***	0. 227***	-0.058	0.454***
	(<0.001)	(<0.001)	(0.382)	(<0.001)
Foreign ownership (%)	0.432	0. 464	0.379	-1.581
	(0.322)	(0.288)	(0.350)	(0.373)
Province-level variables:				
Coal price (ln)	0.197***	0. 143***	0.166***	0.321***
	(<0.001)	(<0.001)	(<0.001)	(<0.001)
GDP per capita (ln)	-0.591***	-0. 424***	-2.167**	-2.536**
	(<0.001)	(<0.001)	(0.011)	(0.012)
Corruption	0.095***	0.099***	0.025	-0.704*
	(<0.001)	(<0.001)	(0.511)	(0.093)
Media exposure	-0. 001	-0.005	0.002	0.002
	(0.768)	(0.237)	(0.732)	(0.689)
Year fixed effects	No	Yes	Yes	Yes
Province fixed effects	No	No	Yes	No
Firm fixed effects	No	No	No	Yes
No. of obs.	21,131	21,131	21,131	2,160
Log pseudolikelihood	-8915.834	-8684.976	-7751.498	-2241.253

Table 4: The determinants of coalmining fatality: The level of debt

This table presents the Poisson regression results on the determinants of coalmining fatality. The sample consists of 22,076 firm-year observations for the period 2001-2006. The dependent variable is the total number of coalmining deaths per firm per year. Low debt subsample comprises firms with a debt ratio below the 25th percentile; Moderate debt is between 25th and 75th percentile; High debt consists of firm above the 75th percentile. All explanatory variables are defined in Appendix Table A1. All regressions include an intercept term, which is omitted from the table. P-values are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively.

Independent variables	Low Debt Poisson (1)	Moderate Debt Poisson (2)	High Debt Poisson (3)
Firm-level variables:			
Debt ratio	3.045***	0. 667***	-0.284
	(<0.001)	(0.003)	(0.238)
Tax rate	-4.795***	-1.990***	-0.782
	(<0.001)	(0.004)	(0.322)
Subsidy rate	-3.756	0. 860***	-1.132**
	(0.476)	(0.002)	(0.014)
Size (ln)	0.190***	0.415***	0.385***
	(0.003)	(<0.001)	(<0.001)
Age (ln)	0. 129*	0.482***	0.092**
	(0.060)	(<0.001)	(0.023)
Return on equity (ROE)	-0.165	0. 235***	-0.0005
	(0.443)	(<0.001)	(0.914)
Asset turnover rate	-0.086**	-0. 121***	-0.047
	(0.031)	(0.001)	(0.203)
State ownership (%)	-0.336	0. 206**	0.253**
	(0.227)	(0.012)	(0.014)
Private ownership (%)	-0.066	0. 238**	-0.608***
	(0.650)	(0.013)	(<0.001)
Foreign ownership (%)	2.419	-0. 279	-10.540
	(<0.001)	(0.728)	(0.535)
Province-level variables:			
Coal price (ln)	-0.376**	0. 317***	0.063
	(0.010)	(<0.001)	(0.444)
GDP per capita (ln)	-1.006	-3.575***	0. 463
	(0.726)	(0.001)	(0.776)
Corruption	-0.428***	0.121**	-0.036
	(0.002)	(0.016)	(0.640)
Media exposure	-0. 045*	0.003	0.015
	(0.073)	(0.644)	(0.166)
Year fixed effects	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes
No. of obs.	5,184	10,694	5,253
Log pseudolikelihood	-1069.454	-3784.470	-2509.742

Table 5: Two-stage least square (2SLS) and GMM regressions

This table presents the regression results on the robustness of the determinants of coalmining fatality by performing the two-stage least square (2SLS) and the generalized method of moments(GMM) regressions. The sample consists of 22,076 firm-year observations for the period 2001-2006. The dependent variable is the natural logarithm of (one plus) the number of coalmining deaths per firm per year. All explanatory variables are defined in Appendix Table A1. All regressions include an intercept term, which is omitted from the table. P-values are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively.

