

Exuberance in China's renewable energy investment: Rationality, capital structure and implications with firm level evidence

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HIGHLIGHTS

- We test the over-investment hypothesis of renewable energy firms in China.
- The role of capital structure is also empirically investigated.
- We find irrational investment and confirm the role of financing structure.
- The results are sensitive to the main business sectors and industrial line.

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ABSTRACT

The new century has witnessed phenomenal worldwide growth in renewable energy investments. China has been especially remarkable, surpassing both the US and the EU in 2013. Some recent facts, however, have raised the question of whether exuberant investment in China's renewable energy sector is rational. This paper aims to contribute to the literature and to the debate in two ways. First, it tests the over-investment hypothesis based on the main stream finance methodology; second, it analyzes the role of capital structure in the performance of China's renewable energy firms. Empirical results show that overinvestment in the renewable energy sector exists. The problem is more significant in the biomass and wind sector. Capital structure is found to be more important to downstream firms, indicating that policy makers may provide support that enables these firms to finance their investments through corporate bonds, commercial credit, or long-terms debts.

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1. Introduction

The global trend of increasing demand for clean energy has led to a phenomenal growth in the investments in the renewable energy sector (see Fig. 1) over the last ten years. Bloomberg New Energy Finance (2014) reports that the average annual growth rate from 2005 to 2013 was approximately 24%. The growth pattern has clearly been more volatile since the 2008 global financial crisis. Although developed countries are still the major contributors to renewable energy investments, developing countries have higher growth rates (27% vs. 15%) and have begun to catch up. While European and the US investments have been falling since 2011, the continuous growth of China and ASOC (Asia and Oceania countries, excluding China and India) has shown strong potential.

Recently, China has been very active in developing its renewable energy sector. In 2005, the National People's Congress of China passed the Renewable Energy Law (hereafter referred to as "REL"). It marks that China's renewable energy development has moved into the fast lane. A number of supporting measures and regulation guidelines have been introduced to stimulate renewable energy development (see Wang et al., 2010; Shen and Luo, 2015; Zhao et al., 2014, for more information). Since then, the total amount of investments in the renewable energy sector has grown rapidly, from 2.4 billion USD in 2004 to more than 59.6 billion USD in 2012 (Bloomberg New Energy Finance, UNEP). China passed EU and the US to be the top investors of renewable energy in the world in 2013.

The enthusiasm for new energy investments in China has also been driven by mounting environmental pressures. China's greenhouse gas emissions have often been criticized for being one of the primary drivers of the world's increasing aggregates level of emissions (Peters et al. 2013). Policy makers in China set up clear

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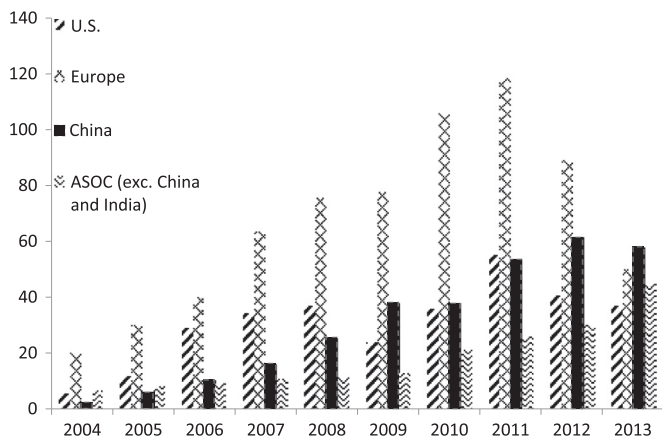


Fig. 1. Global trend of new investment in renewable energy: 2004–2013. Source: UNEP, Bloomberg New Energy Finance; units is billions of US dollars; ASOC refers to Asia and Oceania (excluding China and India).

goals for reducing emissions. However, the size of the economy and its aim for high speed growth have created a dilemma for the government and made it harder to achieve desired emission levels. Besides, the excessive use of coal (which comprises approximately 70% of China's energy use) has made the country one of the most polluted areas in the world. Nationwide air quality has continued to worsen, in turn leading to calls for action against further deterioration and improvements.

