Journal of Cleaner Production 166 (2017) 107–113

Contents lists available at ScienceDirect

Journal of Cleaner Production

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

Determinants and welfare of the environmental regulatory stringency before and after regulatory capture

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ARTICLE INFO

Article history:
Received 18 February 2016
Received in revised form
6 June 2017
Accepted 29 July 2017
Available online 4 August 2017

Keywords:
Environmental regulation
Influencing factor
Capture
Capacity
NGO

ABSTRACT

The enforcement of environmental regulation relies on the willingness and capacity of the regulator. The willingness could be disabled by regulatory capture which is widespread, and that how many public resources should be invested in environmental regulation is always debatable. We develop a 3-stage game to analyze the nonlinear effects and mechanism of regulatory capture and regulatory capacity on environmental regulatory welfare. Our model suggests that the importance of the regional economy to government, the firm size, and the customer's disutility on pollution emissions will influence the possibility of regulatory capture. Furthermore, the dynamic research suggests that when the regulatory capture is controlled, with the improvement of governmental regulatory capacity, the regulator's and customer's welfare continues to grow until the capacity achieves a threshold. Beyond the threshold, the regulatory capacity will be redundant.

1. Introduction

The stringency of environmental regulation depends heavily on two things: the willingness and capacity of regulator (Kamp et al., 2017; Song and Zhou, 2015b; Zhang et al., 2017). However, as Stigler (1971) notes, the regulator is inclined to be captured, and regulations are often observed to be actively sought by the regulated. Under regulatory capture, the regulator will balance profit and intentionally give up regulatory stringency, which is believed to be the main reason for many environmental accidents (Graham et al., 2011; Steinzor, 2012). Staszewski (2010) notes "even the proponents of meaningful judicial review of agency inaction acknowledge the serious practical difficulties such review would present" and that "non-enforcement decisions and other forms of regulatory inaction remain a serious problem".

Regulatory capacity has been highlighted as another key factor that influences regulation effectiveness because the behavior of polluted firms is sneaky and the pollution results are mixed; in addition, there is a time lag and spatial spillover (Gray and Shimshack, 2011; Mutagwaba, 2006). In a case study, Testa et al. (2012) finds out that direct regulation remains the main approach for multi-pollutant control in an industry context, and the efficiency of such regulation may be underestimated in studies that do not consider the full range of pollutants and operational effects. Evidence from China also supports effective governmental regulation is the most important factor on environmental defensive behavior of firms (Liu, 2009; Song and Zheng, 2016). Huang et al. (2016) points out that the lack of adequate regulatory capacity is the same challenge faced by China and Japan. However, a key challenge for regulators is ensuring that appropriate public funding for support and capacity building is well-targeted, not too few or too much; however, the consensus on what this means in practice has yet to be clearly defined (Armsworth et al., 2010; Taylor et al., 2012).

Many studies have been done on deciding regulatory capture, particularly on the relationship between corruption and regulatory capture (Dal Bo, 2006; Livermore and Recesz, 2012). There is also a growing body of literature on regulatory capacity building (Taylor et al., 2012; Testa et al., 2012). However, as with parallels, to the authors' knowledge, the two types of research have few convergences. Furthermore, incorporating the two stages into a complete framework is worthy because both are fundamental to regulation stringency; any study without either part will be limited, or the results could be biased.

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http://dx.doi.org/10.1016/j.jclepro.2017.07.220
0959-6526/

Based on a 3-stage dynamic environmental regulatory game, we discuss how the regulator will be directed by the profit calculation in a continuous decision process. This process can be divided into two parts: what are the factors that determine the environmental regulatory capture? If the regulator is free from capture, what is the relationship between regulatory welfare and regulatory capacity? Environmental regulation is chosen as an example because environmental policy is believed to be representative of many other forms of governmental policy-making in which the government is influenced by special interests, and regulation is captured at the expense of the social interests (Fredriksson and Svensson, 2003). The similarity means that our results are likely not to be exclusive to other policy-making but to have more general acceptability.

We contribute to the regulatory literature in three ways: factors that decide regulatory capture, the correlation between regulatory capacity and regulatory welfare, and new regulator introduction.

Although regulatory capture has been a hot topic, few research has related this widespread phenomena to environmental regulation field. Existing literature reveals that the stringency of environmental regulation could be influenced by interests of local government (Kamp et al., 2017; Song and Zhou, 2015b; Zhang et al., 2017), however, not too many realize that the government could be captured by those regulated, the law and policy could be disabled. That is so say, the nonlinear relationship, or even skipping relationship between environmental regulation and regulatory welfare has not attracted the attention it deserves. In this work, we reveal the existing of regulatory capture in environmental protection theoretically. Furthermore, compared to most former research relating to regulatory capture which is mainly empirically (Dal Bo, 2006; Livermore and Recesz, 2012), we not only theoretically discuss the factors that decide regulatory capture but also investigate the directions and strengths of the factors systematically.

