Lobbying and Enforcement: Theory and Application to Bank Regulation*

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Abstract

We suggest a novel explanation for lobbying in the context of enforcement. Offenders may lobby to communicate some private information, which may allow enforcement agents to focus their enforcement effort on investigating those individuals whose offending would be particularly harmful for society. Our model shows that, if the enforcement agent's objective is to maximise social welfare, the availability of lobbying can never reduce welfare in equilibrium. In the special case of the social value of an offense being aligned with the offender's private benefit, it will be the least socially harmful potential offenders who escape investigation and punishment because of lobbying, whereas a medium range of types will commit the offense but not lobby. However, if enforcement is delegated to a self-interested agent, lobbying may reduce welfare, as the enforcement agent induces the 'wrong', intermediate types of offenders to lobby whereas the least harmful types of offenders commit an offense without lobbying. We briefly discuss applying the model to bank regulation and show that evidence from regulatory enforcement actions against banks in the US is in line with the first of these model versions.

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1 Introduction

Lobbying is an ubiquitous way for firms and interest groups to gain political influence. It is a means to communicate information that these interest groups want political decision makers to consider, and any other information that they think will make congress or regulatory agencies decide in their favour. Following theoretical work such as Potters and Van Winden (1992) and Grossman and Helpman (2001), it is now well understood that, as long as the interest group's and society's interests are at least partially aligned, lobbying is informative to some extent in equilibrium. Therefore, it is rational for a regulator to make use of the information transmitted in this process, even though the interest group has some incentive to misrepresent its private information.

Some recent empirical work has also presented evidence for lobbying to be an effective way to influence enforcement decisions (Correia (2014), Lambert (2019)). This is surprising from a theoretical point of view: If the purpose of lobbying is to reduce one's enforcement probability, we should expect a wrongdoer to have higher incentives to lobby than a law-abiding individual. In other words, an individual who lobbies in order to convince an enforcer to turn a blind eye on him will inadvertently let on that he has probably done wrong. Hence, if investigations of wrongdoing are costly, an enforcement agent could save some of these costs by focusing investigations on lobbying individuals, thus making them more likely to be punished and removing the incentives to lobby in the first place. Indeed, the existing theoretical explanations of potential wrongdoers' influence on enforcement decisions are confined to the exchange of favours (e.g. Polinsky and Shavell (2001)) rather than lobbying.

This paper offers a novel explanation of why potential offenders lobby enforcement agents, which is based on the transmission of relevant information: If the offender can credibly communicate that the social consequences of his offense are less severe, committing to not punishing a lobbying, less harmful offender allows the enforcement agent to provide incentives for this type of offender to identify themselves and focus her costly investigation effort on more severe cases.

We extend a standard model of crime and deterrence in the tradition of Becker (1968) by introducing the possibility that an offender uses a costly lobbying technology that reveals the offender's private information regarding the social harm of his offense to the enforcement agent. At the beginning of the game, the enforcement agent commits herself to probabilities of investigating an individual, depending on whether the individual has lobbied and, if he has, the information that was revealed in the process.

In the main version of the model, we assume that the enforcement agent's objective is to maximise social welfare. In this case, the availability of lobbying can never reduce

welfare in equilibrium, but it might enhance welfare by reducing the enforcement agent's expected investigation costs without reducing deterrence. This effect is established without imposing any particular distribution of offenders' types or crime-specific relationships between offenders' private benefit and social harm from the offense. Furthermore, for the special case of the social value of an offense being non-decreasing in the offender's private benefit, we show that, if lobbying takes place at all in equilibrium, it will be all types of potential offenders whose private benefit of offending are above a certain threshold who commit an offense but escape investigation and punishment because of lobbying. A medium range of potential offenders whose private benefit of offending is below that threshold will commit the offense but not lobby. Intuitively, it can never be efficient to promise a potential offender to let him off the hook if he lobbies if that individual would have been deterred from offending absent lobbying.

We also consider the case where enforcement is delegated to a self-interested agent, who is tasked with detecting a certain mass of offenses. There are striking differences in the equilibrium compared with the case of a welfare maximising enforcement agent. With delegated enforcement, the enforcement agent only benefits from detecting actual offenses, so that she prefers those offenders to lobby who would have been deterred otherwise. As the enforcement agent induces the 'wrong' types of offenders to lobby, this is a source for potential welfare reduction introduced by the possibility of lobbying. In equilibrium, it will be offenders with the highest private benefits from the offense who commit the offense without being induced to lobby, whereas types with intermediate private benefits commit the offense and subsequently lobby.

Next, we apply the model to the example of regulatory enforcement actions in the context of US bank regulation, for which previous literature (Lambert (2019)) has shown a negative relationship between lobbying and enforcement probability to exist. We argue that social and private values of violating regulation are positively related, and that a bank's success probability when managing risky projects is the source of its private information with regards to the potential social harm caused by a violation of the regulation. The assumption of private information raises difficulties when taking our model to the data, as such private information would also be unobservable for the researcher. Based on previous evidence that, in the context of banking, suggests that better governance is associated with better risk management (Ellul and Yerramilli (2013)) but higher risk taking incentives,[1] we suggest that the quality of a bank's corporate governance may be used as a proxy for this unobservable 'quality' of a bank.

[1]Beltratti and Stulz (2012), Erkens, Hung, and Matos (2012) and Minton, Taillard, and Williamson (2014) link certain indicators of good coporate governance to weaker performance during the financial crisis, which may be explained by these risk taking incentives.

In our panel dataset of 173 large US bank holding companies and their subsidiaries, we find that bank holding companies with stronger corporate governance and a poorly performing portfolio of subsidiaries are more likely to lobby. This is in line with the idea that bank holding companies whose subsidiaries are at risk of being penalized lobby in an attempt to convince the regulator of their quality. Furthermore, banks whose parent companies have lobbied and have a high corporate governance indicator are less likely to receive an enforcement action than subsidiaries of their non-lobbying, high-quality counterparts. For bank holding companies with low corporate governance indicator, this result is reversed. This supports the idea that regulators' reaction to lobbying depends on the lobbying firm's quality. In particular, the monotonic relationship between the governance quality and how frequently lobbying banks are punished is in line with the main version of our model, in which the enforcement agent's objective is to maximise welfare, and the availability of lobbying is welfare enhancing, and at odds with the model version with delegated enforcement, where it is intermediate types of offenders who lobby to avoid enforcement, and where lobbying is potentially welfare reducing. Last, we show a positive relationship between lobbying and future performance, which is entirely driven by high-quality bank holding companies.

Our paper seeks to add to our understanding of lobbying. Most of the existing literature on firms' attempts to gain political influence (such as via lobbying) is set in the context of regulation and can be distinguished into two strands, according to how they explain why a regulator would let lobbying influence her decisions. Starting with Laffont and Tirole (1991), papers in the first strand assume that regulated firms can reward regulators for misrepresenting their privately observed information vis-a-vis the ultimate decision maker (Congress, for instance) in the firm's favour,[2] or directly compensate the government for enacting a regulatory framework it prefers less (e.g. Harstad and Svensson (2011)). While papers in this tradition have in common that they use outright bribery and the assumption of perfectly enforceable agreements as a shortcut, the arguments can be readily applied to more sophisticated ways of rewarding favourite treatment by the political decision maker such as campaign donations (PACs contributions in the US).

The second strand of literature models lobbying as an interest group communicating its private information that is relevant for a political decision to the decision maker. If the interest group's and the regulator's interests are aligned up to some bias, and this bias is not too large, Grossman and Helpman (2001) show that even in a cheap talk game, the regulator can distinguish between some levels of the information that the interest group privately observes. In Potters and Van Winden (1992), lobbying costs serve as a further

[2]An example for this type of argument being applied to the setting of bank regulation is Boyer and Ponce (2012).

signalling device if all types of interest group prefer the same regulation but differ in their preference cost of a less-preferred regulation.