Independent variables	2SLS		GMM
	First stage	Second stage	
Additional variables:			
Province average debt ratio (IV)	0.300***		
	(<0.001)		
No. of death last year			0.008
			(0.783)
Firm-level variables:			
Debt ratio		0.510**	0.023*
		(0.013)	(0.077)
Tax rate	-0.159***	-0.020	-0.147***
	(<0.001)	(0.750)	(<0.001)
Subsidy rate	0.030	0. 353***	0.887***
	(0.687)	(0.001)	(<0.001)
Size (ln)	-0.006	0.008	0.017***
	(0.164)	(0.155)	(<0.001)
Age (ln)	-0.00006	0.002	0.017***
	(0.986)	(0.717)	(<0.001)
Return on equity (ROE)	0.0005*	0.0001	-0.0003
	(0.081)	(0.801)	(0.413)
Asset turnover rate	-0.002**	0.0006	0.001**
	(0.015)	(0.553)	(0.041)
State ownership (%)	0.0003	0.017	0.053***
	(0.978)	(0.248)	(<0.001)
Private ownership (%)	-0.014**	0.014	0.017***
	(0.019)	(0.116)	(0.001)
Foreign ownership (%)	-0.053	0.012	0.049
	(0.308)	(0.865)	(0.304)
Province-level variables:			
Coal price (ln)	-0.007*	0.013**	0.010
	(0.069)	(0.035)	(0.132)
GDP per capita (ln)	-0.176**	0.086	-0.053***
	(0.019)	(0.438)	(0.005)
Corruption	-0.001	0.007	0.0006
	(0.659)	(0.127)	(0.864)
Media exposure	0.0003	-0.0005	0.0005
	(0.543)	(0.515)	(0.513)
Year fixed effects	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Number of obs.	21,131	21,131	12,042
Adjusted R^2	0.012		
F-statistic	4.52		
AR(2)			0.191

Table 6: The determinants of coalmining fatality: Alternative explanations

This table presents the Poisson regression results on tests of alternative explanations to the relation between leverage and coalmining fatality. The full sample consists of 22,076 firm-year observations for the period 2001-2006. The dependent variable is the total number of coalmining deaths per firm per year. All explanatory variables are defined in Appendix Table A1. All regressions include an intercept term, which is omitted from the table. P-values are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively.

Independent variables	Poisson (1)	Poisson (2)	Poisson (3)	Poisson (4)	Poisson (5)
Alternative explanations:					
Management quality	-0.00005			-0.00004	0.117***
	(0.927)			(0.931)	(<0.001)
Asset growth (Total)		-0.020		-0.020	
		(0.447)		(0.447)	
Asset growth (Fixed)			-0.027*		-0.038**
			(0.072)		(0.020)
Firm-level variables:					
Debt ratio	0.570***	0.568***	0.505***	0.568***	0.517***
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Tax rate	-1.250*	-1.236*	-3.511***	-1.237*	-3.355***
	(0.069)	(0.072)	(<0.001)	(0.072)	(<0.001)
Subsidy rate	-0.687*	-0.692*	-0.685*	-0.692*	-0.638
	(0.058)	(0.056)	(0.088)	(0.056)	(0.114)
Size (ln)	0.469***	0.469***	0.477***	0.469***	0.474***
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Age (ln)	0.146***	0.143***	0.171***	0.143***	0.194***
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Return on equity (ROE)	0.001	0.002	-0.004	0.002	-0.005
	(0.901)	(0.897)	(0.712)	(0.898)	(0.688)
Asset turnover rate	0.024	0.024	0.006	0.024	-0.003
	(0.170)	(0.176)	(0.807)	(0.176)	(0.912)
State ownership (%)	0.311***	0.310***	0.201**	0.310***	0.190**
	(<0.001)	(<0.001)	(0.021)	(<0.001)	(0.029)
Private ownership (%)	-0.165	-0.164	-0.403***	-0.164	-0.415***
	(0.118)	(0.120)	(0.001)	(0.120)	(<0.001)
Foreign ownership (%)	-68.337	-68.672	-70.242	-68.682	-68.766
	(0.137)	(0.136)	(0.134)	(0.136)	(0.130)
Province-level variables:					
Coal price (ln)	0.243***	0.241***	0.167*	0.241***	0.171*
	(0.007)	(0.007)	(0.069)	(0.007)	(0.063)
GDP per capita (ln)	-2.523*	-2.487*	-6.257***	-2.486*	-6.428***
	(0.084)	(0.089)	(<0.001)	(0.089)	(<0.001)
Corruption	0.057	0.058	0.012	0.057	-0.0008
	(0.263)	(0.260)	(0.828)	(0.261)	(0.988)
Media exposure	0.014*	0.014*	0.005	0.014*	0.004
	(0.055)	(0.056)	(0.560)	(0.056)	(0.604)
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes	Yes
No. of obs.	7,095	7,095	6,627	7,095	6,627
Log pseudolikelihood	-3527.370	-3527.041	-3071.515	-3527.037	-3054.927

Table 7: A Channel: Safety investment and coalmining fatality

This table presents the results for the fixed-effect estimation and the Poisson estimation. The sample consists of 22,076 firm-year observations for the period 2001-2006. For specification (1), the dependent variable is the per capita investment in productive fixed assets. For specifications (2) to (3), the dependent variable is the number of coalmining deaths per firm per year. All explanatory variables are defined in Appendix Table A1. All regressions include an intercept term, which is omitted from the table. P-values are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively.

