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Ben Hunter

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Pinpointing Persistent Polluters: Environmental Offending and Recidivist Companies in England

Ben Hunter

University of Greenwich, London, UK

ABSTRACT

The extent to which firms can be deterred from offending has received significant attention. Despite this, the evidence for such deterrence remains inconclusive. This article suggests that instead of focusing on the deterrence aimed at companies, we should instead begin with a less contentious observation; that companies are frequently recidivists, and that an emphasis on the factors associated with company recidivism would be a useful starting point for thinking about offending by firms. The article explores this through an investigation of companies pursued by the UK's Environment Agency in England between 2000 and 2016. The logistic regression analysis suggests that being a utilities company, a large enterprise or a new company were all predictive of repeat offending. Conversely, whether a company was fined after its initial offense was not predictive of whether it would re-offend. The implications of these findings for regulatory work and future research are discussed.

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Introduction

One of the best illustrations that malfeasance by companies has the potential to create far more harm than that by individuals comes from a consideration of damage inflicted on the environment. The scope and size of some businesses' practices mean that activities such as improper disposal of waste, unauthorized discharges, and other pollution far outstrip the damage that any individual can cause. The fact of environmental harm by companies has been well documented in work that spans decades, demonstrating the impact and extent of such environmental harm. However, much of the focus of existing work has been concerned with whether companies can be deterred from offending, without considering the perhaps more fundamental question of what distinguishes those who commit multiple harmful acts from those whose offend only once. This observation is the starting point for this article, which examines environmental offending by companies who were sanctioned by the Environment Agency of the UK Government's Department for Environment, Food and Rural Affairs in England over a 17-year period. In doing so it identifies the factors that predict repeat environmental offending by companies. In therefore provides a way of thinking about environmental harm by companies within a specific jurisdiction, aiming to move beyond the fact of firm reoffending and consider the factors associated with it via a simple exploratory analysis.

The article continues as follows. The next section outlines what is understood about companies' criminal activity, specifically the extent to which corporations are capable of being deterred from offending, noting that the evidence base for the efficacy of deterrence is inconclusive at best. Instead, any understanding of whether corporations can be deterred from offending – while potentially useful – needs to be preceded by an understanding of *which companies* are more likely to reoffend. Putting the focus more squarely on reoffenders is nevertheless helpful to those interested in deterrence, because

CONTACT Ben Hunter B.Hunter@greenwich.ac.uk School of Law and Criminology, University of Greenwich, Old Royal Naval College, Park Row, Greenwich, SE10 9LS, UK

those more likely to commit only one offense are perhaps less obvious candidates for deterrence-based approaches in any event. The article then moves to consider difficulties associated with regulating environmental harm by companies. In particular, the nature of studies to date means we do not have evidence drawn from a large sample over time focusing on a particular jurisdiction. The current study addresses this with a focus on the Environment Agency for England's activities between 2000 and 2016. The article then discusses the data used before reporting the results of a logistic regression, with the outcome variable distinguishing whether a company was a one-time or repeat offender. Utilities companies, large enterprises and new companies were all associated with an increased odds of being a repeat offender. In contrast, whether or not a company was fined for its first offense had no significant bearing on the likelihood of reoffending. The discussion contextualizes these results with reference to existing work.

Environmental offending by companies

The fact of harm[1] committed by companies against the environment is inarguable. Much of what we do know about such activity has been framed via a consideration of the extent to which corporations can be deterred by appropriate sanction. According to deterrence theory companies should be deterrable via criminal or administrative sanctions, based on the assumption that they are profit maximizing. Therefore, once the costs of harmful activity (via sanctions and reputational damage) outweigh the benefits, the harmful activity will cease (Cohen 1992). The evidence to support such a belief is murkier, however. Lynch et al. (2016) identified several challenges for deterrence theory as it relates to corporate crime. They noted that, given that the likelihood of criminal punishment for corporate crime is low, there is little reason to think that sanctions will deter firms from offending. In addition, they suggested that, due to underreporting of corporate environmental crime, and that fact that when criminal sanctions are applied, they can vary across different types of offenses, it is extremely difficult to draw substantive conclusions about their efficacy in deterring corporate environmental offending (Lynch et al. 2016). Notwithstanding these concerns, several studies have identified evidence of a deterrent effect of sanctions on firms' illegality. This includes both evidence for specific deterrence (i.e., where a sanctioned company is deterred from future offending) and a more general deterrent effect (where those observing the punishment are themselves deterred from future offending).

Simpson, Gibbs, Rorie and colleagues (2013) studied attitudes toward environmental compliance amongst MBA students using vignettes to assess intentions to break environmental regulations. They concluded that certainty and severity of legal sanctions, along with perceiving informal sanctions if offending is detected, affects intention to offend. Similarly, Rousseau's (2007) analysis of environmental regulation in the Flanders textile industry suggested that compliance could be increased through the deterrent effect of sanctions and inspections. Meanwhile, Ghilagaber's (2017) study of sanctions against polluting firms in Sweden suggested that the greater the fine meted out, the less likely firms were to offend again, suggesting that companies were deterrable up to a point. Earnhart and Friesen (2013) surveyed companies with a stated choice scenario, concluding that there was evidence for a specific deterrent effect over compliance with environmental legislation, and that even small fines to companies might serve to deter future offending. Almer and Goeschl's (2010) consideration of the deterrent effect of criminal sanctions for environmental offending in Germany concluded that while companies were deterrable, standing trial, rather than the probability of conviction or the magnitude of any fine, was one of the strongest deterrents.