Much less work has been done on lobbying and political influence in the context of enforcement and is confined to the first of the aforementioned explanations, based on exchanges of favours. Polinsky and Shavell (2001) analyze the impact of enforcers taking bribes or framing and extorting individuals on deterrence and find that punishing enforcers who extort innocent individuals may backfire by inducing them to frame those innocents instead. Malik (1990) assumes that offenders can make an investment in reducing the probability of apprehension, and analyses optimal enforcement taking into account this possibility. In Damania, Fredriksson, and Mani (2004), firms lobby for lower law enforcement expenditures so as to facilitate corruption, which they then use to soften regulation. To the best of our knowledge, no attempt has been made to explain lobbying in the context of enforcement within an argument based on the communication of private information.[3]

Our paper is also related to a literature that identifies potential sources for inefficiency when enforcement is delegated to a self interested agency. In the early literature (e.g. Landes and Posner (1975), Polinsky (1980)), inefficiency stems from restrictions to the choice of the enforcement agent's compensation scheme such as compensation being equal to fines collected. Besanko and Spulber (1989) consider enforcement agencies' failure to commit to enforcement levels. Bond and Hagerty (2010) show that enforcers whose investigation resources are restricted fail to optimally balance deterrence between severe and less severe crimes. Büchel and Mühlheußer (2016) assume that the principal can only observe the detection rate that the enforcement agent achieves and argue that high enforcement rates are not implementable because they are observationally indistinguishable from some lower enforcement rate. Our paper adds the inefficient use of lobbying as another potential source for inefficiency of delegated enforcement to this literature.

Finally, our application of the model and the empirical analysis of data from bank regulation contributes to the vast empirical literature on corporate lobbying. A first strand of this literature examines determinants of lobbying, which include firm size (Hansen and Mitchell (2000) and Brasher and Lowery (2006)), investment opportunities and cash flows (Hill, Kelly, Lockhart, and Van Ness (2013)) and corporate governance (Mathur, Singh, Thompson, and Nejadmalayeri (2013)). In the banking industry, Gibson, Odabasioglu,

[3]In a way, the lobbying decision in our model might be seen as an extreme form of Bayesian persuasion (Kamenica and Gentzkow (2011)), in which the set of possible signals is restricted to a perfectly informative and a perfectly uninformative signal. The analysis in Hedlund (2017) suggests that such a restriction may be a plausible simplification in the context of the sender's private information on the state of nature.

and Padovani (2018) show that larger, less creditworthy banks with more vulnerable balance sheets and more diversified business profiles are more likely to lobby. The second strand of this literature is concerned with firms' benefits from lobbying, which include a reduced exposure to enforcement of regulations (see the aforementioned Correia (2014) and Lambert (2019)) or anti-fraud laws (Yu and Yu (2011) and Wu, Johan, and Rui (2016)), a higher likelihood of being granted a corporate bailout (Faccio, Masulis, and McConnell (2006) or, in the context of banking, Asai (2019)) and better access to finance (Claessens, Feijen, and Laeven (2008)). Our contribution to this literature, particularly vis-a-vis Lambert (2019), are to link bank holding companies' lobbying decisions to their subsidiaries' financial characteristics, and to show how the sign of the relationship between lobbying and enforcement probability varies with the quality of corporate governance.

The remainder of this paper is organised as follows: We first extend a theoretical model of crime and enforcement by introducing the possibility of lobbying in order to avoid enforcement. In Section 3, we analyse the main version of the model in which the enforcement agent's and society's objectives are aligned. We consider the case of a self-interested enforcement agent in Section 4. Section 5 shows how the model can be applied to the context of bank regulation, introduces our dataset and presents the empirical analysis thereof. Section 6 concludes and discusses some policy implications of our paper.

2 A Model of Enforcement and Lobbying

In this section, we extend the basic economic model of crime and enforcement pioneered by Becker (1968) in two ways: First, and most importantly, we include lobbying as a means for potential offenders to communicate otherwise private information to an enforcement agent. Second, we discuss socially optimal enforcement strategies in a more general way by allowing for any possible relationship between private gains and social harm caused by a crime.

A risk-neutral potential offender makes a binary decision between committing a crime and not doing so. Committing a crime yields him a gain g but may impose harm on society and result in the offender being punished. The offender's private gain g is his private information, but it is common knowledge that g is drawn from an interval $[\underline{g}, \overline{g}]$ with the probability distribution $F(g)$ and density $f(g)$.

An enforcement agent is tasked with investigating offenses. The cost $C(p)$ of investigating a case is an increasing, at least once continuously differentiable and weakly convex function of the probability with which an investigation yields evidence on the offense that can be used in court, where $C(0) = 0$. We assume that, if evidence is found, it is perfectly

accurate, i.e., evidence can be found only if the investigated individual has indeed committed the offense. The function $C(p)$ is a shortcut for several possible assumptions on the nature of investigations. For instance, the investigation decision may be binary, where an investigation comes at a fixed cost C, and the enforcement agent may randomise by investigating with probability p. In this case, $C(p) = pC$ would be linear. Alternatively, the enforcement agent's decision might relate to the intensity of each investigation, where investigating more intensely so as to increase the probability of finding evidence comes at an ever higher marginal cost, which would imply a convex shape of $C(p)$. For the sake of simplicity, we will just refer to p as 'investigation probability'. The enforcement agent's investigation strategy specifies such an investigation probability p conditional on all information that is available to her.[4]

If an investigation has shown the guilt of a type-g offender, this offender will be punished, which imposes a disutility with a monetary equivalent of T on him.[5] Furthermore, there may be restitution to some extent if an offender gets convicted, which we seek to capture by a parameter ρ and assume that a convicted offender's payoff is $(1-\rho)g - T$, whereas that of an offender who does not get caught is g.[6] We normalise a law-abiding individual's payoff to zero.

Our main contribution to this model is the possibility that, after the decision of whether to offend, but before an investigation might take place, a potential offender might engage in 'informative lobbying', i.e., lobbying with the purpose of communicating relevant information to the decision maker (rather than lobbying via an exchange of favours). More specifically, we assume that lobbying makes an individual's type g perfectly observable for the enforcement agent,[7] but comes at cost L for the individual. As a consequence, if lobbying is available, the enforcement agent can make her investigation strategy $p^L(g)$ contingent on the question whether an individual has lobbied and, if so, which g has been communicated in this process. By contrast, the enforcement agent cannot do any better than applying the same probability p^N to all individuals that have not lobbied.

As a law-abiding individual's payoff is the same independent of whether or not he

[4]It is possible to ensure the existence of an interior optimal investigation strategy by assuming the Inada conditions that $C'(p) \to_{p\to 0} 0$ and $C'(p) \to_{p\to \overline{p}} \infty$, where $\overline{p}$ is the maximum possible or the fully deterrent probability, whichever is smaller, but we do not need this for our analysis.

[5]T is exogenously given in our model. In the concluding Section 6, we will discuss the appropriateness of this assumption and the consequences of relaxing it for our results.

[6]The size of ρ will depend on the specific crime: A thief may be required to return the loot, but part of it may not be found. Similarly, if the only objective of a violent crime is to harm the victim, the offender will keep this 'gain' even when convicted.

[7]For simplicity, we assume that this communication of g is perfectly accurate, but the model's qualitative results would not change if we assumed that it comes in the form of a noisy signal.

is subject to an investigation, an individual would never want to spend L to lobby the enforcement agent unless he has committed an offense. Hence, a potential offender's expected payoff is

$$\Pi^L(g; p^L(g)) = \left(1 - \rho p^L(g)\right) g - p^L(g)T - L \tag{1}$$

if he (offends and) lobbies, and

$$\Pi^N(g; p^N) = \max\left\{\left(1 - \rho p^N\right) g - p^N T, 0\right\} \tag{2}$$

if he does not lobby.