	Safety Inv.	Death	Death
Independent variables	OLS (1)	Poisson (2)	Poisson (3)
Firm-level variables:			
Debt ratio	-24.132***		0.409***
	(<0.001)		(<0.001)
Investment in safety		-0.002***	-0.002***
equipment (ln)		(<0.001)	(<0.001)
Tax rate	-145.120***	-2.239***	-2.212***
	(<0.001)	(<0.001)	(<0.001)
Subsidy rate	-77.240***	-0.108	-0.158
	(<0.001)	(0.634)	(0.484)
Size (ln)	23.554***	0.438***	0.446***
	(<0.001)	(<0.001)	(<0.001)
Age (ln)	-12.938***	0.283***	0.277***
	(<0.001)	(<0.001)	(<0.001)
Return on equity (ROE)	0.081**	-0.003	-0.003
	(0.042)	(0.382)	(0.303)
Asset turnover rate	0.366**	-0.065***	-0.054***
	(0.027)	(0.001)	(0.004)
State ownership (%)	5.290*	0.283***	0.234***
	(0.099)	(<0.001)	(<0.001)
Private ownership (%)	2.854**	-0.087	-0.061
	(0.047)	(0.189)	(0.359)
Foreign ownership (%)	192.582**	0.333	0.433
	(0.032)	(0.402)	(0.277)
Province-level variables:			
Coal price (ln)	4.122***	0.172***	0.168***
	(0.002)	(<0.001)	(<0.001)
GDP per capita (ln)	-33.829	-2.344***	-2.214***
	(0.346)	(0.006)	(0.009)
Corruption	-2.361**	0.019	0.021
	(0.018)	(0.611)	(0.579)
Media exposure	-0.391**	0.003	0.002
	(0.042)	(0.600)	(0.634)
Year fixed effects	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes
No. of obs.	21,131	21,131	21,131
Adjusted-R^2	0.112		
Log pseudolikelihood		-7742.214	-7728.369

Table 8: Alternative measures of employee death

This table presents the Poisson regression results on the determinants of coalmining fatality. The sample consists of 22,076 firm-year observations for the period 2001-2006. Death3 is a dummy variable which equals one if an accident involves 3 or more deaths (i.e., relatively serious or more severe) and zero otherwise. All explanatory variables are defined in Appendix Table A1. All regressions include an intercept term, which is omitted from the table. P-values are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively.

	Death3	Death per accident
Independent variables	Logit (1)	Poisson (2)
Firm-level variables:		
Debt ratio	0.695***	0.558***
	(0.008)	(<0.001)
Tax rate	-4.708***	-2.352***
	(0.005)	(<0.001)
Subsidy rate	0.035	-0.760**
	(0.964)	(0.023)
Size (ln)	0.523***	0.257***
	(<0.001)	(<0.001)
Age (ln)	0.316***	0.244***
	(<0.001)	(<0.001)
Return on equity (ROE)	0.009	0.0002
	(0.381)	(0.965)
Asset turnover rate	-0.169*	-0.095***
	(0.050)	(<0.001)
State ownership (%)	0.274	0.260***
	(0.181)	(<0.001)
Private ownership (%)	0.155	-0.135*
	(0.499)	(0.062)
Foreign ownership (%)	0.828	0.655
	(0.491)	(0.109)
Province-level variables:		
Coal price (ln)	0.139	0.157***
	(0.348)	(0.003)
GDP per capita (ln)	-1. 968	-1.867*
	(0.509)	(0.064)
Corruption	-0.098	-0.010
	(0.421)	(0.825)
Media exposure	-0.096	-0.007
	(0.453)	(0.297)
Year fixed effects	Yes	Yes
Province fixed effects	Yes	Yes
No. of obs.	21,126	21,131
Log pseudolikelihood	-1001.767	-6356.258

Table 9: State-owned vs. Non-state-owned mines

This table presents the Poisson regression results on the determinants of coalmining fatality. The sample consists of 22,076 firm-year observations for the period 2001-2006. The dependent variable is the number of coalmining deaths per firm per year. All explanatory variables are defined in Appendix Table A1. All regressions include an intercept term, which is omitted from the table. P-values are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively.