Equally, there is some evidence for a general deterrent effect. Shimshack and Ward (2005) concluded from their analysis of fines for water pollution violations in the United States (US) that

[1]Following the other corporate crime work (e.g. Simpson and Yeager 2015; Smith, Simpson, and Huang 2007) "harm" and "crime" are used synonymously here. This recognizes that while many environmentally harmful activities are not violations of criminal law, they are no less damaging. Similarly, those companies in violation of regulation are referred to as offenders.

fines for violators had a significant deterrent effect for other firms within the same state. In addition, they identified that specific deterrent effects for the fined firm beyond this regulator reputation effect were negligible. Thornton, Gunningham, and Kagan (2005) examined the general deterrent effect of sanctions on companies who violated environmental law, assessing 233 firms on whether awareness of other firms' punishments motivated their own compliance. They concluded that some evidence for a general deterrent effect existed. In particular, companies were more likely to take positive environmental action when they were large companies, when managers could recall enforcement actions against other companies, or when they perceived a risk that penalties could lead to closure of facilities. Thornton, Gunningham, and Kagan (2005) concluded that there was some evidence of a general deterrent effect. As important, however, was that an awareness of other companies being penalized for violating environmental law served as a reminder to already compliant companies of the benefits of compliance and as a prompt to check their own compliance procedures.

Set against this work are those studies that identify a limited, or null effect of regulation enforcement. Simpson, Garner, and Gibbs (2007) studied 55 firms across four industries, exploring the relationships between firm characteristics, violations of pollution discharge laws, and enforcement of regulations. They concluded that adherence to environmental standards was related to the *characteristics* of firms – where higher numbers of employees and higher numbers of facilities owned were related to violation of environmental regulations – not at the level of individual facilities owned by those firms. Their results also suggested that sanctions – both formal and informal – were ineffective at creating changes in behavior and that decisions on which facilities to inspect were chiefly governed by prior violations.

Brady, Evans, and Wehrly (2019) analyzed US Environmental Protection Agency data and the deterrent effect of reputational penalties companies incurred following violation of environmental regulations. They argued that the reputational penalties for violating environmental regulations were negligible. This is because, in contrast to other infractions (e.g., fraud), environmental offenses carry little in the way of reputational penalty for firms, because the victim (i.e., the environment) has little ability to penalize the firm by withdrawing custom. Brady and colleagues (Brady, Evans, and Wehrly 2019) suggested, instead, that formal legal penalties are needed to deter environmental offending. Meanwhile, Stretesky, Long, and Lynch (2013) demonstrated that monetary penalties do not deter polluting activities by companies. Barrett et al. (2018) demonstrated a modest negative influence of fines on noncompliance in the short term but argued that over long term prior fines could in fact increase noncompliance. Finally, Earnhart and Glicksman (2015), analyzed the survey responses of 267 regulated companies in the chemical industry in the US, concluding that a regulatory regime that focused on cooperation more than coercion was more successful at securing compliance with environmental laws.

The lack of consensus regarding whether companies can be deterred possibly reflects the difficulty of drawing comparisons across different data sets, methods and contexts. Nevertheless, this somewhat contradictory picture is further informed by meta-analyses deterrence by both Simpson, Rorie, Alper, and colleagues (Simpson et al. 2014) and Schell-Busey et al. (2016), which indicated limited support for companies being deterrable. Both suggest that more methodologically rigorous studies are unlikely to identify a deterrent effect, however. Simpson and colleagues' analysis (2014) further indicated a limited deterrent effect across the various legal responses to crime by firms, including punitive sanctions and regulatory policies.

That there is no clear evidence for a deterrent effect compliments a robust and longstanding finding in corporate crime research: many companies are repeat offenders (Baucus and Near 1991; Clinard and Yeager 2006 [1980]; Gibbs and Simpson 2009; Simpson, Garner, and Gibbs 2007; Sutherland 1983). Despite the conclusive nature of this finding, however, a focus on repeat offending is less well studied or is featured only implicitly in such work. In sum then, although the above research is informative, the picture it paints is somewhat incomplete. The evidence base to date is largely focused on the US, with small samples of particular industries, or subsets of business within those industries, and there is little consideration of factors associated with repeat offending. There is also a sense of

putting the cart before the horse. Although it is important and helpful to talk about deterrence, before we ask who is deterrable, perhaps we should identify who is more likely to become a repeat offender. The intention of this study is to explore this within a particular regulatory context.

Regulating environmental crime

A focus on the environment and non-human animals is firmly established as a sub-discipline within criminology. Such green criminology, (e.g., Brisman and South 2020; Lynch 2020, 2019) is concerned not just with crimes against flora and fauna, but also harm more generally, recognizing that some of the most ecologically damaging acts are not violations of criminal law (South, Brisman, and Beirne 2013). Enough has been written elsewhere about green criminology's focus (see, e.g., Brisman and South 2020) that there is no need to repeat this here, but it should be unsurprising that some of the greatest environmental harms are caused by companies, due to the scale of their activities, the resources they possess, and their influence on policy, such that they are in a position to assist in creating definitions of their activities that are not criminal. It is thus the case that both green criminology and corporate crime work have often sought to focus on regulatory breaches that cause harm to the environment, in addition to behaviors that are not technically illegal (Simpson and Yeager 2015; Smith, Simpson, and Huang 2007). Tracking this has involved efforts by green criminologists, corporate crime scholars, and others. A key concern of this work is identifying the factors that relate to environmental compliance amongst companies, particularly as this relates to interactions with regulators.