Another motivation for developing China's renewable energy sector is to ensure energy security (IRENA, 2014a). Behind the fast economic growth of the last three decades there is an increasing demand for energy. China has already become a net energy importer, depending heavily on the international market. Discovering how to meet the increasing energy demand and ensure sustainable growth are of great strategic importance. The increasing needs for energy in the modern society and the exhaustible nature of most fossil fuels mean that developing the renewable energy sector and utilizing alternative sources of energy is inevitable. In fact, China has abundant renewable energy resources (Shen and Luo, 2015), including hydro, wind, solar, biomass, and geothermal, which offer clean power sources and alternatives to fossil fuels. Developing the renewable energy sector is therefore necessary and also feasible to provide stable energy supply to the growing Chinese economy.

Although there is evidence (Zhao et al., 2014) of its many benefits, the boom in renewable energy investments is not without problems. Fast expansion can induce misallocation of resources and unbalanced industrial structure, which exposes the whole sector to high risks. For example, China's solar PV industry has experienced rapid growth since 2008 and China is now the world's largest manufacturer. In 2011, China accounted for approximately 60% of global PV production. The industry is mainly export driven and depends heavily on the demand of the EU and North American markets. Policy changes in the EU and the US between 2011 and 2012 (reducing subsidies by the EU and imposing anti-dumping tax by both parties) caused sharp drops in market demand and clearly the surplus of China's PV industry. It eventually led to a substantial decline in the price of PV products. Similar issues also occurred in the wind power sector in China. Some recent dramatic increases of China's wind power capacity may also be the consequence of possible overinvestment (Liu, 2013).

Investment in the renewable energy sector is risky. This is probably why the global trend has been more volatile since the 2008 global financial crisis, potentially causing higher uncertainties in the market. Government subsidies and support can

only provide the industry with short-run motivation, but not replace market mechanisms. It is observed that China's energy firms tend to invest irrationally (Tan, 2013). Similar concerns can also be extended to the fast growing renewable energy sector. If overinvestment exists in this sector, it can cause a significant waste of resources and also do harm to the industry's development. Therefore, it is necessary to empirically investigate the story behind China's exuberance towards renewable energy investments.

Given the strategical importance of the renewable energy sector in China and the challenges in presence, this paper aims to study two separate but related aspects of financing renewable energy in China. The first goal of this paper is to empirically test for the rationality of renewable energy investments in China. "Irrational exuberance", a phrase used by Greenspan (1996) in a speech given at the American Enterprise Institute during the Dot-com bubble of the 1990s, is also used by Shiller (2000) to warn that the market might be overvalued. We borrow this concept here and extend the existing literature on testing for the free cash flow problem (Jensen, 1986) in China's renewable energy sector. Specifically, we use listed firm data and adopt a standard finance methodology to investigate the overinvestment problem.

IRENA (2014b) argues that financing renewable energy is getting easier and cheaper, but still with variations. The second main contribution of this paper is therefore to find out how different financing channels may affect profitability. It is shown (Zeng et al., 2014) that bank loans are the main financing channel with a total of 300 billion RMB issued by banks by the end of 2011. Equity financing in the stock market has been popular since 2009, and by the end of June 2012 more than 20 billion RMB had been raised by listed firms in this sector. The evolving of financing structure has brought an additional question: does capital structure matter in the renewable energy sector? If yes, what is the best form of financing in this industry?

The remainder of this paper is organized as follows. Section 2 provides a brief survey of relevant literature with more focus on introducing the background of renewable energy investments in China. Section 3 introduces the methods used in our empirical studies. Section 4 describes the data and Section 5 reports empirical results and discusses potential implications. The last section concludes.

2. Literature review

The significance of developing the renewable energy sector has attracted intensive attention in the literature. The world needs to invest heavily in renewable energy development¹ in order to reduce emissions and keep global warming under control. It is important to realize that the sustainability of such investments requires policy makers and firms to act optimally. Among all factors, investment decision and profitability are two most important issues, which drive the empirical investigation in this paper.

Understanding such issues requires us to take a financial perspective and this has been regularly found in recent literature. For example, Wustenhagen et al. (2007) point to the needs to explore the factors that affect the financial community's acceptance of renewable energy innovation. Wustenhagen and Menichetti (2012) propose a conceptual framework for renewable energy investment and explicitly emphasize the importance of this issue in the background of finance theory. Their starting point is that risk, return, and policy jointly decide the current investment levels.

Studying the market mechanism, especially from the investors' perspective (see Dinica, 2006 and Hamilton, 2009), is crucial to

¹ In 2009 IEA estimated that around 400–500 billion USD annually in renewable energy investments would be needed until 2020.

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