Independent variables	State-owned Poisson (1)	Non-state-owned Poisson (2)
Firm-level variables:		
Debt ratio	0.563***	0.553***
	(<0.001)	(<0.001)
Tax rate	-4.623***	-0.781
	(<0.001)	(0.187)
Subsidy rate	0.152	1.160
	(0.538)	(0.266)
Size (ln)	0.412***	0.280***
	(<0.001)	(<0.001)
Age (ln)	0.263***	0.262***
	(<0.001)	(<0.001)
Return on equity (ROE)	-0.018**	0.002
	(0.034)	(0.650)
Asset turnover rate	-0.0008	-0.118***
	(0.987)	(<0.001)
State ownership (%)	-2.024***	2.054***
	(<0.001)	(<0.001)
Private ownership (%)	-1.092*	-0.067
	(0.090)	(0.347)
Foreign ownership (%)	0.848	0.570
	(0.748)	(0.176)
Province-level variables:		
Coal price (ln)	0.185***	0.109
	(0.004)	(0.101)
GDP per capita (ln)	-4.760***	1.435
	(<0.001)	(0.255)
Corruption	0.006	0.054
	(0.902)	(0.399)
Media exposure	0.002	-0.003
	(0.748)	(0.717)
Year fixed effects	Yes	Yes
Province fixed effects	Yes	Yes
No. of obs.	3,582	17,549
Log pseudolikelihood	-3054.819	-4395.190

Table 10: Changes in compensation and fine

This table presents the Poisson regression results on the determinants of coalmining fatality. The sample consists of 22,076 firm-year observations for the period 2001-2006. The dependent variable is the number of coalmining deaths per firm per year. All explanatory variables are defined in Appendix Table A1. All regressions include an intercept term, which is omitted from the table. P-values are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively.

Independent variables	Low Compensation & Fines (2001-2004) Poisson (1)	High Compensation & Fines (2005-2006) Poisson (2)
Firm-level variables:		
Debt ratio	0.338***	0.639***
	(<0.001)	(<0.001)
Tax rate	-2.995***	-0.423
	(<0.001)	(0.605)
Subsidy rate	0.463**	-3.717***
	(0.046)	(0.001)
Size (ln)	0.414***	0.412***
	(<0.001)	(<0.001)
Age (ln)	0.256***	0.429***
	(<0.001)	(<0.001)
Return on equity (ROE)	-0.004	0.005
	(0.314)	(0.627)
Asset turnover rate	-0.080***	-0.024
	(0.002)	(0.399)
State ownership (%)	0.250***	0.306**
	(<0.001)	(0.011)
Private ownership (%)	-0.007	-0.047
	(0.930)	(0.674)
Foreign ownership (%)	0.552	-2.577
	(0.181)	(0.290)
Province-level variables:		
Coal price (ln)	0.249***	0.127
	(<0.001)	(0.613)
GDP per capita (ln)	-3.000*	-4.291
	(0.078)	(0.284)
Corruption	-0.163***	1.075***
	(0.007)	(<0.001)
Media exposure	-0.009	0.520***
	(0.158)	(<0.001)
Year fixed effects	Yes	Yes
Province fixed effects	Yes	Yes
No. of obs.	10,867	10,264
Log pseudolikelihood	-5217.344	-2369.379

Table 11: Shanxi province and other regions

This table presents the Poisson regression results on the determinants of coalmining fatality. The sample consists of 22,076 firm-year observations for the period 2001-2006. The dependent variable is the number of coalmining deaths per firm per year. All explanatory variables are defined in Appendix Table A1. All regressions include an intercept term, which is omitted from the table. P-values are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively.

