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China Economic Review



# Biased data revisions: Unintended consequences of China's energy-saving mandates

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## ARTICLE INFO

### Article history:

Received 13 April 2016

Received in revised form 10 August 2016

Accepted 10 August 2016

Available online xxx

### Keywords:

Energy-saving mandates

Unintended consequences

Biased benchmark revision

Checks and balances

China

## ABSTRACT

In China energy-saving mandates issued by the central government can trigger a trade-off between faithful implementation and kinds of strategic responses at the local level. This paper examines the biased data revision pattern of Chinese provinces under incentives created by energy-saving mandates. The data revisions conducted by provinces in the treatment group are evaluated against those carried out by their counterparts in the control group. Empirical evidence is provided that some provinces in the treatment group conducted biased data revisions by taking advantage of benchmark revisions of historical data following the 2008 Economic Census. These provinces adjusted their base-year energy consumption figure upward in seeking to reach the 2010 energy intensity reduction targets numerically. In institutional terms, strong political incentives are formed by assigning energy-saving indicators a veto power in cadre performance assessment. In a self-reported statistical regime, checks and balances are particularly weak regarding benchmark revisions of historical data. The findings of this paper suggest that the data quality of associated official statistics at the local level is undermined by energy-saving mandates. To improve the data quality of the official statistics, new checks and balances should be installed for local statistics.

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## 1. Introduction

The energy intensity, defined as total energy consumption per unit of gross domestic product (GDP), experienced a continuous decline from the 1980s to 2002 in China. This trend, however, was then reversed in 2003 (Wang, Zhao, & Chi, 2014; Zhu & Ruth, 2015). To deal with the associated challenges, such as air pollution, energy security, and climate change, an energy-saving target for the country was specified to decrease the energy intensity by 20% or thereabouts by 2010 based on the 2005 level. For local authorities, energy-saving policy implementation will yield significant external benefits (Kostka & Hobbs, 2012). A “policy implementation gap” between national concerns and local interests typically emerges (OECD, 2006; Van Rooij, 2006). To bridge this gap, a numerical energy intensity reduction target for 2010 was assigned to each province in 2006; then, “veto power” (*foujue quan*) was attached to energy-saving performance in 2007 to guarantee faithful implementation at the local levels.

Against this backdrop, a considerable amount of literature has examined the effectiveness of China's energy-saving policies. As expected, empirical studies have confirmed that energy-saving policies were fairly effective in promoting China's energy-conserving actions during the 11th Five-Year Plan (FYP, 2006–2010) (Lo & Wang, 2013; Price et al., 2011; Xu, Fan, & Yu, 2014; Yuan, Kang, Yu, & Hu, 2011). The anticipated strategies adopted by local governments include informational supply, energy

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price adjustment, and various types of exchange of interests (Kostka & Hobbs, 2012; Wang et al., 2014; Zhao, Li, Wu, & Qi, 2014). However, this is not the whole story. Target-based performance regimes in China can also trigger unintended and undesirable consequences. Cai, Chen, and Gong (2016) detected unintended consequences of China's pollution reduction mandates in provinces' tendency to locate more water-polluting activities in the most downstream counties through lenient enforcement of pollution fee collection. Ghanem and Zhang (2014) reported that Chinese cities manipulate air pollution data under the air quality standard mandate issued by the central government. Regarding China's energy-saving mandate, a variety of factors codetermine whether the preset energy-saving target of a province can be achieved. Typically, local officials cannot manage all these factors (e.g. the changing of the macro economy). Accordingly, a rigid target will also motivate local governments to seek fulfillment of the energy-saving target by hook or by crook, bringing about various negative effects. In late 2010 local officials in China sought to fulfill time-bound energy-saving targets by adopting drastic and short-sighted responses, such as clamping down on electricity consumption (Kostka, 2013; Wang et al., 2014), hinting at the need for more rational thinking concerning China's target-based energy-saving system.