Reflecting trends in regulation generally, efforts to consider environmental regulation have in recent years been concerned with sketching out the challenge of balancing sustainability, risk and 'responsive' regulation as they relate to concerns around environmental justice (e.g., Gemmell and Scott 2013). Tied up with this is the recognition that decisions on how and how much to regulate, and how such regulation should be funded, are decisions driven by politics as much as science (Gemmell and Scott 2013). Businesses themselves are often desirous of a "seat at the table" when such decisions are made, advocating for "voluntary" regulation rather than being directed by government (Taylor et al. 2015). And, perhaps inevitably, environmental campaigners are likely to be critical of any attempt by companies to influence regulators (Bell and Gray 2002). Perhaps because of these competing positions, there is still little consensus on whether regulation should reflect a risk-based approach (i.e., where regulatory efforts are targeted at those entities and activities that pose the most risk) compared with a command and control rationale (based on the assumption that companies are deterrable), "smart" regulation (e.g., leveraging the potential of wider society to exert social license pressures) or some other – perhaps mixed – approach (Gunningham 2011).

Although it is clear that regulation research is concerned with establishing what "works" in environmental regulation, what constitutes "working" is less well developed (Kellett 2020). For example, does "working" constitute some form of reduction in regulatory violations? Perhaps a focus on the way regulation is conducted so as to reduce repeat violations is more appropriate, emphasizing that regulatory responses need to be effective at reintegrating violators. Is a regulatory regime that "works" one in which the regulated are invested and "happy," or is it simply a requirement that they comply? Alternatively, perhaps regulation that "works" delivers on reducing environmental harm but does so in a cost-effective way. Relatedly, Gemmell and Scott (2013) have argued that for all the concern that regulation should be better, what constitutes "better" regulation is less clear (although Gemmell and Scott note that, as far as companies are concerned, "better" often means "less" (2013: 120)). Kellett (2020: 183) has argued that the focus of understanding regulatory efforts should be on what works in "intervention" as opposed to what encourages companies to break the law in the first place i.e., how to deal with offenders so that they do not reoffend.

As noted above, studies of environmental harm by companies have tended to be placed outside the UK. Indeed, the Environment Agency for England's own Director of Legal Services has argued that the agency has insufficient evidence on which to base regulatory decisions (Kellett 2020: 192). This means

that in the UK, in particular, we have little understanding of patterns of violation and compliance with environmental legislation amongst firms more generally. There is some understanding of which sanction approaches serve to bring companies back "into the fold" (Kellett 2020), but these are identified in the aggregate, and so risk concealing variation in company characteristics that may contribute to noncompliance.

The current study

The goal of the current study is to contribute to the above work on environmental offending by firms with a simple exploratory study of factors that may predict recidivism. It does this via analysis of a large sample of firms in England that, over a seventeen-year period, violated environmental regulations. Such would be useful for both deterrence-based approaches and a more compliance-oriented rationale. To date, there has been little mapping of environmental offenders in the UK in terms of firm characteristics, nor much consideration of what factors may predict repeat offending. Deterrence-informed approaches need to know where to deliver efforts so as to maximize the deterrent effect of sanctions. Meanwhile, a more compliance-oriented approach would benefit from understanding which companies are, for whatever reason, more likely to fail to meet the obligations placed upon them and may need further support.

Before we think about deterrence, then, understanding what differentiates firms who offend once, twice or many times would seem to be a necessary precursor to exploring the effectiveness of different approaches to regulation. A focus on recidivism side steps discussions about whether or not deterrence "works," because while the evidence for this is unclear; what *is* conclusive is that companies frequently *do* reoffend. Perhaps regulators and scholars would be best served by thinking about the factors associated with repeat offending, targeting efforts toward these rather than being overly concerned with companies' rationality (Kellett 2020). Understanding who may be more likely to reoffend will contribute to a discussion about regulatory approaches, which will assist an understanding of company crime within an environmental context. Finally, a focus on environmental harm and regulation would contribute to quantitative understandings of green criminological concerns. Lynch and Pires (2019; see also Lynch et al. 2017) argue that, for all the contributions green criminology has made to understandings of environmental harm and justice, it lacks a quantitative base, a handful of contributions aside (Lynch and Pires 2019).The purpose of the current study, then, is to draw some basic conclusions about patterns of environmental offending by companies within a particular regulatory area, with a specific focus on identifying the factors associate with repeat offending.

Method

The Environment Agency (EA) for England and Wales was established in 1996, with a remit including regulating discharges to air, land water, and to grant permits to permit such discharges. As part of their regulatory powers, the EA also conducts announced and unannounced inspections, monitors compliance from companies to which it has granted permits, and may also test the water discharge from regulated operators.