Independent variables	Shanxi province Poisson (1)	Other regions Poisson (2)
Firm-level variables:		
Debt ratio	2.348***	0.321***
	(<0.001)	(<0.001)
Tax rate	-3.653**	-1.660***
	(0.022)	(0.001)
Subsidy rate	-8953.603	-0.030
	(0.130)	(0.894)
Size (ln)	0.529***	0.417***
	(<0.001)	(<0.001)
Age (ln)	0.205**	0.316***
	(0.036)	(<0.001)
Return on equity (ROE)	0.002	-0.004
	(0.877)	(0.257)
Asset turnover rate	-0.010	-0.044**
	(0.945)	(0.020)
State ownership (%)	-0.474**	0.300***
	(0.027)	(<0.001)
Private ownership (%)	-7.530***	0.053
	(0.007)	(0.446)
Foreign ownership (%)	-60.118	0.501
	(0.998)	(0.213)
Province-level variables:		
Coal price (ln)	0.673	0.158***
	(0.387)	(0.001)
GDP per capita (ln)	-3.908**	-2.562***
	(0.019)	(0.004)
Corruption	0.279	0.039
	(0.731)	(0.319)
Media exposure	0.017	0.002
	(0.739)	(0.714)
Year fixed effects	Yes	Yes
Province fixed effects	No	Yes
No. of obs.	5,704	15,427
Log pseudolikelihood	-694.057	-6952.371

Appendix Table A1: Variable Definitions

Variable	Definition
Coalmining death	The number of coalmining deaths per firm per year.
Debt ratio	Total liabilities divided by the total assets.
Tax rate	The annual total amount of taxes paid by a firm divided by its total sales.
Subsidy rate	The annual total amount of government subsidies received by a firm divided by its total sales.
Size	The natural logarithm of a firm's total asset.
Age	The natural logarithm of the number of years since the formation of the firm.
Return on equity (ROE)	Net profit divided by the book value of equity.
Asset turnover rate	The firm's total sales divided by its total assets.
State ownership	The percentage equity ownership by the state.
Private ownership	The percentage total equity ownership by the collective individual investors.
Foreign ownership	Total equity ownership by foreign investors including investors from Hong Kong, Macau, and Taiwan
Coal price	The natural logarithm of average coal price per ton in each province.
GDP per capita	The natural logarithm of average GDP per capita for each province.
Corruption	It is measured as the corruption cases filed per 10,000 government officials for each province.
Media exposure	It is measured as the per capita print of newspapers in a year for each province.
Investment in safety equipment	A firm's per capita investment in productive fixed asset in each year.
Management quality	Operating income growth over the past year, defined as (Operating income$_{t-1}$ – Operating income$_{t-2}$)/Operating income$_{t-2}$
Asset growth (Total)	Annual percentage change in total assets, defined as (Total assets$_{t-1}$ – Total assets$_{t-2}$)/Total assets$_{t-2}$
Asset growth (Fixed)	Annual percentage change in fixed assets, defined as (Fixed assets$_{t-1}$ – Fixed assets$_{t-2}$)/Fixed assets$_{t-2}$

Appendix Table A2: Pearson correlation matrix

This table presents the pair-wise correlations between the key variables used in the study. All variables are defined in Appendix Table A1.

	Death	Debt ratio	Tax rate	Subsidy rate	Size	Age	ROE	Asset turnover	State owner-ship	Private owner-ship
Debt ratio	0.036									
Tax rate	-0.015	0.019								
Subsidy rate	0.095	0.078	-0.030							
Size	0.148	0.038	0.016	0.038						
Age	0.114	0.177	0.106	0.207	0.175					
ROE	-0.003	0.005	0.006	-0.012	-0.005	-0.007				
Asset turnover	-0.031	-0.143	-0.185	-0.056	-0.061	-0.157	0.118			
State ownership	0.108	0.220	0.074	0.222	0.201	0.455	-0.017	-0.174		
Private ownership	-0.039	-0.143	-0.120	-0.083	-0.093	-0.283	-0.004	0.107	-0.343	
Foreign ownership	0.0004	-0.019	-0.012	-0.008	0.005	-0.021	-0.010	0.013	-0.020	-0.045

Appendix Table A3: Leverage and Profitability

This table presents the percentile distribution for the mean and median of return on equity (ROE).

	Return on Equity (ROE)	
Debt Ratio	Mean	Median
25th Percentile	0.362	0.180
50th Percentile	0.366	0.179
75th Percentile	0.369	0.170
90th Percentile	0.390	0.166
99th Percentile	0.401	0.167

Appendix Table A4: Negative binomial regressions

This table presents the negative binomial (NB) regression results on the determinants of coalmining fatality. The sample consists of 22,076 firm-year observations for the period 2001-2006. The dependent variable is the number of coalmining deaths per firm per year. All explanatory variables are defined in Appendix Table A1. All regressions include an intercept term, which is omitted from the table. P-values are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively.