We will measure social welfare as the difference between the expected impact of a crime on society and expected investigation and punishment costs. The impact of a crime on society, which we denote as a continuous function $v(g)$, may be quantified as the difference between the offender's private gain and the harm that this crime imposes on society. However, we don't impose any assumption about the extent to which an offender's private gain is reflected in $v(g)$,[8] and about the specific relationship between social harm and private gain, which makes our model widely applicable to a variety of offenses.[9] Given the enforcement agent's investigation strategy, expected investigation costs are $C(p^L(g))$ or $C(p^N)$, depending on whether or not the potential offender has lobbied. Finally, we assume that punishment comes at social costs αT, where the parameter α is specific to a particular crime and to the way society typically punishes that crime.[10]

Summing up, social welfare is $-C(p^N)$ if an individual does not commit an offense and, therefore, does not lobby. If the individual does offend, social welfare is $(1-\rho)v(g) - \alpha T$

[8]See, for instance, the discussion in Polinsky and Shavell (2007). A recent example of a model that allows for different fractions of the offender's private gain to be reflected in social welfare is Büchel, Feess, and Mühlheußer (2020) who, however, assume a specific functional form of $v(g)$, which we do not.

[9]Depending on the nature of the offense, this relationship may be positive or negative. For instance, more ruthless individuals may be more violent when committing robbery, which causes the robbery to yield a higher monetary gain for them but imposes higher harm on society. In this case, $v(g)$ is decreasing in g. On the other hand, a car driver's decision of whether to follow traffic laws such as speed limits will depend on this driver's individual probability of being involved in an accident. An excellent driver who is very unlikely to be involved in an accident will experience a higher net expected gain g from exceeding the speed limit. On the other hand, due to the lower accident probability of this type, social value $v(g)$ after that driver's traffic offense will be higher than after a lower-type driver's offense whose accident probability is higher, calling for $v(g)$ to be increasing in g in this example (see e.g. Traxler, Westermaier, and Wohlschlegel (2018)). Another context in which $v(g)$ is typically increasing is the enforcement of regulations, as we will argue below in Section 5.

[10]For instance, if punishment comes in the form of a monetary fine, it will just be a welfare neutral transfer of wealth from the offender to the government, so that $\alpha = 0$. However, other forms of punishment, such as incarceration or capital punishment, come at some social cost, in which case $\alpha > 0$.

with, and $v(g)$ without an investigation and conviction, less investigation costs. Based on the enforcement agent's investigation strategies p^N and $p^L(g)$, expected social welfare conditional on the offender's type is, therefore,

$$w^L(g; p^L(g)) = \left(1 - \rho p^L(g)\right) v(g) - p^L(g)\alpha T - C(p^L(g)) - L \tag{3}$$

if the offender has (offended and) lobbied, and

$$w^N(g; p^N) = \begin{cases} \left(1 - \rho p^N\right) v(g) - p^N \alpha T - C(p^N), & \text{if } \left(1 - \rho p^N\right) g - p^N T \geq 0; \\ -C(p^N), & \text{otherwise.} \end{cases} \tag{4}$$

if he hasn't lobbied.

For most of the analysis, we will assume that the enforcement agent's interests are aligned with society's, so that her objective is to choose the investigation strategy so as to maximise

$$W(p^N, p^L(\cdot)) = \int_{\underline{g}}^{\overline{g}} \left[\ell(g) w^L(g; p^L(g)) + (1 - \ell(g)) w^N(g; p^N)\right] f(g) dg, \tag{5}$$

where $\ell(g)$ denotes whether a type-g individual chooses to lobby ($\ell(g) = 1$) or not ($\ell(g) = 0$). In Section 4, we will discuss an extension of the model where the enforcement agent is purely selfish and receives some remuneration contingent on the number of detected offenses.

Let us briefly summarise the timing of the model: At time 0, the enforcement agent announces an investigation strategy. We will assume that the enforcement agent can credibly commit to this enforcement strategy, but we will briefly discuss in the conclusion how the results change in the absence of commitment. The potential offender draws his type g from a distribution on $[\underline{g}, \overline{g}]$ with cdf $F(g)$ and privately observes this g. At time 1, the potential offender decides whether to abide by the law or to commit an offense. Furthermore, the potential offender may spend L to make the value of g perfectly observable to the enforcement agent, which we refer to as lobbying. At time 2, the enforcement agent's investigation strategy p^N or $p^L(g)$ is implemented, depending on whether the potential offender has lobbied at time 1. At time 3, payoffs are realised.

3 Optimal Investigation Strategies and Lobbying

3.1 Benchmark Case: No Lobbying

As a benchmark, let us start by analysing a version of our model in which lobbying is exogenously ruled out. In this case, the enforcement agent cannot do any better than choosing the enforcement probability p^N unconditionally.

According to equation (2), a law-abiding type g individual's payoff is zero. By contrast, when committing an offense, she gains g but may be fined T with probability p^N, in which case she would also lose a fraction ρ of the gain from the offense, resulting in an expected payoff of $\left(1-\rho p^N\right) g - p^N T$.

As the potential violator's expected gain from the offense, given the enforcement probability p^N, is increasing in g, we can define a threshold type

$$\widetilde{g}(p^N) := \frac{p^N T}{1-\rho p^N}, \tag{6}$$

such that she prefers to commit the offense if and only if $g \geq \widetilde{g}(p^N)$. Note that $\widetilde{g}(p^N)$ is increasing in p^N.

In the absence of lobbying, the enforcement agent's objective (5) becomes

$$W_{NL}(p^N) = \int_{\underline{g}}^{\overline{g}} w^N(g;p^N) f(g) dg = \int_{\widetilde{g}(p^N)}^{\overline{g}} \left[\left(1-\rho p^N\right) v(g) - p^N \alpha T\right] f(g) dg - C(p^N) \tag{7}$$

The enforcement agent will choose the enforcement probability p^N so as to maximise $W_{NL}(p^N)$. The first derivative of $W_{NL}(p^N)$ w.r.t. p^N is

$$\begin{aligned} \frac{\partial W_{NL}(p^N)}{\partial p^N} = &- \int_{\widetilde{g}(p^N)}^{\overline{g}} \left[\rho v(g) + \alpha T\right] f(g) dg \\ &- \left[\left(1-\rho p^N\right) v(\widetilde{g}(p^N)) - p^N \alpha T\right] f(\widetilde{g}(p^N)) \frac{d\widetilde{g}(p^N)}{dp^N} - C'(p^N). \end{aligned} \tag{8}$$

Intuitively, increasing p^N is costly but increases the set $[\underline{g}, \widetilde{g}(p^N))$ of types of potential offenders who will choose to abide by the law. For instance, suppose that $v(g)$ is increasing in g, and that $\rho v(\widetilde{g}(p^N)) + \alpha T = 0$, which means that, for the marginal type of potential offender who is just indifferent between offending and abiding by the law, the social gain from imposing enforcement on such an offender, $-\rho v(\widetilde{g}(p^N))$, is just offset by the enforcement cost αT, notwithstanding any investigation cost $C(p^N)$. In this case, the above derivative is negative, so that slightly reducing the investigation probability p^N would be welfare enhancing. However, this need not be true if $v(g)$ takes other functional forms, and even if $v(g)$ is increasing in g, the above observation cannot be used to relate this particular p^N with the optimal choice of p^N, as there is no assumption that guarantees that the solution is interior or unique. Let us, for further reference, define

$$p^N_{NL} := \max \ \arg\max_{p^N} W_{NL}(p^N). \tag{9}$$

In the special case where the optimal choice of investigation probability is indeed unique, p^N_{NL} denotes this unique optimal probability.