Data

A freedom of information request[2] to the EA sourced all actions the agency had taken against companies between 2000 and 2016.[3] These data included the company name and registered address,

[2]The Freedom of Information Act (2000) allows requests for information to be made of public authorities in England, Wales and Northern Ireland.

[3]The FOI request asked for data as far back as records permitted. In the case of the EA, this should have gone back to 1996. FOI legislation, however, permits refusal to comply (or part compliance) with a request if the cost of processing it would exceed a certain threshold.

the specific piece of legislation that the company had breached, whether or not the case went to court, the plea entered by the company, the location and the date of the judgment and the penalty, including the amount of any fine levied. Each entry in the original data represented an outcome of the EA's investigation against a company for a particular legislative breach.[4] Individual incidents frequently breached more than one piece of legislation, and it is the case, therefore, that a separate outcome was recorded for each breach (Lynch and Barrett (2015) make a similar point in drawing upon pollution data). Each incident was recorded as one offense in the final data set, with the most serious outcome (e.g., fine, caution) recorded and the total fine summed. These offense data were combined with data on companies drawn from the FAME (Financial Analysis Made Easy) database. The initial FAME search attempted to identify basic company information such as main business activity and year of incorporation with more detailed financial data for given years surrounding the offense.

There were sometimes difficulties identifying companies, both within the initial EA data and with the FAME information. Unsurprisingly, given the period of time involved, some companies had been taken over by larger entities, or had changed their name. This sometimes posed a challenge when matching companies across the EA and FAME databases, meaning details for some companies were not available. In addition, due to differences in reporting of company names, a judgment sometimes had to be made to determine whether companies that had been pursued by the EA were the same as similarly named ones in the same data set. For example, the EA data contain numerous examples of companies that appeared multiple times for different offenses, but where names were recorded with subtle variation (e.g., "*2 Sisters Food Services*," "*Two Sisters Food Services*"). The FAME data contained even more of these discrepancies in recording, when compared to the EA data. In such instances, it was necessary to make judgments about each individual case to determine if the entity named was, in all likelihood, the same company. In this, the business addresses provided by the EA were useful. There is also a conceptual issue here, inherent to the question of to what extent can a company change before it is a quantitatively different offender (see Hunter 2021). For example, if *North West Skip Hire* cease all company activity in 2001, but that same year *Northern Skip Hire* start trading on the same premises with the same director, it is worth considering the extent to which these might be counted as a single consistent entity. In resolving such dilemmas, the decision was made to err on the side of a conservative estimate of recidivist companies, i.e., to avoid overestimating company recidivism. The judgment made was to treat differently named companies as different entities, even in the handful of cases where directors and/or site addresses were similar. Sometimes, a company was listed as being a subsidiary of a parent company. Data were taken for this subsidiary where available.[5] The initial collection of cases from the EA database contained 3933 ostensibly different companies. Of these, 644 were removed because there was no match for them in the FAME database. Another 337 were removed either because they were judged to be the same company as another entry, or because, although there was an entry for it in the FAME database, there was no detailed information. This left a final sample of 2952 companies.

The data set presents a detailed picture of environmental offending by companies over time. It differs from many previous longitudinal data sets (see, e.g., Clinard and Yeager, 1980) in that the criterion for inclusion is committing an offense within a particular jurisdiction instead of membership of a particular index, such as the Fortune 500 (Clinard and Yeager, 1980) or Standard and Poor 1500 (Simpson et al. 2019), or belonging to a particular industry (Kluin and Jagtman 2014). These latter efforts have the advantage of holding company size or type of activity as (reasonably) constant. Making comparisons across jurisdictions can be challenging, however. The most obvious of these being that differences in recorded offending may represent differing priorities that particular regulatory bodies

[4]All the cases were confined to England, as cases in Wales fall under a separate jurisdiction.

[5]Although we can be reasonably certain we have detail on all environmental offenders from 2000–2016, the trade-off, for now, of course is that we are in a position to know only about environmental offending. A cursory media search indicated that several of the companies included in the data set were pursued for other offenses (such as violations of health and safety legislation). At this point, however, we are not in a position to systematically evaluate all other offending by these entities. Nevertheless, an absence of repeat environmental offending does not mean an absence of any other violations.

place on firms' offending and/or the differing abilities they have to police such crime (Simpson 2013). The advantage the current data set offers, then, is that it holds jurisdiction and oversight of companies as constant. It also allows any subsequent analysis to identify variations in offending based on company size, leading to the consequence that we avoid focusing simply on exceptional cases and can say something about offending by smaller entities compared to larger ones. Simultaneously, it is a far larger set of companies than those analyzed in other work that has considered particular jurisdictions (e.g., Simpson and colleagues (2007) analyzed data from 212 facilities).