Independent variables	NB (1)	NB (2)	NB (3)
Firm-level variables:			
Debt ratio	0.427***	0.478***	0.675***
	(0.005)	(0.002)	(<0.001)
Tax rate	-5.660***	-5.592***	-1.894**
	(<0.001)	(<0.001)	(0.025)
Subsidy rate	2.671**	2.484**	-0.132
	(0.028)	(0.043)	(0.888)
Size (ln)	0.269***	0.292***	0.348***
	(<0.001)	(<0.001)	(<0.001)
Age (ln)	0.314***	0.333***	0.266***
	(<0.001)	(<0.001)	(<0.001)
Return on equity (ROE)	0.002	0.001	0.002
	(0.871)	(0.923)	(0.834)
Asset turnover rate	-0.097***	-0.075***	-0.069**
	(0.001)	(0.009)	(0.018)
State ownership (%)	0.854***	0.803***	0.320**
	(<0.001)	(<0.001)	(0.017)
Private ownership (%)	0.258**	0.331***	-0.109
	(0.018)	(0.003)	(0.345)
Foreign ownership (%)	0.523	0.568	0.472
	(0.508)	(0.465)	(0.514)
Province-level variables:			
Coal price (ln)	0.464***	0.324***	0.068
	(<0.001)	(<0.001)	(0.499)
GDP per capita (ln)	-0.468**	-0.274	0.930
	(0.044)	(0.243)	(0.602)
Corruption	0.001	-0.013	-0.108
	(0.980)	(0.793)	(0.206)
Media exposure	-0.016	-0.018**	0.003
	(0.056)	(0.031)	(0.837)
Year fixed effects	No	Yes	Yes
Province fixed effects	No	No	Yes
No. of obs.	21,131	21,131	21,131
Log pseudolikelihood	-5027.236	-4963.337	-4775.363

Appendix Table A5: OLS regressions

This table presents the OLS regression results on the determinants of coalmining fatality. The sample consists of 22,076 firm-year observations for the period 2001-2006. The dependent variable is the natural logarithm of (one plus) the number of coalmining deaths per firm per year. All explanatory variables are defined in Appendix Table A1. All regressions include an intercept term, which is omitted from the table. Robust standard errors are clustered at the provincial level. P-values are reported in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively.

Independent variables	OLS (1)	OLS (2)	OLS (3)	OLS (4)
Firm-level variables:				
Debt ratio	0.011*	0.010*	0.014**	0.097*
	(0.074)	(0.100)	(0.018)	(0.073)
Tax rate	-0.175***	-0.172***	-0.026	-0.396*
	(<0.001)	(<0.001)	(0.386)	(0.089)
Subsidy rate	0.871***	0.870***	0.719***	2.508*
	(<0.001)	(<0.001)	(<0.001)	(0.083)
Size (ln)	3.03e-8***	3.04e-8***	3.10e-8***	-3.81e-8
	(<0.001)	(<0.001)	(<0.001)	(0.664)
Age (ln)	0.017***	0.017***	0.016***	0.027
	(<0.001)	(<0.001)	(<0.001)	(0.377)
Return on equity (ROE)	0.00002	0.00001	0.00007	0.0003
	(0.945)	(0.967)	(0.796)	(0.519)
Asset turnover rate	-0.002	-0.001**	-0.002***	-0.0009
	(0.004)	(0.010)	(0.005)	(0.426)
State ownership (%)	0.071***	0.069***	0.056***	0.047
	(<0.001)	(<0.001)	(<0.001)	(0.677)
Private ownership (%)	0.010**	0.012***	-0.008*	0.022
	(0.012)	(0.003)	(0.072)	(0.438)
Foreign ownership (%)	0.038	0.038	0.029	-0.080
	(0.320)	(0.310)	(0.437)	(0.428)
Province-level variables:				
Coal price (ln)	0.015***	0.011***	0.009**	0.048
	(<0.001)	(0.001)	(0.045)	(0.130)
GDP per capita (ln)	-0.038***	-0.025***	0.094	-0.489
	(<0.001)	(0.007)	(0.225)	(0.254)
Corruption	-0.001	-0.0003	0.004	0.029
	(0.545)	(0.884)	(0.218)	(0.526)
Media exposure	-0.00001	-0.0003	-5.92e-06	0.001
	(0.973)	(0.435)	(0.992)	(0.718)
Year fixed effects	No	Yes	Yes	Yes
Province fixed effects	No	No	Yes	No
Firm fixed effects	No	No	No	Yes
No. of obs.	21,131	21,131	21,131	21,131
Adjusted-R^2	0.072	0.076	0.105	0.006