What we can do in this most general formulation of the model is to use Milgrom and Shannon (1994) to derive comparative statics based on cross derivatives of $W_{NL}(p^N)$ w.r.t. p^N and the parameters of interest: If this cross-derivative is positive (negative), the argmax set is 'higher' if that parameter is greater (smaller), in the sense of the so-called 'strong set order' approach.[11] In our case, we can study the impact of an offense's social harm or the size of investigation cost by defining $v(g) := v_0(g) + \lambda_v$ and $C(p) := C_0(p) + \lambda_C p$ and studying comparative statics w.r.t. these parameters λ_v and λ_C. Increasing λ_v, which makes every type of individual's offense less harmful for society, or λ_C, which increases marginal investigation cost for any given investigation intensity, will reduce $\frac{\partial W_{NL}(p^N)}{\partial p^N}$ and, therefore, result in a lower optimal investigation probability p^N.[12]

3.2 Investigation Strategy with Lobbying

If lobbying is available to potential offenders as a way to reliably communicate their type g to the enforcement agent, the latter can make the enforcement probability contingent on some features that are now observable: She can implement different enforcement probabilities for non-lobbying (p^N) and lobbying (p^L) individuals and, if an individual has used lobbying to reveal its type g, different probabilities $p^L(g)$ for different types. We will analyse this scenario in two steps: First, we will determine the optimal enforcement strategy towards lobbying individuals for a given enforcement probability p^N for non-lobbying individuals. Based on this result, we will then analyse the optimal enforcement probability p^N for non-lobbying individuals given that, for each p^N, the optimal $p^L(g)$ for lobbying individuals is implemented.

In the previous subsection, we saw that p^N divides the set of all types of potential offenders, $[\underline{g}, \overline{g}]$, into those types that prefer abiding by the law over offending without lobbying, $\left[\underline{g}, \widetilde{g}\left(p^N\right)\right)$, and those who prefer the latter over the former, $\left[\widetilde{g}\left(p^N\right), \overline{g}\right]$. Increasing the investigation probability p^N makes offending less attractive for all types, which means that some types that preferred offending under the lower p^N will prefer abiding by the law under the higher p^N. By contrast, changes in the investigation strategy towards lobbying individuals have a very different effect: As the enforcement agent can choose a unique investigation probability just for a particular type, changing that probability will leave all other types' offending and lobbying decisions unaffected.

This irrelevance of the investigation strategy $p^L(g)$ towards a particular type g, if he lobbies, for other types' lobbying and offending decisions greatly simplifies the analysis of

[11] See the Proof of Proposition 1 for the relevant definition of this concept for our model.

[12] However, comparative statics w.r.t. parameters that also influence the integration boundary $\widetilde{g}(p^N)$ will depend on the functional form of the density $f(g)$, and, thus, are generally ambiguous.

the optimal $p^L(\cdot)$: For any given investigation strategy p^N towards non-lobbying potential offenders, expected social welfare (5) can be maximised by deciding for each g separately whether lobbying should be rewarded by reducing the investigation probability to some $p^L(g) < p^N$. Hence, for any given p^N and g, the enforcement agent will choose $p^L(g)$ so as to

$$\begin{aligned} \max_{p^L(g)} \quad & \ell(g)w^L(g;p^L(g)) + (1-\ell(g))w^N(g;p^N) \\ \text{s.t.} \quad & \ell(g) = \begin{cases} 1, & \text{if } \Pi^L(g;p^L(g)) \geq \Pi^N(g;p^N); \\ 0, & \text{otherwise.} \end{cases} \end{aligned} \tag{10}$$

where w^L and w^N are social welfare conditional on the offender's type with and without lobbying, given by (3) and (4), and Π^L and Π^N a potential offender's payoff with and without lobbying, given by (1) and (2).

For given p^N and g, $w^L(g;p^L(g))$ is linear in $p^L(g)$. Hence, given that the potential offender commits an offense and lobbies ($\ell(g) = 1$), the optimal investigation probability $p^L(g)$ is either zero or one. At the same time, the choice of $p^L(g)$ affects the potential offender's choice of whether to lobby, $\ell(g)$. As, for any given g, $\Pi^L(g;p^L(g))$ is monotonically decreasing in $p^L(g)$, $p^L(g) = 0$ makes lobbying most attractive for a type-g potential offender. Therefore, $p^L(g) = 0$ is the optimal investigation policy towards lobbying individuals whenever $w^L(g;p^L(g))$ is decreasing in $p^L(g)$ and the resulting welfare is higher than without lobbying, $w^L(g;0) \geq w^N(g;p^N)$. Note that the latter condition implies the former, so that we can divide the set of all types of potential offenders into a set

$$G_e^L(p^N) := \left\{g : w^L(g;0) \geq w^N(g;p^N)\right\} \tag{11}$$

of types which the enforcement officer wants to induce to lobby, and a set $[\underline{g},\overline{g}] \setminus G_e^L(p^N)$ of types which she doesn't want to induce to lobby.

Whether a type $g \in G_e^L(p^N)$ can indeed be induced to lobby depends on whether $p^L(g) = 0$ makes lobbying sufficiently attractive for this type to be preferred over not lobbying. Let us define the set

$$G_i^L(p^N) := \left\{g : \Pi^L(g;0) \geq \Pi^N(g;p^N)\right\} \tag{12}$$

of types of potential offenders whose optimal choice is to commit the offense and lobby if this makes them avoid investigation ($p^L(g) = 0$). Comparing (1) and (2) shows that the slope of $\Pi^L(g;0)$ in g is one, whereas that of $\Pi^N(g;p^N)$ is strictly less than one, no matter whether the individual commits an offense (slope $1-\rho p^N$) or not (slope zero). Therefore, there exists at most a unique

$$g_i^L(p^N) := \max\left\{\frac{1}{\rho}\left(\frac{L}{p^N} - T\right), L\right\} \tag{13}$$

such that

$$G_i^L(p^N) = \left[g_i^L(p^N), \overline{g}\right].$$

Depending on p^N, this $g_i^L(p^N)$ may be greater or smaller than $\widetilde{g}(p^N)$, but this relationship between both thresholds is monotonic, so that there is a $\widetilde{p}^N$ such that $\widetilde{g}(p^N) < g_i^L(p^N)$ if and only if $p^N < \widetilde{p}^N$. In other words, $\widetilde{p}^N$ is the investigation probability for non-lobbying types under which a potential offender prefers lobbying over not lobbying if and only if she prefers offending over complying.

Notice the difference between the set $G_i^L(p^N)$, which is an interval whenever it is non-empty, and $G_e^L(p^N)$, which potentially can take any shape as we haven't made any assumption on the functional form of $v(g)$ (other than continuity). On the other hand, $G_i^L(p^N)$ is weakly increasing in p^N in the sense that increasing p^N can never remove types from this set, as a higher p^N weakly increases a potential offender's private costs of investigation and enforcement when not lobbying. However, this need not be true for $G_e^L(p^N)$, as $w^N(g; p^N)$ typically is discontinuous at $g = \widetilde{g}(p^N)$.

Summing up, we have shown that, for any given investigation probability for non-lobbying individuals p^N, the optimal and implementable investigation strategy is to induce all types

$$g \in G^L(p^N) := G_e^L(p^N) \cap G_i^L(p^N) \tag{14}$$

to lobby by setting $p^L(g) = 0$ for all these types, and any sufficiently high $p^L(g) \geq p^N$ to discourage types $g \notin G^L(p^N)$ from lobbying.

Anticipating this optimal choice of $p^L(g)$, the enforcement agent's objective function (5) becomes

$$\begin{aligned} W_L(p^N) =& \int_{g \notin G^L(p^N)} w^N(g, p^N) f(g) dg + \int_{g \in G^L(p^N)} w^L(g, 0) f(g) dg \\ =& W_{NL}(p^N) + \int_{G^L(p^N) \cap \left[\underline{g}, \widetilde{g}(p^N)\right]} \left[v(g) + C(p^N) - L\right] f(g) dg \\ &+ \int_{G^L(p^N) \cap [\widetilde{g}(p^N), \overline{g}]} \left[p^N(\rho v(g) + \alpha T) + C(p^N) - L\right] f(g) dg, \end{aligned} \tag{15}$$

which she seeks to maximise by choice of p^N. The second line in (15) presents $W^L(p^N)$ so as to highlight the welfare gain that can be made by allowing for lobbying for any given p^N. Note, in particular, that both integrands in that second line are positive for all $g \in G^L(p^N)$ by definition. Therefore, whenever there is lobbying at all in equilibrium, it is welfare enhancing compared to a situation where lobbying is not available.