Nevertheless, there are some difficulties with the current data set. These prove instructive for thinking about the challenges of studying firms' offending over time, while some are problems inherent to focusing on particular jurisdictions. First, as is noted above, no detailed information could be obtained for a some of companies. The fact that these were, according to the EA, largely companies that committed only one offense, has implications for the analysis. Because (by definition) there is very little information about the companies that were removed, it is difficult to obtain an impression about how their removal might impact the analysis. Second, because each data point represents an outcome of a particular offense, it is not possible to gauge from the data how many victims were impacted by each event. In this, then, the data set undercounts the number of victims impacted by environmental offending. A related point is that the different outcomes in the original EA data do not specify the type of incident that occurred. It is, therefore, possible that the offenses recorded here include single occurrences of pollution, as well as more sustained breaches of legislation that have played out over months but been treated as one case. This has implications for attempts to identify factors related to reoffending because (for example) companies that commit sustained, ongoing environmental crime may be more likely to reoffend. Unfortunately, this is not something the current data set can track. Third, because we do not have access to EA data prior to 2000, we are not in a position to confirm that the first offense recorded for each company was, in fact, the first offense. Indeed, for some of the more persistent offenders, we might be virtually certain it is not. Many of the sample companies (2098, 71%) were founded prior to 2000.

A further difficulty relates to financial information we might wish to know about companies. Financial reporting rules require only the largest companies to report detailed financial data every year. Smaller companies are exempt from doing so; they are obliged to report abridged accounts, depending on their size (Companies House 2022). This hampered attempts to obtain a detailed picture of the finances of the sample. Although this did prevent analysis of how a company's fortunes relate to offending, as other researchers have attempted to do (e.g., Lund and Sarin 2021), it is also worth noting that such analyses have, until now, failed to return a consistent message about which financial measures are effective predictors of wrongdoing/compliance (Simpson et al. 2013). Finally, although the focus on environmental crime means that it is not necessary to attempt to control for differences in regulatory approach (for example, between environmental regulators and financial regulators), regulatory priorities are themselves subject to change, and differences in reporting practices over time may hamper attempts to rely on official data (Kellett 2020; Kluin and Jagtman 2014). Regarding the EA in particular, Taylor, Gallagher, Pollard, and colleagues (Taylor et al. 2019) suggested that the agency now favors a command-and-control approach compared to earlier in its history. Kellett (2020) asserted that the EA changed practices in 2013, moving from pursuing prosecutions to attempting to incorporate a wider array of sanctions, a response in part to the UK Regulatory Enforcement and Sanctions Act 2008 (Stott 2009). Consistency of jurisdiction does not necessarily mean consistency of approach across a given period.

The final sample consisted of 2,952 companies, responsible for 4,866 offense outcomes (range 1–182, mean 1.95, sd 6.585). In keeping with other analyses of company offending (Clinard and Yeager 2006 [1980]; Sutherland 1983), a small proportion of firms were responsible for the majority of violations. Of this final sample, 528 (18%) companies had committed more than one offense during the sample period, and so were designated repeat offenders. This group accounted for just over half (2,442) of the total outcomes reported. Considering the total sample, 2,609 (98.5%) companies had four or fewer total offenses each. Figure 1 shows the distribution of outcomes across the sample.

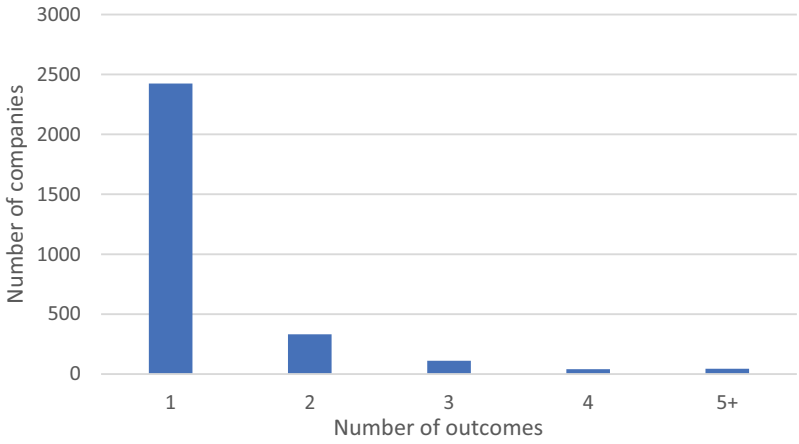

Figure 1. Distribution of offenses across the sample.

Variables

Outcome variable

Because the focus was on factors that predict reoffending, the primary variable of interest was whether a firm was a repeat offender. Due to the skewed distribution of the offenses count (see Figure 1), this was constructed as a binary measure distinguishing between those companies that had committed a single offense (0, $n = 2424$) and repeat offenders (1, $n = 528$). This follows similar approaches to studying company offending and reflects a desire for a more conservative estimate of illegality (e.g., Mishina et al. 2010: 706).

Predictor variables

A number of predictor variables suggested by prior research were utilized. As noted above, the lack of financial data meant that company finances were not used. Less than 10% of the sample returned basic financial data and this, combined with these missing values likely to not be completely at random meant that methods of dealing with missing data such as multiple imputation were inappropriate. Instead, based on what was known, several categorical variables were constructed. Farrington and Loeber (2000) demonstrated that dichotomization of variables is frequently the most appropriate approach in criminological research, given that much of the data criminologists are interested in violates assumptions necessary for employing continuous predictors. Nor, they argue, does dichotomization necessarily result in any loss of data, or change results significantly. Simultaneously using categorical data may help to encourage "a 'risk factor' approach, which helps in targeting intervention efforts" (Farrington and Loeber 2000: 120). Table 1 contains a summary of these variables, organized by the outcome variables.

