

What Drives Firms to Act Positively on Environmental Quality Overtime? Evidence Based on Panel Data from Sri Lankan Agri-Food Processing Sector

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Abstract

The effect of relative changes occurred to the system of economic incentives, which comprised of market-based, regulatory, and liability incentives as well as environmental altruism, over time on firms' private actions towards environmental quality was investigated using the special case of adoption of solid waste management practices (SWMPs) recommended by the Ministry of Environment by agri-food processing firms in Sri Lanka. The panel data gathered from a cross section of firms (n=146) in Stage I (2009) and Stage II (2011/12) by means of in-depth personal interviews supported by a structured questionnaire from environmental managers/owners of firms were used, separately, with Confirmatory Factor Analysis techniques to derive an index for each individual incentive for each stage. These indices were, in turn, modelled with a Count Data Analysis taking the firm's level of adoption of SWMPs as the dependent variable. The results suggest that the level of adoption of SWMPs, on average, has increased over time (*i.e. shift of Mean from 1.25 in Stage I to 1.86 in Stage II*), and irrespective of time, the financial implications/cost, technical efficiency and liability laws had a significant impact on firms' private actions on environmental quality. The outcome, overall, highlights the positive role of market-based incentives alongside regulation, thus, emphasizes the importance of bringing the current, largely single-sided public regulatory regimes towards co-regulation to ensure firms' participation on up keeping environmental quality.

Key words: Agri-food processing sector, Economic incentives, Environmental quality management, Solid waste management

Introduction

Based on the evidence gathered from both the developed and developing country context, economists conclude that market-based actions are, in general, more effective than government-oriented "first best" solutions to deal with the problems associated with public goods. Bansal and Roth (2003), for example, suggest four drivers of corporate environmental response, including: (1) regulation; (2) stakeholder pressures; (3) economic opportunities, and (4) ethical motives or altruism. Although, for the purpose of managing potential impacts that those commercial and industrial operations can have on the environment various types of environmental management systems/practices are suggested, designed, introduced, and/or be adopted, the real impacts of which to the society, at large, and to the end-users, in particular, are not yet fully investigated.

Being the largest manufacturing sector in Sri Lanka with a vast majority of firms operate in geographical areas with high population density, the generation and accumulation of waste through the agri-food processing firms has become a growing problem. In light of these, this study look into the special case of adoption of environmental management practices formulated by the Ministry of Environment and Natural Recourses then [MENR] for the purpose of minimizing the issues arising from solid waste produced by firms operating in the agri-food processing sector in Sri Lanka. These practices include: (1) "Sorting of waste based on 3R system"; (2) "Composting"; (3) "Biogas Technology"; (4) "Biodegradable packing materials"; (5) "Sanitary land filling"; (6) a set of "Good Manufacturing Practices" (GMP); (7) Regular "Waste Auditing" system, and (8) ISO 14000 Environmental Management System. The

changes occurred in the perceptions of firms about relative effectiveness of different incentives prevailing at the level of firm in this respect is of special interest. It, in particular, investigates the impact of an individual incentives characterizes by marker-based, regulatory, judiciary, and altruism on the adoption of those recommended SWMPs, with a special focus on the perceptual changes over time.

Materials and Methods

It was conceptualized that there are four social processes, namely: (1) market; (2) political; (3) judicial, and (4) environmental altruism that can influence firms in implementing environmental management controls. Based on the findings from past studies (Caswell *et al.*, 1998; Jayasinghe-Mudalige and Udugama, 2010; Jayasinghe-Mudalige and Henson, 2006), 10 individual incentives are identified to represent these social processes, including: (1) cost/financial implications; (2) technical efficiency; (3) human resource efficiency; (4) sales & revenue; (5) commercial pressure; (6) reputation; (7) existing government regulation; (8) anticipated government regulations; (9) liability laws, and (10) environmental altruism.

The panel data collected from a cross section of firms (n=146) in Stage I (2009) and Stage II (2011/12) by means of in-depth interviews supported by a structured questionnaire from environmental managers/owners of firms. In Stage I, data were gathered from a cross section of 325 firms' representative to the industry structure from the Central, North Western, Southern and Western provinces during January to September 2009. In Stage II, panel data were obtained using the same procedure used in Stage I from 146 firms out of 325 participated to Stage I. We managed to maintain at least two years gap between the date of collection of data in Stage I and II for each firm. The scores provided by respondents in Stage I and Stage II, separately, on a two-way five-point likert

scale on a series of statements written to reflect the potential impact of each driver stated above were, first, subject to Principle Component Analysis, and then, to Confirmatory Factor Analysis techniques in order to derive respective indices of which the values range from 0 - 1 (1 denotes that a firm perceives the said driver to be "absolutely important" towards environmental governance; 0 denotes "not at all"). These indices were, in turn, modelled with a Count Data Analysis taking the firm's level of adoption of SWMPs as the dependent variable.