The following proposition compares the enforcement agent's optimal choices with and without lobbying:

Proposition 1 *Suppose that lobbying is available and*

$$\forall p^N \in \left[\widetilde{p}^N, p^N_{NL}\right] : v(\widetilde{g}(p^N)) < \frac{\frac{L}{p^N} - C - \alpha T}{\rho}. \tag{16}$$

If there are some types g at all who lobby in equilibrium, the optimal investigation rate p^N_L for non-lobbying potential offenders is above the optimal investigation rate p^N_{NL} in the model where lobbying is not available.

Proof. All proofs are in the Appendix. ■

The proof of Proposition 1 is based on the insight that the difference $W_L(p^N) - W_{NL}(p^N)$ is equal to the integrals on the right-hand side of the second line in (15), which are increasing in p^N if condition (16) holds: Both integrands are increasing in p^N, and we have argued before that the set $G^L(p^N)$ is weakly increasing in p^N in the sense that raising p^N can never remove types g from this set. At those integration boundaries where the enforcement agent is indifferent between the individual lobbying and not lobbying (i.e., for types where $w^L(g;0) = w^N(g;p^N)$), the change in these boundaries as a reaction to the increase in p^N has no consequence for the value of this integral, as the integrand is zero for such a boundary type by definition. On the other hand, at those integration boundaries where the potential offender is indifferent between lobbying and not lobbying, the types g of these boundaries are elements of $G^L(p^N)$, so that $w^L(g;0) \geq w^N(g;p^N)$, which implies that the integrand is positive for that type and that adding a marginal type increases the integral.

There might be a countervailing effect if the type of offender who is indifferent between not offending and committing the offense without lobbying actually prefers lobbying over both of these options, and if at the same time society is better off if that type of offender lobbies rather than offending without lobbying. In this case, increasing p^N makes that type strictly prefer not to offend, in which case society might have preferred that type not to lobby, thus reducing welfare for that type. Condition (16) is sufficient for ruling out this possibility, as it makes sure that, for any $p^N < p^N_{NL}$, there is always an interval with lower bound $\widetilde{g}(p^N)$ where no type lobbies.

As a consequence, the derivative of $W_L(p^N) - W_{NL}(p^N)$ w.r.t. p^N is non-negative whenever $p_N < p^N_{NL}$ and (16) holds. Again, Milgrom and Shannon (1994) imply that, in such a case, the p^N that maximises $W_L(p^N)$ is weakly above the p^N that maximises $W_{NL}(p^N)$ if both of these maximisers are unique, and, if they are not, the argmax set of the former function is 'larger' than the argmax set of the latter when using the 'strong set order' approach.

Proposition 1 illustrates how the availability of lobbying improves the enforcement agent's optimal investigation strategy: If there are some types of potential offender whose

offense imposes less harm on society than the combined investigation and punishment costs (less the lobbying costs), then inducing these types to lobby, if possible, by promising not to investigate their offense if they lobby, permits the enforcement agent to focus her costly investigation effort on those types whose offense is more harmful for society. This focus of the investigation effort on non-lobbying types is represented in the model by the higher investigation probability p_L^N established by Proposition 1.

It is important to point out that, as the enforcement agent's interests are aligned with society's, lobbying is welfare enhancing whenever it occurs in equilibrium. This is true even if the countervailing effect, which condition (16) seeks to rule out, exists and dominates the other effects discussed above, so that the optimal investigation probability p_L^N towards non-lobbying individuals if lobbying is available is *below* that p_{NL}^N in the absence of lobbying. In that latter case, the enforcement agent's commitment to 'rewarding' lobbying by certain types reduces her expected investigation costs even if non-lobbying types had been investigated with the same probability as without that commitment. More generally, a sufficient condition for the availability of lobbying to improve welfare is that $G^L(p_{NL}^N) \neq \emptyset$.

3.3 Monotonic Relation of Social and Private Value of Crime

We will now add more structure to the model by assuming a monotonic relationship between private benefit g of crime and its impact $v(g)$ on society. We will start by analysing the case where this relationship is weakly positive, i.e., $v(g)$ is non-decreasing in g.

This monotonicity assumption for $v(g)$ simplifies the analysis as it carries over to society's preferences over whether type g abides by the law, or whether he commits an offense, with or without lobbying. For instance, whenever society prefers some type g of potential offender to offend with lobbying over offending without lobbying (and, therefore, being punished with probability p^N), the same is true for all types $g' > g$. Similarly, if society prefers g to offend with lobbying over abiding by the law, the same is true for all $g' > g$.

As a consequence, for any p^N, the set $G^L(p^N)$ of all types who lobby under the optimal investigation strategy against lobbying individuals is comprised of at most two intervals: An interval $[g^a(p^N), \widetilde{g}(p^N))$ of types who society prefers to offend with lobbying over abiding by the law, who prefer that themselves, and who prefer abiding by the law over offending without lobbying, and another interval $[g^L(p_L^N), \overline{g}]$ of types who society prefers to offend with lobbying rather than without lobbying, who prefer that themselves, and who prefer offending without lobbying over abiding by the law. However, the following

proposition shows that the first of these two intervals never exists under the enforcement agent's optimal choice of p^N, thus reducing the equilibrium $G^L(p_L^N)$ to a single interval:

Proposition 2 *Suppose that $v(g)$ is non-decreasing. If lobbying is available, the optimal investigation policy p_L^N towards non-lobbying individuals implies that there is a unique $g^L(p_L^N) \geq \widetilde{g}(p_L^N)$ such that $G^L(p_L^N) = [g^L(p_L^N), \overline{g}]$.*

Proposition 2 establishes that, under the optimal investigation strategy, the set of types of potential offender can be divided into at most three intervals: Individuals with the lowest private benefit from committing the offense will abide by the law. This interval $[\underline{g}, \widetilde{g}(p_L^N))$ coincides with the interval of law-abiding types in the absence of lobbying if the same investigation probability $p = p_L^N$ is appplied. On the other hand, individuals with the highest private benefit from committing the offense, $g \in [g^L(p_L^N), \overline{g}]$, will do so, lobby by communicating their type and, as a result, escape punishment. Depending on the parameter values, there may be a third interval $[\widetilde{g}(p_L^N), g^L(p_L^N))$ of intermediate types that commit an offense without lobbying. Intuitively, it can't be optimal to have a type of potential offender lobby ($g > g^L(p^N)$) who would have been deterred anyway ($g < \widetilde{g}(p^N)$), as the same outcome, the potential offender committing the crime, could have been achieved with a lower investigation probability $p^{N'} < p^N$. Hence, for the optimal investigation strategy p_L^N, it must be that $\widetilde{g}(p_L^N) \leq g^L(p_L^N)$.

Under the assumption of monotonicity of $v(g)$, Proposition 2 also simplifies some of the results from the previous Subsection that analysed the more general model. For instance, Condition (16), which was sufficient for the optimal investigation probability for non-lobbying individuals when lobbying is available to be above that when lobbying is unavailable in Proposition 1, becomes

$$p_{NL}^N \leq \widetilde{p}^N \qquad \text{or} \qquad v(\widetilde{g}(p_{NL}^N)) < \frac{L + C(p_{NL}^N) - \alpha p_{NL}^N T}{\rho p_{NL}^N}. \tag{17}$$

That is to say, condition (16) only needs to be checked at the upper boundary of the interval $\left[\widetilde{p}^N, p_{NL}^N\right]$ whenever it exists, rather than in the entire interval as in the more general case covered by Proposition 1. Similarly, the sufficient condition for lobbying to strictly enhance welfare has, in the previous Subsection, been argued to be that some lobbying is optimal even under the optimal investigation probability p_{NL}^N in the absence of lobbying. With Proposition 2, this condition can be formalised as

$$g_i^L(p_{NL}^L) < \overline{g} \qquad \text{and} \qquad v(\overline{g}) < \frac{L + C(p_{NL}^N) - \alpha p_{NL}^N T}{\rho p_{NL}^N}.$$

where $g_i^L(p_{NL}^L)$, as defined in (13), is the type of offender who is indifferent between lobbying and not lobbying. In other words, lobbying is strictly welfare enhancing if, even

under the optimal investigation strategy p^N_{NL} absent lobbying, both the potential offender and society prefer the highest possible type of offender $\overline{g}$ to lobby.