Size

A binary variable indicating whether or not the company was classed as a small/medium enterprise or a large enterprise at the time of the EA outcome. This was judged based upon His Majesty's Revenue and Customs classifications for companies. There are good theoretical reasons to associate firm size with offending. Larger firms may be more likely to engage in crime, given that their increased size allows for more opportunities to offend. Alternatively, they may be less likely to offend than smaller firms, as their resources may allow them to navigate regulatory burdens more easily (Parker and Lehmann Nielsen 2006; van Erp 2011), while smaller companies' ignorance of the law may hinder attempt to comply with environmental legislation (Brehm and Hamilton 1996). Attempts to link firm size to offending have been inconclusive, however. Several studies have suggested larger firms are

Table 1. Predictor variables organized by outcome variables.

	One-time offender	Repeat offender
Size		
Large	461 (19%)	197 (37.4%)
Small/medium*	1964 (81%)	330 (62.6%)
Total	2425 (100%)	537 (100%)
Industry		
Utilities	356 (14.7%)	157 (29.8%)
Manufacturing	679 (28%)	139 (26.4%)
Construction	427 (17.6%)	80 (15.2%)
Services	146 (6%)	40 (7.6%)
Trade and transport	570 (23.5%)	65 (12.3%)
Professional/administrative*	247 (10.2%)	46 (8.7%)
Total	2425 (100%)	527 (100%)
Outcome		
Fined	1424 (58.7%)	315 (59.8%)
Not fined*	1001 (41.3%)	212 (40.2%)
Total	2425 (100%)	527 (100%)
Status		
Established*	2263 (93.3%)	470 (89.2%)
New	162 (6.7%)	57 (10.8%)
Total	2425 (100%)	527 (100%)

*Indicates comparison group in the analysis.

more likely to violate both regulations, generally (Baucus and Near 1991; Clinard and Yeager, 1980), and environmental regulations (Hill et al. 1992; Mckendall, Sánchez, and Sicilian 1999). Borck and Coglianese (2011: 159), however, indicate that larger firms are more likely to engage with both voluntary environmental compliance programs and also are more likely to "over comply" (although see Gibbs 2012). Relatedly, Stretesky (2006) showed that larger companies were more likely than their smaller counterparts to self-report violations of environmental regulations to the US Environmental Protection Agency. While this suggested a commitment to regulatory compliance even where companies failed to meet standards, Stretesky also noted that self-reported incidents were, in general, less serious violations of regulations. This raises the possibility that companies may report minor violations as a way of appearing to be compliant, to increase their standing with regulators (Stretesky 2006).

In the current sample, an estimation of companies' size was based on the financial information they reported (or did not), in accordance with company reporting guidelines. The results of this were coded as a dummy variable distinguishing between Small and Medium Sized (SME) companies and large companies.

Industry

A longstanding and consistent observation in corporate crime work is that industry characteristics may influence offending. Sutherland's (1983) and Clinard and Yeager's (2006 [1980] analyses both demonstrated that some industries have higher rates of offending than others (Baucus and Near 1991). Wang and Holtfreter (2011) showed how characteristics of particular industries can mediate opportunities and motivations to engage crime; corporations in rapidly growing industries demonstrated higher violation rates than those in financially depressed industries. Meanwhile the criminogenic effect of corporation level strain was greater when the industry was also strained (Wang and Holtfreter 2011). Peeters, Denkers, and Huisman (2020) also showed that industry characteristics (in conjunction with firm and individual level factors) can influence intentions to violate or comply with rules amongst SME firms.

In the present study, an *Industry* variable was derived from the description of business activity in the original FAME database. FAME identifies a company's primary business activity from one of 32 classifications. In the present study, these were reviewed for each company and grouped around similar business activity based on sectors of the economy, to comprise a dummy coded categorical variable with six values: Utilities, Manufacturing, Construction, Services, Trade/Transport, and

Professional/Administrative activities. The last of these was used as the reference category in the analysis.

Outcome

The overwhelming majority of outcomes for the first offense (2716, 92%) resulted in either a fine or a caution, with 1,739 of the sample (58.9%) receiving a fine.[6] Other outcomes occurred only very infrequently (e.g., four companies were subject to an injunction, 35 were subject to a conditional discharge) and so the outcome of an action was converted to a binary variable. This identified whether a company was fined (1) or not (0) for its first offense i.e., contrasting the most punitive of approaches with the rest. Prior research has been equivocal on whether or not fines deter further offending by companies (Barrett et al. 2018; Earnhart and Friesen 2013; Lund and Sarin 2021; Stretesky, Long, and Lynch 2013). Nevertheless, fines represent one of the more punitive measures available to the Environment Agency and it is important to consider the impact they may have on future offending.

Status

Some studies have drawn attention to the role of company longevity as related to offending. Both Bennett et al. (2013) and Crutchley, Jensen, and Marshall (2007) suggest that younger firms were more likely to offend than incumbents. The years of business operation of the companies in the sample was accounted for with a simply binary variable to determine whether a company could be considered "new" or "established" at the time of the offense. Companies were judged to be new if they had been incorporated in the three years prior to the conviction. This cut off point was chosen following work that shows that around 50% of companies fail in the first three years of "life," and that, therefore, these are some of the most turbulent times for companies (for a discussion, see Coad 2018: 28–30). It follows from this that it is during this period that they may be more likely to violate regulations due to failure to navigate complex regulatory structures or possibly to keep the company in business.