This article investigates the unintended consequences resulting from China's energy-saving mandate. Under incentives created by the energy-saving mandate, sub-national authorities conducted biased data revisions with the aim of achieving the energy intensity reduction targets for 2010 against the 2005 level. The basic logic is that, with values of energy intensity remaining unchanged in recent years, a higher base-year figure will facilitate the fulfillment of the preset energy intensity reduction rates. In China data on key indicators (e.g. GDP and energy consumption) are routinely revised following the national Economic Census. The comprehensive revisions of data of both the targeted year and the previous years are called "benchmark revisions." The 2010 benchmark revision following the 2008 Economic Census made the adjustment of historical statistics (i.e. the base-year figure) endogenous in realizing the energy-saving targets for 2010. This paper establishes an analytical framework to identify the potential strategies that local authorities can adopt to reach their energy-saving targets. Based on pre-Economic Census data, provinces that failed to attain their preset energy intensity reduction targets are clustered as the treatment group. For these regions there are incentives to revise the base-year energy consumption figures upward. In contrast, provinces that achieved their energy-saving targets (i.e. a control group) are free from energy-saving goal-oriented incentives. The abnormal revision mode of provinces in the treatment group against that in the control group is empirically tested using both parametric and non-parametric methods. The empirical results show that biased data revisions occurred due to incentives to attain the energy-saving targets. The biased revisions of the 2005 energy consumption contradict the basic view that provincial energy consumption data are typically overstated (Guan, Liu, Geng, Lindner, & Hubacek, 2012; Ma, Song, Zhang, & Sonnenfeld, 2014). A downward revision for all the provinces of the 2013 energy consumption data following the 2013 Economic Census further validates the main conclusions of this paper.

This paper adds several novel aspects to the existing literature. First, instead of focusing on the effectiveness of energy-saving policies (Lo & Wang, 2013; Price et al., 2011; Xu et al., 2014; Yuan et al., 2011), this research reveals an undesirable aspect associated with China's energy-saving mandates. The detected data falsification by local authorities can help to provide a better understanding of the underlying trade-off between actual implementation and sorts of strategic responses. Second, an analytical framework is established for the first time to identify the potential strategies that local governments can adopt to achieve their energy-saving targets. An empirical strategy similar to a natural experiment is used to link biased data revisions with incentives created by energy-saving mandates. Third, apart from the target-based regulation, both a self-reported statistical regime and a lack of revision specifications for historical data play a role in the process of biased revisions of energy consumption data. As for the widely questioned official statistics in China (Holz, 2004; Koch-Weser, 2013; Ma et al., 2014; Rawski, 2001; Sinton, 2001), this paper focuses on how associated institutional arrangements undermine the data quality of statistics at the local level, facilitating institutional changes to improve this criticized issue fundamentally.

The rest of the paper is structured as follows. Section 2 introduces China's energy-saving mandates and associated institutional arrangements. Section 3 covers the analytical framework, empirical strategy, and data issues. In Section 4 the empirical results are reported, linking biased data revisions with energy-saving mandates. The research concludes in Section 5 by highlighting the key findings and providing policy implications.

## 2. Institutional background

To highlight the urgency of the reversal of the declining energy intensity since 2003, an energy intensity reduction target for China's 11th Five-Year Plan (FYP, 2006–2010) was confirmed by the National People's Congress (NPC) in March 2006. The NPC ratified the Outline of the 11th National Economic and Social Development Five-Year Plan, within which an energy intensity reduction goal was specified. The energy intensity goal for the country was set in the 11th FYP as a reduction by 20% or so by 2010 against the 2005 level. In the 11th FYP, the energy-saving target was categorized as a "restricted" (*yueshuxing*) indicator, assuming primary accountability of the governments in meeting the target by allocating public resources and employing administrative power. Then, a series of energy-saving guidelines, policies, and programs was introduced by the central government from 2006 to 2010.<sup>1</sup> As a consequence, energy intensity reduction has taken a place on the core political agenda at the national level.

Within China's multi-tier administrative structure, however, a national priority will not necessarily lead to faithful implementation at the local level. As a result of China's decentralization reform, local governments are generating strong incentives to

<sup>1</sup> For a list of energy-saving policies issued during the 11th Five-Year Plan (2006–2010), readers can refer to Lo and Wang (2013); Yuan et al. (2011); Zhou, Levine, and Price (2010), and Zhu and Ruth (2015).

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