Let us now briefly discuss the opposite kind of monotonic relationship between private benefits of an offense and its impact on society, i.e., where $v(g)$ is decreasing in g. This case might occur in reality when, for instance, a crime is so serious that the offender's private gain should not be reflected in total welfare, and offenders who have a high private gain from the offense inflict more harm on society than those with a low private gain.

Due to the opposing nature of social and the offender's private interests, the intervals of g in which the offender is induced to lobby have a lower boundary that is determined by the offender's preferences and an upper boundary that is determined by social preferences. More specifically, one of the following two cases may arise: If $p^N < \widetilde{p}^N$, none of the types $g < \widetilde{g}(p^N)$ want to lobby, and $G^L(p^N)$ is a single interval. On the other hand, for $p^N \geq \widetilde{p}^N$, if there are any types of potential offenders who commit an offense without lobbying, it will only be the very highest types. The following proposition shows that there is a limit to the enforcement agent's incentives to encourage high-type offenders (whose offense would, due to the decreasing nature of $v(g)$, be especially harmful for society) to lobby:

Proposition 3 *Suppose that $v(g)$ is decreasing. Then, under the optimal investigation strategy p^N_L, for any $\varepsilon > 0$, there is some $g \in [\widetilde{g}(p^N_L) - \varepsilon, \overline{g}]$ such that a type g potential offender does not lobby in equilibrium.*

In some way, Proposition 3 corresponds to Proposition 2 for the non-decreasing case, but its benefit for narrowing down the potentially optimal choices of p^N is much more limited than that previous proposition's. The intuitive reason for this is that it's those types that are most difficult to deter (i.e., high g) that the enforcement agent is most eager to punish and least willing to let off the hook via lobbying. This implies that there is a beneficial effect of increasing p^N even if it is already quite high.

4 Delegated Enforcement

Let us now extend the model to the case where enforcement is delegated to a self-interested agent. We will refer to the principal in this principal-agent relationship as the regulator, whose task it is to maximise social welfare. Following the literature on delegated enforcement (e.g. Büchel and Mühlheußer (2016)), we assume that all that the regulator can observe is the mass x of offenses that the enforcement agent successfully investigates ('*detects*'). More precisely, we add a preliminary period -1 to the game, in which the regulator announces an incentive scheme $R(x)$, which specifies the reward that the enforcement agent receives if she has detected a mass x of offenses.

It is straightforward to see that the regulator cannot do any better than decide on an $x \in X$, where

$$X := \left\{ x \mid \exists p : p \int_{\widetilde{g}(p)}^{\overline{g}} f(g)dg = x \right\} \tag{18}$$

is the set of implementable detection levels, and announce $R(x)$ so as to satisfy the enforcement agent's participation constraint, and $R(x') = 0$ for all $x' \neq x$. Given such an incentive scheme, the enforcement agent's objective is to

$$\begin{aligned} \min_{p^N, G^L} \quad & C(p^N) \int_{g \notin G^L} f(g)dg \\ \text{s.t.} \quad & G^L \subset G_i^L(p^N) \\ & p^N \int_{g \notin G^L \cup [\underline{g}, \widetilde{g}(p^N))} f(g)dg f(g)dg = x \end{aligned} \tag{19}$$

That is to say, the enforcement agent seeks to minimise her investigation costs. In (19), we have used the insight from Subsection 3.2 that the optimal enforcement policy towards lobbying offenders entails defining a set of types to be induced to lobby, and set $p^L(g) = 0$ for all of these types. The first constraint reflects the fact that the enforcement agent can only induce those types to lobby who prefer lobbying and a zero investigation probability over not lobbying and facing investigation strategy p^N. The second constraint simply means that the enforcement agent must detect the required number of offenses.

When solving (19), it cannot be optimal to induce any type g to lobby who would, absent lobbying, commit an offense. For instance, consider an investigation probability p^N that yields the enforcement agent the required mass of detected offenses absent any lobbying. If it is possible for the enforcement agent to induce some types to lobby (and commit the offense) that would otherwise abide by the law, this would save him investigation costs for these types without changing the number of detected offenses. By contrast, when inducing some of those types to lobby that would commit the crime anyway, these types would have to go unpunished to make lobbying attractive for them, so that the enforcement agent would detect strictly fewer offenses as a result. Therefore, the optimal set of lobbying types in this case is the set of types that would have abided by the law absent lobbying and that can be induced to lobby:[13]

$$G^L(p^N) = \left[L, \widetilde{g}(p^N) \right). \tag{20}$$

As for the optimal p^N, there typically are, as Büchel and Mühlheußer (2016) point out, several investigation probabilities that detect the required mass of offenses.[14] Among all

[13] Recall that $g_i^L(p^N) = L$ whenever $g_i^L(p^N) \geq \widetilde{g}(p^N)$.

[14] The reason for this multiplicity is that, while $\int_{\widetilde{g}(p)}^{\overline{g}} f(g)dg$ is strictly decreasing in p as $f(.)$ is a

these investigation probabilities, the minimum one comes at the lowest expected cost and is, therefore, optimal:

$$\hat{p}(x) := \min \left\{ p \mid p \int_{\widetilde{g}(p)}^{\overline{g}} f(g)dg = x \right\} \tag{21}$$

The following proposition sums up the enforcement agent's optimal investigation strategy and is presented without proof:

Proposition 4 *Suppose enforcement is delegated. Then, if an enforcement agent is tasked with detecting a mass $x \in X$ of offenses, the optimal investigation strategy is $p^N = \hat{p}(x)$, and*

$$G^L(\hat{p}(x)) = [L, \widetilde{g}(\hat{p}(x)))] \tag{22}$$

When comparing the optimal investigation strategy in Proposition 4 with the (welfare maximising) one in Proposition 2, there are two main differences: First, in line with Büchel and Mühlheußer (2016), the investigation strategy p_L^N might not be implementable (i.e., $p_L^N \notin P$) even absent lobbying. Second, even for a given investigation strategy p^N, the types of potential offenders who lobby to escape enforcement are different in both scenarios: While the self-interested enforcement agent will induce types of potential offender to lobby who would otherwise have been deterred, it is, if $v(g)$ is non-decreasing in g, the types who are most eager to offend and least harmful when doing so who will be induced to lobby by a welfare maximising enforcement agent.

In other words, under delegated enforcement, the enforcement agent will induce the 'wrong' set of types to lobby, compared to a welfare maximising enforcement agent. Therefore, a natural question is whether the regulator will be able to solve this problem by designing the enforcement agent's compensation scheme appropriately. Taking into account that the enforcement agent needs to be compensated for her expected investigation costs in order to satisfy her incentive compatibility constraint, the regulator's problem is equivalent to choosing some $p \in P$, where

$$P := \{ p \mid \exists x \in X : p = \hat{p}(x) \}. \tag{23}$$

For further reference, define $p_m := \max P$. The regulator chooses $p \in P$ so as to maximise

$$\begin{aligned} W_L^{DE}(p) &= -C(p) + \int_L^{\widetilde{g}(p)} [v(g) - L + C(p)] f(g)dg + \int_{\widetilde{g}(p)}^{\overline{g}} [(1-\rho p)v(g) - \alpha p T] f(g)dg \\ &= W_{NL}^{DE}(p) + \int_L^{\widetilde{g}(p)} [v(g) - L + C(p)] f(g)dg, \end{aligned}$$

probability density function, the product p times that integral is not: This product converges to zero as p approaches zero and, unless there are some types that cannot even be deterred by certain punishment, as p approaches one, and it is strictly positive in between these extremes.

where $W_{NL}^{DE}(p)$ denotes social welfare with delegated enforcement but in the absence of lobbying if the regulator implements investigation probability $p \in P$.