Analysis

Prior to analysis, tests of multicollinearity were performed on the predictors. As these were categorical variables, a Pearson's Chi-Square measure was used. Following Bergh's (2015) caution that large sample sizes inflate the Chi-Square value and risk type one errors, these tests were performed on a random sample of the data. They did not suggest any cause for concern regarding multi-collinearity. Following the creation of the regression model, the variance inflation factor (VIF) and tolerance statistics for the predictor variables were analyzed. The tolerance statistics were all approaching one, suggesting that multicollinearity was unlikely to be seriously biasing the results (Maynard (2010) suggests tolerance values below 0.2 are a cause for concern). Similarly, none of the VIF statistics for the predictors were above 1.01. Although there are no hard and fast rules regarding when VIF indicates a serious multicollinearity problem, values larger than 10 are typically thought to be cause for concern (Alin 2010; Krzanowski 1998).

As a simple exploratory investigation, and accounting for the categorical nature of the variables, a binary logistic regression analysis was the most suitable approach. Table 2 shows the results of this, indicating that repeat offending is associated with company size, industry, and whether the company was new at the time of the first offense. Specifically, large companies are more likely to reoffend, as are utilities companies and "new" companies. Conversely, trade/transport companies are less likely to reoffend. In contrast, neither manufacturing, construction nor services companies were any more or less likely to reoffend. Similarly, whether a company was fined for its first offense appeared to have little bearing on its likelihood of reoffending.

[6]Amongst those firms that did receive a fine for their first conviction, the mean fine imposed was £11,712 (range £1 - £1,450,000, sd £43,564.55).

Table 2. Outcome of the logistic regression analysis.

							95% C.I.for EXP(β)	
Predictor	β	S.E. β	Wald's X^2	df	Sig.	Exp(β)	Lower	Upper
Size	1.094	.109	100.801	1	<.001	2.985	2.411	3.695
Industry			90.641	5	<.001			
Utilities	.950	.192	24.490	1	<.001	2.586	1.775	3.768
Manufacturing	.047	.190	.063	1	.802	1.049	.723	1.521
Construction	.058	.206	.079	1	.779	1.060	.708	1.586
Services	.354	.246	2.074	1	.150	1.424	.880	2.305
Trade/transport	−.526	.211	6.182	1	.013	.591	.391	.895
Outcome	.065	.102	.411	1	.522	1.067	.874	1.303
Status	.535	.170	9.841	1	.002	1.707	1.222	2.384
Constant	−1.538	.233	43.565	1	<.001	.215		

Model Summary -2 log likelihood = 2582.364 Cox and Snell R^2 = 0.061 Nagelkerke R^2 = 0.1
Hosmer and Lemeshow Test 5.635 8(df) 0.688

The odds ratios in Table 2 can be read as the effect size of these significant results (Monahan et al. 2007). While being a new company is associated with a 71% greater chance of reoffending than for older companies (odds ratio 1.707), the associated chances are far larger for companies in the utilities sector and for large companies. Utilities companies are estimated as being more than two and a half times as likely to reoffend after the initial conviction (2.586) and trade/transport companies are 40% less likely to reoffend than the comparison group (0.591). Meanwhile, the estimate for large companies is that they are almost three times as likely to reoffend (2.985).

Discussion

The preceding sections have highlighted work on environmental offending by firms, while noting the paucity of data that considers such offending within the UK context (specifically, England). They have also suggested that a focus on factors that predict reoffending would be a useful starting point on which to base regulatory decisions, in addition to providing a useful statistical portrait of corporate environmental harm. Finally, they have outlined a simple model for thinking about firms' environmental recidivism, drawing from a large data set. This represents the first attempt to consider a large sample of environmental law violators in England. Some aspects of the analysis serve to confirm what work focusing on other jurisdictions has observed. At the same time, the results indicate some useful ways for thinking about recidivism and environmental regulation, and directions for future work.

Several things are clear from the above analysis. First, that large companies were more likely to be repeat offenders than small or medium-sized enterprises. Previous research has indicated similar findings (Hill et al. 1992; Mckendall, Sánchez, and Sicilian 1999). Larger companies, virtually by definition, could have larger operations spread across multiple sites and, therefore, more opportunities to offend, which may explain this observation. They are also likely to be in possession of resources that enable them to cope with sanctions, possibly reducing any punishment to simply the cost of doing business (Lund and Sarin 2021).[7] Such a luxury is unlikely to be available to smaller companies, who are likely to find fines proportionately more costly. Regardless, at least for this sample, the social license pressures that have been identified as working to keep larger companies compliant with the law (Gunningham 2011) do not seem to be operating.

Second, and consistent with other work (Peeters, Denkers, and Huisman 2020; Wang and Holtfreter 2011), the industry that companies were located in had a bearing on their likelihood of being a repeat offender. Utilities companies, in particular, were over two and a half times as likely to be repeat offenders. The remit of the utilities companies in the sample includes water treatment and disposal of sewage; activities that have the potential to cause environmental harm on a wide scale if not

[7]This simultaneously leaves larger firms less able to rely on a defense of incompetence or ignorance (Brehm and Hamilton 1996).

managed properly. It is therefore possible that they are subject to greater oversight – and consequently more likely to have violations detected – than other companies. It is also possible that utilities companies' core activities (often involving the treatment and disposal of waste) make their transgressions more harmful and bring them into direct conflict with the EA.

