



Enterprise investment, local government intervention and coal overcapacity: The case of China

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ABSTRACT

Long-term management of China's coal overcapacity depends on the targeted policy guidance on industry production capacity expansion in the overcapacity formation process. In this study, coal enterprise and local government are treated as game participants, and a three-stage dynamic game model has been developed to depict the boosting effect of the game behavior of coal enterprise's and local government's capacity investments in different markets of supply and demand. The results are shown in the following: (1) local government has been the "behind-the-scenes" operator of over-investment and redundant construction, and its excessive interventions in coal industry investment have been the primary cause of overcapacity formation; (2) when the market is in short supply, coal enterprise's optimal behavior is to continuously increase the rate of investment growth until it reaches the threshold to obtain the maximum excess profits, ultimately leading to overinvestment in the industry; and (3) the key factors affecting the game abilities of coal enterprise and local government are the market's self-regulation and the central government's supervision intensity. Although the Chinese government, a highly vertically oriented bureaucratic structure, is implementing a mandatory de-capacity policy to alleviate the intensity of excessive coal capacity, it is not a long-term regularization on the supply-side reform.

1. Introduction

As the primary subject in energy structure, the coal industry's operational situation has faced severe irrational structures and low utilization efficiency issues. Under the current trend of continuously shrinking market demand, the biggest obstacle confronting China's economic development is the traditional energy industry's overcapacity, especially in the coal industry (European Chamber, 2016; Greenpeace, 2015a, 2015b). During this Paris climate talks, the document titled "Enhanced Actions on Climate Change: China's Intended Nationally Determined Contributions (INDC)" claimed that in 2030, China will achieve its carbon emission peak, which means that in 2020 and 2030, China's total coal consumption must be controlled below 3.8 billion tons and 3.4 billion tons, respectively. Since 2015, the Chinese government has adopted a series of supply-side reforms, including cutting excessive industrial capacity, i.e., the de-capacity policy (O'Reilly, 1986; "De-capacity scheme", 2015), upgrading technologies, substituting coal with an equivalent amount of alternative energy, etc., to resolve the coal overcapacity issue. Currently, although the reduction of coal capacity has been effective, coal enterprises have suffered a tremendous loss. By the end of 2015, more than 90% of

large- and medium-sized coal enterprises endured a loss, which indicated that the significant de-capacity reform has not brought a new "spring" to coal enterprises; production capacity remains seriously excessive ("Coal industry", 2016). Accordingly, against the background that coal supply and demand in China is currently experiencing a serious problem that will continue for a long period of time, investigation of the formation mechanism of coal overcapacity is of great significance to optimizing and also upgrading the China's industrial structure and can provide important support for protecting China's energy supply security, promoting the optimization of the overall energy structure and developing the low-carbon economy.

Coal overcapacity is currently plaguing China's economic transformation and ability to optimize its energy structure. Given coal's dominant position in energy structure and its non-sustainability, coal overcapacity has attracted the attention of many scholars worldwide (Betancourt et al., 1985; Koerner et al., 1995; Danicic et al., 2009; Wang et al., 2015). Ward et al. (2004) believed that overcapacity is a long-term state and cannot be resolved by simply relying on the market's self-regulation; Kirkley et al. (2002) argued that overcapacity means that an enterprise's production capacity has not been fully utilized owing to the rigidity of capacity investment and the variability

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of market demand. Neoclassical economics holds that overcapacity is a short-run economic phenomenon and a structural imbalance-caused fluctuation state (Johansen, 1968; Morrison, 1985; Dupont et al., 2002), however government circles and academia do not agree about the mechanism of overcapacity. On the one hand, some scholars believe that overcapacity reflects market imbalance, in which the uncertainty of demand stimulates overcapacity to an extent (Papadopoulos, 1981; Fair, 1985; Ward et al., 2004; Lee and Jang, 2012); on the other hand, from the perspective of cost accounting, other scholars propose that overcapacity represents irrational overbuilding caused by overheated investments (Barres, 1987; Erturk, 2001; Terada, 2002; Wu et al., 2016). With respect to China's coal industry it is worth to believe that historical factors or policy factors also contributed to the overcapacity (Shen et al., 2012). Particularly in the late 1990s, China's small coal mines boomed "everywhere", resulting in the waste of coal resources and the destruction of ecological environment, along with an over-supply and overcapacity in coal production (Andrews-Speed et al., 2003a, 2003b; Shi, 2013). Besides, China's coal market has been at a lower level than markets in developed countries and the government conducted extensive interventions in coal enterprises' production investments (Cao et al., 1999; Garnaut et al., 2005; Shi, 2013). Shi (2011) also argued that the policy to shut down mines simply is impractical and ineffective to govern overcapacity and guide the coal industry's transformation in China. Therefore, this study focuses on the formation mechanism of coal overcapacity and further discusses governments' and enterprises' strategies associated with the irreversible capacity investment.