Results and Discussion

The sample comprised of 32% "Large", 33% "Medium" and 35% "Small" scale firms based on their annual returns. With regard to the type of SWMPs adopted by firms in Stage II, it was observed that "Good Manufacturing Practices" has become the most popular practice over time followed by the "3R system" and "Composting". The most popular SWMP in Stage I and Stage II were composting (30.8%) and GMP (52.1%) respectively. Where the number of practices adopted is of concern, In Stage I, almost 47 percent of firms in the sample did not adopt a single SWMP suggested by the MENR which dropped off to 15 percent by Stage II. This implies that the level of adoption of SWMPs has improved overtime (Figure 1). It is also clear that the adoption rates of almost all practices have increased with time; i.e. only 25, 10 and 3 percent of firms adopted 1, 2 or 3 out of the 8 practices recommended, respectively, in Stage I. These percentages, respectively, have been changed to 34, 24 and 13 in Stage II while the percentage of firms which adopted over 5 practices did not show a notable increase.

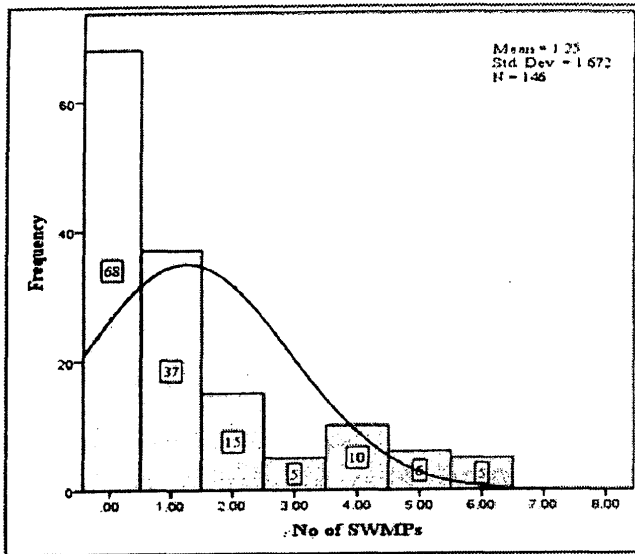


Figure 1a. No. of SWMPs in Stage I

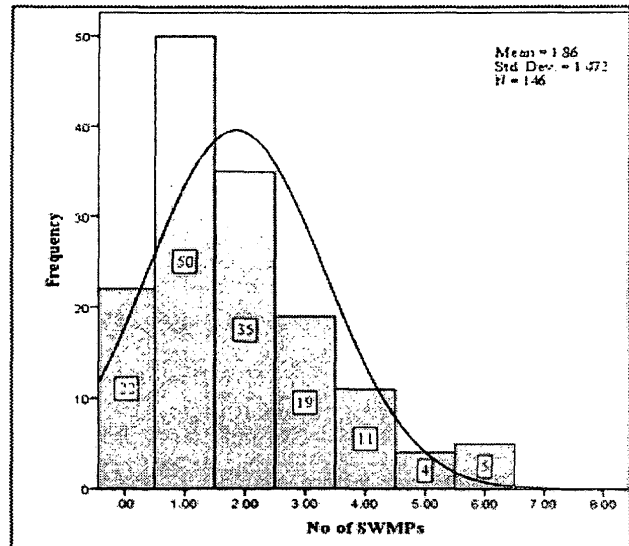


Figure 1b. No. of SWMPs in Stage II

Figure 1. Number of SWMPs adopted by firms

The results of the Zero Inflated Poisson Regression Model revealed that cost/financial implications continued to pose a significant impact on the rate of adoption irrespective of time whereas on technical efficiency had a similar impact which implies that the perceived improvements in technical efficiency of the firms act as a positive incentive leading to a higher adoption rate. Among the market based incentives, although reputation was a significant concern in Stage I, it was not perceived important by Stage II. On the other hand, sales & revenue was thought to be a crucial driver by stage II though was not so in Stage I.

Among the regulatory incentives, only liability laws showed significant importance over time while both existing and anticipated regulation were not considered important by Stage II. This is mainly due to that fact that, firms are relatively motivated by more stringent laws while the existing and the future regulation were thought as actors that will not pose a greater impact on their responsiveness on the environment. However, with the perceived and evident failures in the regulatory framework, they have been inclined to deem that a financial liability (*i.e.* may be in the forms of fines, compensation, closure of firms *etc.*) or rather a liability

law would have a greater impact on their behaviour as it will make them feel more responsible and liable towards their actions. Interestingly, environmental altruism of firms' decision makers was not a significant factor in both stages implying that their altruism had not improved over time or were not altruistically inclined towards environment.

Where the type/size of firm/producer was of concern, while in Stage I, only essential oil producers had a notable impact on adoption, with time, it was evident that there was a tendency for coconut product producers and non-alcoholic beverage producers to move towards compliance. This may be due to the fact that majority of these firms catered the export market. As expected, only large scale firms significantly continued as adopters while others showed insignificant adoption levels stating several hindering factors such financial constraints, lack of awareness *etc.* Vintage of the firm, however, was not a significant factor.

It is clear that this perception on government regulation, together with their desire to respond to market-based and stricter liability incentives, can

effectively regulate these firms. The results further imply that firms, futuristically show a positive affinity in adopting solid waste management practices overtime. However, it is evident that though they have laid comparatively higher importance on certain market-based and regulatory incentives, cost associated with adoption of those environmental practices is still perceived to have a significant impact in complying with and maintenance of these practices which calls for alternative measures for financial facilitating for firm level compliance. The outcome, thus, overall, highlights the positive role of market-based incentives alongside regulation, thus, emphasizes the importance of bringing the current largely a single-sided public regulatory regimes towards co-regulation to ensure firms' participation on up keeping environmental quality.

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