The solution p_L^{DE} to this problem may be larger or smaller than some $p_{NL}^{DE} \in \arg\max W_{NL}^{DE}(p)$, as increasing p may have countervailing effects on $W_L^{DE}(p) - W_{NL}^{DE}(p)$: On the one hand, the integrand on the right-hand side of the above definition gets larger as the enforcement agent saves investigation costs whenever lobbying occurs in equilibrium. On the other hand, increasing p widens the range over which that integral is taken, so that, if society would prefer the marginal type $\widetilde{g}(p)$ at the upper boundary of that integral not to lobby, the integral gets smaller as a result.

An important insight that can be gained immediately is that, even under the regulator's optimal choice of $p \in P$, there will always be some types of individual who offend without lobbying:

Proposition 5 *With delegated enforcement, if there is any lobbying in equilibrium, it will be intermediate types of potential offenders who commit the offense while lobbying, and the very highest types of potential offenders commit the offense without lobbying.*

All that is needed to prove Proposition 5 is the insight that full deterrence cannot be implementable, as it is observationally indistinguishable from no deterrence for the regulator. Hence, $\widetilde{g}\left(p_{NL}^{DE}\right) < \overline{g}$, so that, with Proposition 4, the very highest types of potential offender will commit an offense without lobbying.

Proposition 5 shows that, even for the optimal required mass of detected offenses, the enforcement agent will potentially induce the 'wrong' types to lobby: If $v(g)$ is non-decreasing in g, there will be some types with higher g that society would have preferred more to lobby than the ones that are actually induced to lobby. As a consequence, provided there is any lobbying in equilibrium, welfare under delegated enforcement is lower than that with a welfare maximising enforcement agent, even if the optimal enforcement strategy in the latter case, p_L^N, is implementable under delegated enforcement. In other words, we have established a self-interested enforcement agent's inefficient reaction to lobbying to be an additional source for inefficiency of delegated enforcement.

Depending on how restrictive the set P of implementable investigation rates is and how much individual and social benefits from lobbying, as represented by the sets $G_i^L(p^N)$ and $G_e^L(p^N)$ defined in Section 3.2, differ for $p^N \in P$, this inefficiency may even result in the availability lobbying to be welfare reducing, compared to a situation in which lobbying is exogenously ruled out. When comparing welfare with and without lobbying, both are identical whenever $p < \widetilde{p}^N$, which is equivalent to the type $g = L$ of offender indifferent between lobbying and abiding by the law being above the type that is indifferent between offending without lobbying and abiding by the law, i.e., $\widetilde{g}(p) < L$. As p increases above

that level, the enforcement agent will always induce types $g \in [L, \widetilde{g}(p))$ to lobby, which may increase or reduce welfare, depending on whether society prefers types in this set, on average, to lobby rather than abiding by the law. As p grows, so does $\widetilde{g}(p)$, which means that types that just marginally preferred committing an offense without lobbying over abiding by the law change their behaviour to committing the offense while lobbying. Depending on whether society prefers the marginal type $\widetilde{g}(p)$ to lobby over offending without lobbying, this type's behaviour change may increase or reduce welfare.

For instance, in the special case where $v(g)$ is increasing in g, there is a unique $g_e^o(p)$ such that the integrand in the second line of (24) is positive if and only if $g > g_e^o(p)$, where $g_e^o(p)$ is decreasing in p. Therefore, if $\widetilde{g}(p) = g_e^o(p)$ and $p > \widetilde{p}$, society would have preferred if all the types of offenders, whom the enforcement agent induces to lobby, had not lobbied. As p increases, the set of types over which the integral in (24) is taken is extended by types that society wants to lobby, so that this integral is increasing in p within this range of p. As a consequence, if the enforcement agent encourages lobbying under what would have been the equilibrium investigation strategies absent lobbying (i.e., $p < \widetilde{p}$ for all $p \in \arg\max W_{NL}^{DE}(p)$), and even increasing p up until the maximum implementable investigation rate p_m is not enough to turn the integral in (24) positive,

$$\int_L^{\widetilde{g}(p_m)} [v(g) - L + pC] f(g) dg < 0,$$

then we can conclude that the availability of lobbying is strictly welfare reducing.

5 Application: Enforcement of Bank Regulation

5.1 Aligning the Model with Institutional Facts

In this section, we will apply our model to the case of regulatory enforcement actions against banks, derive some testable predictions of the equilibrium in this case, and use data from regulatory enforcement actions against US banks to test whether these features can be observed in reality. In general, bank regulation aims to curb banks' potentially excessive risk taking incentives, which are caused by a combination of a highly leveraged balance sheet, investors' limited market discipline and the expectation of being too big to fail (e.g. Bhattacharya, Boot, and Thakor (1998)). Therefore, we model compliance with (violation of) bank regulation as choosing a safe (risky) portfolio of assets. More specifically, we assume that a bank decides whether to comply with or violate regulation. If the bank has complied with the regulation, its payoff will be S with certainty. If the bank has not complied, payoff is risky. With probability θ, a high payoff $R > S$ is realised. With probability $1-\theta$, the bank defaults and gets a payoff of zero, which imposes

a negative externality B on society.[15] We assume that a bank's probability of successfully managing a risky portfolio, θ, is the bank's private information and unobservable to the regulator.

Based on previous literature, we argue that this unobservable quality can be proxied by information that we have about the quality of corporate governance in a bank's parent company. Ellul and Yerramilli (2013) show that banks with better governance are better at managing risks. On the other hand, Beltratti and Stulz (2012), Erkens, Hung, and Matos (2012) and Minton, Taillard, and Williamson (2014) have linked certain indicators of good coporate governance to weaker performance during the financial crisis, which, in some cases, is attributed to different risk taking incentives for these banks.

Let us now express the elements of our general model discussed in the previous section in terms of this particular example. A bank's expected private gain from violating regulation is $g := \theta R - S$. The impact of this violation on social welfare is equal to the bank's private benefit g, less the negative externality that arises if the risky project fails, which happens with probability $1 - \theta = 1 - \frac{g+S}{R}$. Hence,

$$v(g) = g - \left(1 - \frac{g+S}{R}\right) B = \frac{g(R+B) - (R-S)B}{R}. \tag{24}$$

Note that $v(g)$ is increasing in g, $v'(g) > 1$, and $v(g) < g$ for all $g < R - S$, which is satisfied whenever the risky portfolio does not succeed with certainty ($\theta < 1$).

Regulatory enforcement of the US banking sector is assigned to three regulatory agencies, each of which is allocated specific types of banks to regulate and supervise.[16] A core activity of these agencies is to monitor the safety and soundness condition of the banks they supervise on a regular basis by conducting examinations, which aim to reveal important information with regard to the financial condition and performance of the bank. During these examinations banks are assessed and assigned a composite rating, which is based on six core areas (Capital, Asset, Management, Earnings, Liquidity and Sensitivity to market risk; commonly referred to as CAMELS ratings), and which is used to determine the type (if any) of enforcement action to be imposed. These types of enforcement actions can be classified into formal (publicly disclosed and legally enforceable) and informal ones, where the former vary in severeness, depending on the type of weakness or misconduct identified during the examination process.

[15]For instance, such a payoff structure emerges when a bank may or may not comply with capital adequacy rules in Feess and Hege (2011).

[16]The Office of the Comptroller of the Currency is in charge of federally chartered banks (national banks). The Federal Reserve Bank supervises state-chartered institutions that are members of the Federal Reserve System. The Federal Deposit Insurance Corporation is responsible for federally insured depository institutions.