From the perspective of the production investment structure, coal enterprises—especially large, state-owned coal enterprises—have been the most active players in the investment market, and the scale of investment in fixed assets by these enterprises directly determines the extent of overcapacity. In the early 1990s, Lantz and Junqueira-Lopez (1992) proposed that the enterprise's capacity scale is directly settled by its investment behavior; moreover, some types of investment (investment subsidies, if any) strongly stimulate enterprises' investment behavior. Henderson and Cool (2003), and Yifu et al. (2010) also noted that overcapacity is caused by an enterprise's capacity expansion bandwagon behavior and that the curb on the enterprise's overinvestment can effectively eliminate overcapacity; Wang et al. (2014) noted that the drivers of capacity expansion are primarily market-positive signals such as high revenues in this sector, strong government support and low access standards, and under the assumption of incomplete information, companies are inclined to opt for the strategy of increasing investment and expanding capacity.

According to the neoclassical school of economics, the bounded rationality of coal enterprise's investment behavior leads to overcapacity in the industry, and spontaneous market regulation can eliminate the negative impact on social welfare; therefore, government intervention is unnecessary. However, China's current bureaucratic structure and market mechanism cannot solve issues such as "private alliances" and local protectionism. Hence, government intervention is essential in China's coal market. As shown by China's financial expenditure, both the central government and local government conduct direct interventions (currency investment) and indirect interventions (tax subsidies, etc.). Shleifer and Vishny (1994) maintained that the government uses political power to control state-owned enterprises to achieve private objectives. Through empirical investigations, Lin et al. (1998) and Chen et al. (2011) found that government intervention has a significant effect on enterprises' investment efficiency; Zhang et al. (2014) illustrated that government subsidies—indirect interventions—have significant positive effects on the companies' performance and the institutional behavior of rent-seeking in long and short terms. Besides, government intervention in enterprises' investment behavior is also reflected in corporate finance (Sapienza, 2004; Fan et al., 2008). Although the literature has not addressed the issues of the difference between central and local government's intervention and investment in

coal production capacity, it still can be inferred that government intervention influences overinvestment and overcapacity in China's coal sector and this influence cannot be ignored.

In terms of government projects in coal capacity investment, although the budget is controlled by the central government, local government has authority over local fiscal expenditures and resource planning, and their intervention decreases the opportunity cost of the enterprises' capacity expansion. Meanwhile, their influence on overcapacity exceeds that of the central government (Kim, 1997; Terada, 2002). Wang et al. (2011) and Wu et al. (2016) stated that to achieve better performance and thus more promotion opportunities, local government has a very strong incentive to invest in industries with a high return, leading to institutional overcapacity. Dai and Cheng (2016) also proposed that strong government intervention is a prominent feature in China's energy sector to generate market distortions in some conditions while the market distortions further contribute to a resource misallocation including production overcapacity. Moreover, investment intervention by the central government in a given industry is primarily reflected in investment regulation and the pursuit of the maximization of overall social welfare. Andrews-Speed et al. (2003a, 2003b) declared that the complexity and incoherence of government regulatory mechanisms on investment have also contributed to coal overcapacity. Accordingly, we believe that the current overcapacity in China's coal production has an obvious local government feature. As in the context of fiscal decentralization, the motivations for the central and local government to intervene in coal production investment are inconsistent. Local government and coal enterprise pursue maximum benefits, whereas the central government pursues the orderly development of the industry.

Apparently, there are asymmetric information and benefits conflict of coal capacity investment among local government, coal enterprise and the central government. Along with the different set of the action strategies, the utility level of each player is assigned by not only his own behavior but also the other players', which illustrates that a game relationship exists among local government, coal enterprise and the central government. Until now, the investment game models, especially the game models between enterprises, have received increasing amounts of attention from scholars and politicians. Booth and Vertinsky (1993), Sumaila (1995), Wie (2005) and Kou and Luo (2016) constructed the game model to analyze the capacity investment under the different industries and market structures, and concluded that it is the optimal choice of the existing enterprises to maintain the excessive investment to impede the entry of new enterprises. Unlike those, Kim (1997) took the government into the game model to study the changing capacity investment behavior between the potential and existing enterprises under the government regulation. After then, a tripartite game model among local government, the bounded rational enterprise and the central government is brought forward by Qian and Roland (1998). However, the tripartite model lacks of the policy effect of tax incentives and other indirect intervention. Similarly, Xia and Wang (2015) studied the formation of industry overcapacity in China, but only analyzed the static game without taking the above three subjects into the same game model. Ji et al. (2014) presented a three-stage dynamic theoretical game model to discuss coal firms' privatization behavior rather than investment behavior, which is not involved the local government intervention. In addition, coping with various market uncertainties, Bai et al. (2014) proved that external factors such as supply and demand are highly relied on by the government to draw policies under a macroeconomic framework, which starts a brainstorming that we should discuss the formation mechanism of coal overcapacity under different market environment.

After examining previous studies, we found that previous studies have mostly focused on corporate investment or government intervention to analyze the relationship between the investment and overcapacity, which were mostly limited in the game choices among enterprise-enterprise, government-enterprise and central govern-

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