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ANALYSIS

Environmental regulations impact on agricultural spills and citizen complaints [☆]

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ABSTRACT

The paper addresses the regional characteristics where spills occur, if these spills are generating complaints, what types of citizens are doing the complaining, and if environmental policy deters either spills or complaints. The results suggest that distance between livestock producers and both environmentally sensitive areas and people are an effective means to reduce conflicts between farmers and the local community. Another policy question raised in the study was the effectiveness of using citizen complaints as an information tool in addressing environmental quality issues surrounding agriculture. There is a positive influence between spills in a region and the number of complaints suggesting complaints can be used by regulators to indicate problem areas but the information signal will be noisy. Factors such as education and income increase the average number of complaints lodged in a region.

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1. Introduction

Increasing levels of regulation have been imposed on the agricultural sector in response to concerns that farming can have detrimental impacts on environmental quality. Many of the policy instruments have been targeted to livestock operators, who have grown significantly in size and intensity over the years. The severity of the regulations varies geographically as documented by the US EPA (2001) but a typical regional by-law involves the submission of a nutrient management plan (NMP) before a building permit is issued for the construction of a new barn. Random inspections after the facility is built are used to ensure the NMP is being followed.

Several unanswered questions face policy makers designing cost-effective environmental regulations for the farm sector. For

example, it is assumed that increasing regulations will reduce the number of spills and consequently environmental degradation. However, it is not clear whether restrictions on management practices, aside from complete prohibition of production, can limit either the environmental mishaps by farmers or the dissatisfaction with farmers from local residents. Thus, one of the unanswered questions pertains to the environmental efficiency of local regulations, such as zoning or restrictions on barn location and manure storage size.

Assuming that the regulations do reduce agricultural spills, another question facing enforcement officials is which farms to inspect to verify environmental compliance. Since third party random inspections by regulators are an increasingly common form of ensuring compliance to environmental regulations such as an NMP, reports of violations by local citizens can serve as a

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cost-effective means of targeting potential polluters. On the other hand, the complaints may be coming disproportionately from regions with higher than average education and income levels. Residents of such areas are more likely to have the desire to improve environmental health and have both the expertise and means to take effective local action through complaints. Another potential problem with using complaints within the regulation process is that the complaints may not be directly related to violations. Within the livestock sector, complaints are often related to nuisance issues such as odour rather than directly correlated to environmental problems such as excessive nutrient levels in groundwater. The combination of demographics and the possible indirect relationship between nuisance complaints and actual environmental damages means that complaints may not be an accurate measurement of regulation non-compliance and therefore, an ineffective information tool for enforcement officials to use in determining who to inspect.

Previous research into the relationship between spills, regulations, and citizen complaints is limited. Russell, Harrington and Vaughan (1986) note the regional variability in complaints to the US EPA and suggest that the variation is due to factors other than environmental quality but no analysis was conducted to test the hypothesis. These authors found few of the complaints, which were all investigated, resulted in convictions for polluters suggesting that complaints may not be a cost effective means of monitoring. On the basis of a suggestion by the Singapore government to rely on complaints as the means to identify excessively noisy work sites, Mookherjee and Png (1992) examine how a regulator should combine graduated fines affected through regular inspection with graduated enforcement rates affected through investigation prompted by citizen-provided information. The choice was shown to depend on the relative costs and if the offenses are adequately reported. The relationship between citizen complaints and pollution levels was examined for China by Dasgupta and Wheeler (1996) and for Indonesia by Pargal and Wheeler (1996). Higher education levels increased the probability of filing complaints bringing into question the accuracy of citizen complaints. None of these studies have examined the accuracy of complaints against agricultural producers as a signal of pollution and the influence of local preferences on the applicability of complaints as an enforcement tool. Nor have they examined the influence of environmental regulations on the level of spills and the rate of citizen complaints.

The purpose of this paper is to examine the characteristics of citizen complaints about local agricultural practices. The paper addresses the regional characteristics where spills occur, if these spills are generating complaints, and what types of citizens are doing the complaining. It also determines whether local regulations affect either emissions or complaints. The paper begins by developing a theoretical model of the decision to lodge a complaint by a representative citizen. The next section describes the unique data set available to test the hypotheses. The set includes the number and type of complaints lodged against agricultural producers, socio-economic characteristics of the local citizens, characteristics of the regional agricultural sector including the severity of local environmental regulations, and the number and type of self-reported pollution discharges by farmers for 167 munic-

ipalities in the Canadian province of Ontario over a 4 year period. The fourth section describes the major results and the final section concludes with implications of the findings.

2. Theoretical model

To address the several questions surrounding the relationships between environmental regulations, pollution discharges and complaints, we begin by modeling the effects of regulations (R_j) on the number of agricultural spills of type a in region j (S_{aj}). We will assume that

$$S_{aj} = S(R_j, L_{jk}) \tag{1}$$

where L_{jk} is the density of livestock farms in region j of type k . We hypothesize that increasing the stringency of regulations decreases the likelihood of spills ($\partial S / \partial R < 0$) while increasing the density of livestock farms has the opposite effect ($\partial S / \partial L > 0$). The latter marginal effect will vary between spill and farm types. For example, spills into waterways are more likely to occur from swine farms with large volumes of liquid manure than from poultry farms with relatively smaller amounts of dry manure.

Spills have a negative effect on environmental quality (Q) within a given region. Regulations affect Q indirectly by reducing the number of agricultural spills (Eq. (1)) but could also improve environmental health directly if government efforts are focused on resource rehabilitation policies. It is also assumed that environmental quality improves with the per capita rate of complaining regarding affected resource m in region j (C_{jm}). Total number of complaints in a region is the average number of complaints registered by an individual (c) multiplied by total population for the region (POP). Finally, the level of Q also depends on physical characteristics of the region (Z). For example, Q will be higher in wilderness areas than densely populated urban areas. In summary, the reduced form equation for environmental quality in a region is given by

$$Q_j = Q_j(S_{aj}, R_j, C_{jm}, Z_j) \tag{2}$$

Whether an individual in a given region lodges a complaint of type m (c_{jm}) depends on whether the expected benefits of doing so in terms of improved environmental health outweigh the costs of lodging the complaint. This decision to complain is assumed to be the result of a utility maximization problem in which the individual in region j derives satisfaction (U) from the level of purchased goods consumed (X), and the level of environmental quality for the region (Q_j) according to

$$U_{ij} = U_i(X_i, Q_j; H_i, Z_j) \tag{3}$$

where H_i is a set of socio-economic characteristics of the individual and Z_j is a set of regional characteristics.

Environmental quality is influenced by the set of variables summarized in Eq. (2). The other constraint to the utility maximization problem is with the allocation of effort and consequently purchasing power given by

$$P_x X_i + P_c(H_i) \cdot c_{ijm} = P_w(H_i) W_i + rA \tag{4}$$

Where P_x is the price of purchased goods X , P_c is the cost of lodging an individual complaint c , P_w is the wage rate per unit

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