Being a new company was predictive of reoffending. This therefore suggests that contact with the environment agency is particularly "criminogenic" for such companies relative to their more established counterparts. There are a number of possible explanations for this. One is that pursuit by the EA early in a company's life is damaging because it disrupts business activity, such as by necessitating the direction of scarce resources to respond to EA monitoring and sanctions. Another possibility is that contact with the EA attaches a stigma to the company that makes business survival seem insurmountable without further offending. An alternative explanation is that pursuit by the EA may be more likely to be viewed as unfair early in a company's life; a turbulent time when survival is uncertain and the focus may be on getting the business "off the ground." Feeling unjustly treated may then lead to further offending, as Earnhart and Glicksman have hypothesized (Earnhart and Glicksman 2015: 136). Outside the field of environmental regulation, Crutchley, Jensen, and Marshall (2007) indicated that younger companies (with age measured in years) were more likely to be involved in fraud. Another possibility is that newer companies are more likely to engage in harmful activity in the first place. Bennet and colleagues (Bennett et al. 2013) demonstrated that, as a response to competitive pressure, new entrants to particular markets are more likely to be drivers of illegal and harmful business practices. The increased likelihood of new companies being repeat offenders may, therefore, reflect similar competitive pressures that prompted the original offense.

The only predictor variable that was not significant was the outcome of the first offense. The presence or absence of a fine for a first offense does not appear to predict whether a company was likely to reoffend. Past work provides evidence both for and against a deterrent effect of fines on companies' offending. Based on this analysis, receiving a fine is neither a deterrent, nor – as some have suggested (Earnhart and Glicksman 2015) – does it serve to foster resentment in firms who have offended, "pushing" them into further offending out of defiance. This finding is in keeping with other work that has suggested that the magnitude of a fine has little effect on whether reoffending occurs (Almer and Goeschl 2010; Stretesky, Long, and Lynch 2013).[8]

These results suggest several directions for the regulation of companies, regardless of whether one subscribes to a deterrence-focused approach or not. First, the observations have implications for how resources are directed, suggesting closer scrutiny of regulation efforts as they relate to disposal and treatment of waste by identifying those companies that might be most likely to benefit from increased monitoring. It would be useful to better understand the observation that trade/transport companies are less likely to re-offend, particularly if it can be identified that interactions with them take a different tenor to those with companies in other industries. Regarding new companies, it would be prudent for regulators to give thought to how enforcement interactions with such companies unfold, and identify whether there are extra burdens (relatively speaking) that regulatory compliance places on newer companies that make it more difficult for them to comply after an initial offense. Finally, that fines do not appear to provoke further offending indicates regulators need not be reluctant to use them as an enforcement tool; although fines may not discourage reoffending, they may serve other – important – symbolic or instrumental purposes, and may have a role in fostering general deterrence (Shimshack and Ward 2005).

[8]One possibility is that the nature of the analysis (i.e., with the *outcome* variable dichotomized) obscures the relative severity of fines as potentially being predictive of repeat offending. To check for this, a separate analysis was conducted on the subsample that was fined ($n = 1739$), using the amount of fine as a continuous predictor variable. This indicated no significant relationship between fine amount and repeat offending ($p < 0.739$ for the fine variable).

Conclusion

For all the focus on environmental offending by companies – and especially the extent to which they are deterrable – there has been little consideration of what factors relate to their recidivism. This article presents an initial exploration of this. The principal contribution of this work is the analysis of a large data set with a specific jurisdictional focus and the inclusion of smaller companies, not just larger entities. It is also the first study that has considered environmental recidivism in England. The results of this exploration suggest that reoffending is more likely amongst utility companies, large enterprises, and newer companies. Meanwhile, being fined seems to have no bearing on the likelihood of reoffending. Identifying which companies are more likely to reoffend informs discussion about where regulatory resources might be directed, adding some empirical evidence that has, until now, been lacking. Therefore, it is a necessary precursor to better understanding companies that violate environmental law. Simultaneously, it adds to a wider quantitative green criminology, bringing a more explicit empirical focus on environmental harm to the fore.

Future work should aim to consider some of the above observations in more detail, addressing some of the limitations of the data employed here. Although identifying the financial characteristics of smaller companies is difficult, doing so would enable further analysis of the relationship between company characteristics and offending, while simultaneously adding a greater understanding of the factors associated with small company offending. In addition, because a clear finding here is that some industry characteristics are predictive of repeat offending, future analyses could aim to untangle this relationship, for example by identifying whether the above observations are a result of certain industries being subject to more scrutiny, or some other reason, such as competition or market pressure. Some nuance could also be added through a focus on different types of violations and their relationship to future offending. Finally, greater effort could be made to identify the role of regulators' working practices as mediators of reoffending by firms. This recognizes that, above all, it is the decisions made by regulators – themselves informed by broader priorities – that are at the heart of efforts to understand environmental harm.

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Notes on contributor

Ben Hunter is an Associate Professor in the School of Law and Criminology at the University of Greenwich. His research interests include white-collar and corporate crime, desistance from crime and narrative perspectives on offending.

ORCID

Ben Hunter http://orcid.org/0000-0003-3563-9608

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