The correlation between regulatory capacity and welfare is ambiguous in the existing literature, particularly in empirical works (Armsworth et al., 2010; Taylor et al., 2012). Our work reveals the sources of the contradiction by pointing out that the relationship is not a linear, but a skipping one. The model equilibrium notes that if the regulator has not been captured, or if not all firms completely adhere to the environmental law, capacity improvement is important to government's and customers' welfare. Furthermore, by distinguishing pollution consumption from pollution emissions, the dependent third party is introduced into the model. The customers' disutility could be informed by the organization's work on awakening customers' environmental awareness, avoiding free-riding, and communicating between the society and the government.

The transition is accelerating from environmental policy-making by law towards other governance approaches based upon networking, voluntary commitments, benchmarking and other forms of "soft law". Hey et al. (2007) points out the new governance approaches often claim to lead to "better regulation" by adopting a more consensus-oriented and participatory style, mobilizing a broader knowledge base or adopting more integrated and holistic approaches than previous sectionalized and compartmentalized policies. NGOs have long been devoted to environmental protection, and are introduced as important stakeholders by the designers of environmental regulation; our work lays a solid foundation on its theoretical basis (Eden and Bear, 2010; Gulbrandsen, 2009; Huang et al., 2016).

The remainder of this paper is organized as follows. After the introduction of the game in section 2, we discuss the factors that determine regulatory capture in section 3 and the relationship between governmental capacity and welfare in section 4. Section5 provides the regulatory strategies, and we conclude in section 6.

2. Research design

2.1. Game development

The work of Peltzman (1976) consists of three classes of players: a politician, a producer, and a consumer. Based on this work, our game introduces a new player, a third party, who collects funding from the consumer and improves the consumer's ability to communicate with the government. For model simplicity, we focus on the communication ability of the third party in environmental protection; however, in the real world, the third party can do far more than this, including but not limited to education, free-riding avoidance, technical support, and financial support (Belton et al., 2009; Gouldson et al., 2008).

Before the game, the government delineates the rules, including checking, supervision, punishment, and award, and constructs a framework of "carrot and stick". The game between the government and the firm can be separated into three stages. In stage 1, the firm makes the choice between cleaner production technology and polluted production technology. The cost of the former is high, and the latter cost is low; however, the environmental resources are consumed during production. In stage 2, the government monitors the environment and judges whether the production is clean, and whether the firm should be punished because of its environmental pollution. In the last stage, if the firm is not punished by the government, whether the production is clean or polluted, its product enters the market and will be consumed by customer. If the consumer suffers environmental disutility, the consumer will donate m funding to the third party to improve the consumer's ability to report the pollution disutility to the government. The game's process is described in Fig. 1.

The firm has a specific market q for its product. Cleaner production needs a relatively high cost, C_h. The cost of polluted production C_l is less than C_h, but if the expenditure of environment C_e is included, $C_l + C_e = C_h$. The C_e does not enter the firm's cost in general; therefore, we use this as an assumption in this research. During the first stage, the firm evaluates the profit and loss and chooses production technology. Let C represents decision set of the firm, we have $C = \{C_h,\ C_l\}$.

$$\text{cost} = \begin{cases} C_h, \ \textit{cleaner production} & C_h = C_l + C_e \\ C_l, \ \textit{polluted production} & C_e > 0 \end{cases} \quad (1)$$

During the second stage, the government judges the production technology of the firm. Because environmental monitoring depends not only on funding but also on technology, irrefutable evidence of polluted production is expensive and is not always available by the government (Song et al., 2015a, Song and Zheng, 2016). We assume the possibility of polluted production

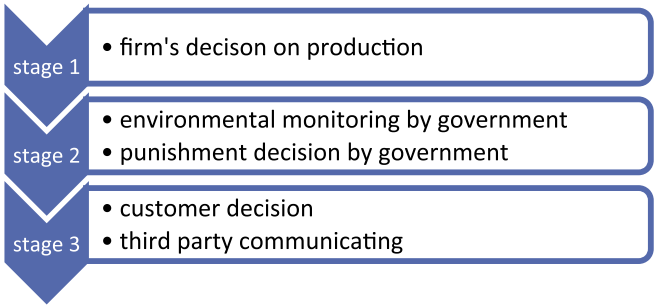

Fig. 1. The game procedure of government and firm.