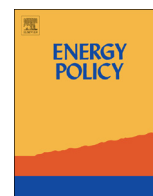




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Energy Policy

journal homepage: www.elsevier.com/locate/enpol

Assessing the design of three carbon trading pilot programs in China

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HIGHLIGHTS

- We assess the design of three carbon trading pilots in China.
- We focus on how these programs adapt emissions trading to China's context.
- We find instances of deft tailoring to China's unique institutions.
- We also find instances where designs are insufficient to ensure smooth operation.
- We make nine recommendations to improve the programs' design and operation.

ARTICLE INFO

Article history:

Received 11 July 2015

Received in revised form

1 April 2016

Accepted 7 June 2016

Available online 14 July 2016

Keywords:

China

Carbon

Emissions trading

ETS pilot

Political economy

ABSTRACT

To help overcome the challenge of growing CO₂ emissions, China is experimenting with market-based instruments, including pilot CO₂ emissions trading systems (ETSs) in seven regions that serve as precursors of a national CO₂ ETS. Implementing an ETS in a rapidly growing economy in which government authorities exercise significant control over markets poses many challenges. This study assesses how well three of the most developed pilot ETSs, in Guangdong, Shanghai, and Shenzhen, have adapted carbon emissions trading to China's economic and political context. We base our study on new information gathered through interviews with local pilot ETS regulators and experts, analysis of recent trading data, and extensive legal and literature reviews. We point out instances in which pilot regulators have deftly tailored carbon emissions trading to China's unique context and instances in which designs are insufficient to ensure smooth operation. We also indicate areas in which broader institutional reforms of China's political economy may be required for carbon emissions trading to operate successfully. We make nine recommendations to improve the design and operation of the pilot programs and to inform the construction of a national CO₂ ETS.

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1. Introduction

Chinese policymakers initiated seven pilot carbon dioxide (CO₂)¹ emissions trading systems (ETSs) in 2013 and 2014, following a remarkably brief two-year planning period. In total, these pilots cover approximately 1.2 billion tons of CO₂—more than any other ETS aside from the EU's ETS. Allowance prices in the pilots range from 3 to 9 US\$, which is comparable to other CO₂ ETSs. However, after more than a year of operation, the pilots risk over

allocation (Jotzo and Loschel, 2014), and various opportunities to improve their design and operation have become apparent. For example, liquidity is quite low in all pilots, and regulators have only approached full compliance rates after significant and unplanned interventions. This article assesses the design and operation of three pilots—those in Guangdong, Shanghai, and Shenzhen—in an effort to improve their performance and inform the construction of a national CO₂ ETS, now expected to start in 2017.

China's economy has a number of non-market features that present particular challenges to the implementation of an ETS, a fundamentally market-based instrument (Lo, 2013). As will be shown throughout this article, the lack of a strong legal foundation for ETS regulations, weak enforcement of environmental regulations in general, tight regulation of the electricity sector, dominance of state-owned enterprises in major sectors, and the

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¹ Abbreviations include: carbon dioxide (CO₂); grandfathering (GF); gross domestic product (GDP); National Development and Reform Commission (NDRC); National People's Congress (NPC); output based allocation (OBA); state-owned enterprises (SOEs); sulfur dioxide (SO₂); monitoring, reporting, and verification (MRV); and Regional Greenhouse Gas Initiative (RGGI).

paucity of publicly available data on CO₂ emissions and other major emitting sources—combined with the presence of multiple overlapping energy and environmental mandates—all compound the complexity of operating a CO₂ ETS in China.² Further, China's own experiment with regional sulfur dioxide (SO₂) ETS pilots, dating back to the 1990s, yielded limited success, and a program at the national level never materialized. Pilot regulators have therefore tried to adapt CO₂ ETS to China's distinct economic, regulatory, and legal institutions by crafting designs that deviate substantially from international approaches. In some cases, these adaptations represent a deft tailoring of an ETS to local contexts. In other cases, designs may be insufficient to ensure smooth operation and thereby require modification. Local regulators can always revise pilot designs to better tailor an ETS to China's unique institutions, but proper functioning of an ETS in China may also require improvements in the institutions themselves—which necessitates action from policymakers at the national level.

