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The role of revenue sharing and first-mover advantage in emission abatement with carbon tax and consumer environmental awareness

Huixiao Yang^{a,b}, Jianwen Luo^{a*}, Haijun Wang^a

^a*Antai College of Economics and Management, Shanghai Jiao Tong University, Shanghai 200030, China.*

^b*School of Management, Jinan University, Guangzhou 510632, China.*

Abstract: In this study, we explore the role of revenue sharing and first-mover advantage in manufacturer's carbon emission abatement effort and the firms' profitability in a linear demand setting, where the government might impose some carbon emission charges and consumers may have environmental awareness. We consider a supply chain system, consisting of a manufacturer and a retailer. Either of them can move first to offer the other firm a wholesale price contract (WP) or a revenue sharing contract (RS), which is termed as "abatement level promise strategy" (PR) and "abatement level requirement strategy" (RQ), respectively. Our analysis shows that under both PR and RQ, there exists a unique abatement level maximizing the manufacturer's profit in WP and RS, respectively. Moreover, both firms' incentives for abatement are perfectly aligned under PR, but are misaligned under RQ when the marginal abatement cost is large. Contrary to conventional wisdom, RS does not necessarily dull the manufacturer's effort in abatement, it depends on whether she possesses first-mover advantage and whether consumers have environmental awareness. Further, with consumer environmental awareness (numerically) or without, both firms always prefer to possess first-mover advantage, but the system's profit under RQ is smaller than that under PR (numerically). Surprisingly, whether a greater share of revenue benefits a firm depending on whether the firm possesses first-mover advantage (numerically). Finally, under both RQ (numerically) and PR, RS fails to coordinate the system.

Keywords: Revenue sharing; First-mover advantage; Carbon emission abatement; Environmental awareness; Carbon tax.

1. Introduction

Being regarded as one of the main contributors to global warming, carbon emission has received significant concerns in recent decades. Many countries have passed various regulations aiming at carbon emission reductions. For example, the European Union imposed carbon emission limits and allowed companies to trade their allowances (EC 2005). According to the Kyoto Protocol, countries are required to reduce a basket of the six major greenhouse gases by the year 2012 by 5.2% on average compared with their 1990 emission levels. As a result, the Intergovernmental Panel on Climate Change (IPCC 2007)

* Corresponding author: Jianwen Luo. Address: Antai College of Economics and Management, Shanghai Jiao Tong University, Shanghai, China. Tel. : +862152302053.

E-mail addresses: jwluo@sjtu.edu.cn (J. Luo); hxyang86@126.com (H. Yang).

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