This article contributes to the literature by offering a detailed assessment of whether CO₂ emissions trading pilots in Guangdong, Shanghai, and Shenzhen—three of the longer running programs whose key elements have a good chance of being replicated at the national level—effectively adapt emissions trading to China's unique political economy. Our structural framework—which includes interviews and data collected on allowance prices, compliance rates, and trading volumes—compares these Chinese pilots to an idealized well-functioning ETS based on selected design features from the literature and operating characteristics of the relatively advanced ETSs in North America. We incorporate key findings into nine proposed recommendations.

The remainder of this article is organized in three sections. Section 2 describes methodologies, Section 3 presents results and discussion, and Section 4 offers conclusions and policy recommendations.

2. Method

We focus on the pilots in Guangdong, Shanghai, and Shenzhen because they are three of the longer running programs, and their key elements have a strong chance of being replicated at the national level. The remaining four pilots (Beijing, Chongqing, Hubei, and Tianjin) share important similarities (e.g., the tendency to freely allocate the majority of allowances and coverage of the electricity and industry sector) and differences (e.g., the extent of sectoral coverage and emissions thresholds for inclusion in the pilot) with the three pilots we study. Important socioeconomic differences also exist between the three pilots we consider, which are in relatively developed parts of China, and two of the pilots (Chongqing and Hubei) that operate in less developed regions. We note that the National Development and Reform Commission (NDRC), China's agency responsible for national planning, initiated the policy of conducting local pilots and has played a crucial role in providing political and administrative support to the local pilots (Kong and Freeman, 2013). Table 1 summarizes key design and socioeconomic differences among the seven pilot programs.

We integrated four sources of information to assess the pilot designs in Guangdong, Shanghai, and Shenzhen. First, we reviewed the English language literature on the pilots. Second, we translated and summarized more than 50 publicly available Chinese language documents describing the design and operation of the three pilots, including decrees, notices, laws, and progress reports by local governments and carbon trading exchanges. Third,

² We define overlapping policies as energy and environmental policies that also reduce CO₂ emissions.

Table 1
Key design and socioeconomic features in China's seven pilots.

Pilot	GDP per capita (1000\$) ^a	CO ₂ intensity (t/1000\$) ^b	Inclusion threshold (k tons CO ₂) ^b	Sectoral coverage ^d	Allowance Allocation ^e
Beijing	10.6	0.8	10	Electricity, Industry and Buildings	Free allocation, auction if market price is adjusted
Chongqing	4.1	1.4	10 or 20 ^c	Electricity and Industry	Free allocation
Hubei	4.1	1.1	120	Electricity, Industry and Manufacturing	Small auction and free allocation for remainder
Guangdong	5.0	0.8	5 or 10 ^c	Electricity and Industry	Auction for 10% in 2015 and free allocation for remainder
Shanghai	11.0	0.9	10 or 20 ^c	Electricity, Industry, Manufacturing, Air Transport and Buildings	Free allocation with plans to auction later on
Shenzhen	13.5	0.6	5	Electricity, Industry, Manufacturing and Buildings	Free allocation with up to 3% auction
Tianjin	10.5	1.0	20	Electricity and Industry	Free allocation, auction if market price is adjusted

^a Values from 2010 as presented in Zhang et al. (2014).

^b From Jozzo (2013), Duan et al. (2014), Guangdong Government (2014), Schreifels (2013), Shanghai Government (2012), and Shenzhen Government (2014).

^c Lower thresholds typically apply to non-industrial (e.g., textiles or building) sectors while higher thresholds apply to industry (e.g., electricity or industry) sectors.

^d Adapted from Duan et al. (2014), Guangdong Government (2014), Shanghai Government (2012) and Shenzhen Government (2014) with sectors categorized at a more aggregated level.

^e From Duan et al. (2014), ICAP (2015), Guangdong DRC (2013a), Shanghai Government (2012), and Shenzhen Exchange (2013).

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