The aim of an enforcement action is to correct the imperfections determined during the assessment process and ensure that the bank's financial health recovers as soon as possible. In other words, enforcement actions force banks to correct their conduct to fully comply with the regulation. This correction can be interpreted as $\rho = 1$ in our model. Apart from this correction of conduct, receiving a formal enforcement action may affect a bank's reputation, and some types of enforcement action include a monetary fine. In our model, these additional costs correspond to the parameter T.

Imposing regulatory enforcement actions against non-compliant banks has been shown to have a mixed impact on welfare. In particular, there is empirical evidence supporting that regulatory enforcement against banks has a temporary negative impact on areas such as personal income growth and unemployment (Danisewicz, McGowan, Onali, and Schaeck (2018)). However, there is also evidence supporting that enforcement actions can have a positive impact on economic welfare, stemming from the so called 'competition-reputation effect'. That is, punished banks may be urged to lower the cost of corporate borrowing in order to remain competitive in the market. Therefore, firms are able to borrow in lower rates in order to proceed with their investment projects (Deli, Delis, Hasan, and Liu (2019)). In terms of our model, this points to a positive but low value for α.

In this context, Lambert (2019) has shown that subsidiary banks are less likely to be punished if their parent Bank Holding Companies have lobbied. As the particular communication in and motivation for this lobbying activity is unknown, we cannot directly test our theoretical model's main assumption that the purpose of lobbying is to communicate the bank's private information (in this case banks' success probability with risky portfolios) relevant for the social harm caused by the bank's violation to the regulator. Instead, we will compare our theory's predictions about lobbying and enforcement in equilibrium with evidence from our dataset of lobbying and regulatory enforcement actions. As explained above, we will use corporate governance quality as a proxy for the bank's private information on its quality at managing risky portfolios.

In the general theoretical model, Proposition 2 has shown that it is banks with high private benefit g and low social harm $-v(g)$ from the violation that lobby in equilibrium. We have argued above that both are associated with high ability θ of managing risks, which we are using corporate governance quality to proxy for. Hence, we conclude:

Prediction 1 *Banks with better corporate governance are more likely to lobby.*

Furthermore, it is only offenders who benefit from lobbying in the theoretical model. In reality, there may also be other motivations for banks to lobby, but, based on our theory, we would at least expect that, ceteris paribus, parents of banks that have violated

the regulation benefit more from using lobbying to convince the regulator of the violating bank's quality.

Prediction 2 *Bank Holding Companies are more likely to lobby if their subsidiaries have poor CAMELS ratings.*

Offenders will only have an incentive to lobby if they are less likely to be punished than in the case where they do not lobby. Therefore, under the optimal enforcement strategy characterized in Section 3.2, $p^L(g) < p^N$ for all types g that lobby in equilibrium. On the other hand, the enforcement agent has not committed herself to letting types $g \notin G^L(p_L^N)$ off the hook if they lobby, so that she could use the fact that such a type lobbies as a hint that he has committed an offense and, therefore, investigate him. In our application, it is banks with high θ, which we proxy for using high corporate governance quality, that are induced to lobby in equilibrium. Hence, we predict:

Prediction 3 *Lobbying high-quality (low-quality) banks are less (more) likely to be punished than non-lobbying high-quality (low-quality) banks.*

Finally, note that in our application, a bank's benefit from violating the regulation is linked to its profit, which is independent of the private information θ if it complies with the regulation, and increasing in θ if it violates it. Furthermore, Prediction 1 argues that it is high-θ banks whose BHCs are more likely to lobby. Therefore, lobbying banks can be expected to be more successful for two reasons: a selection effect, because the decision to lobby is correlated with quality, and a punishment effect, because lobbying banks are more likely to be allowed to go ahead with their risky strategy, which they are good at because of their high type.

Prediction 4 *Lobbying high-quality banks perform better than non-lobbying high-quality banks.*

5.2 Sample, data and variable selection

We will now use a dataset of US banks and regulatory enforcement actions against them to test the aforementioned predictions. Recall that regulatory enforcement actions are imposed on banks and tailored around their specific characteristics, thus, will largely depend on their financial characteristics. However, these banks do not usually lobby by themselves. Instead, their parent Bank Holding Companies lobby on their behalf. As a consequence, we will need to work with two different samples to analyze our research question: (i) the *Bank Holding Company Sample* which consists of 173 large listed US

Bank Holding Companies, and (ii) the *Subsidiary sample*, which consists of 684 Commercial and Savings Banks and are subsidiaries of the Bank Holding Companies included in (i).

The data in both samples refer to the years from 2002 until 2017. The choice of the Bank Holding Companies included in our sample, as well as the time-frame, are mainly driven by the availability of the Corporate Governance indicator, which is one of the core variables of interest of our study. Data is collected from the following sources: (i) Financial characteristics and Enforcement Actions are obtained by S&P Market Intelligence (former SNL Financial), (ii) Lobbying information is hand collected by the Center of Responsive Politics website, and (iii) Corporate Governance information is retrieved by Datastream.

The sections below provide an overview of the construction of our working sample, as well as a detailed description of the variables included in our analysis. We also include tables with their descriptive statistics. A full list of the variables can be found in Table 1.

Insert Table 1 about here

Bank Holding Company sample When seeking to explain the lobbying decision of a Bank Holding Company, we will, in line with above predictions, focus on the quality of a Bank Holding Company's Corporate Governance, while controlling for financial and other characteristics.

All information in regard to lobbying activity is hand collected from the lobbying database and filing archives of the United States Senate and the 'Open Secrets' website of the Center for Responsive Politics (CRP). Information is available from 1998 to date. The Lobbying Disclosure Act of 1995 requires lobbyists to register and report information on their activities to the Senate Office of Public Records (SOPR). The SOPR keeps an archive of these files, which is available to the public. We thus, collect the compiled data on lobbying activities as provided by the CRP. This information includes various files which provide details on the lobbying reports that each Bank Holding Company files. Such reports are provided on firm level. In regard to financial institutions, the majority of reports are filed by a bank's parent company (i.e. the Bank Holding or Financial Holding Company). For the purpose of the present analysis, we obtain information on lobbying report files from 2002 to 2017. Once lobbying information is gathered and matched with each Bank Holding Company of our sample, we create a dummy variable, *Lobbying*, which takes '1' if a Bank Holding Company has filled a lobbying report in a given year, and '0' otherwise.

In order to capture the overall quality of a Bank Holding Company's Corporate Governance systems and processes, we make use of the 'Management Score' indicator provided by Datastream's Asset 4, which is defined to measure a company's commitment and effectiveness towards following best practice corporate governance principles. In essence, this indicator reflects a company's key areas of corporate governance such as board structure, compensation policy, board functions, shareholder rights and its vision and strategy. We make use of this indicator (*cgov_bhc*) in our analysis as a proxy for a Bank Holding Company's corporate governance quality. Higher values indicate better governance, and vice versa.

Finally, we control for several financial and demographic characteristics. Following empirical precedent (e.g. Gibson, Odabasioglu, and Padovani (2018)), we include a measure of capitalisation with the equity to assets ratio (*cap_bhc*) and performance with return on assets (*roa_bhc*). Furthermore, we take into consideration the Bank Holding Company's age (*age_bhc*) and number of depository subsidiaries (*depository_number*), in order to account for the magnitude and significance of the institution. For the test of Prediction 2, we control for the average profitability (*ROA (mean)*) and non-performing loans (*NPL (mean)*) of each Bank Holding Company's subsidiaries. More precisely, for the average value of performance (*ROA (mean)*), we create a variable that takes the mean return on assets ratio of the subsidiary banks of each Bank Holding company at year t; and for the average value of non-performing loans (*NPL (mean)*), we create a variable that takes the mean non-performing loans ratio of the subsidiary banks of each Bank Holding company at year t. Last but not least, we also control for the geographical distance of the Bank Holding Company's headquarter location to DC (*distance_bhc*) and for the extent of financial sector employment (*fin_employment*) recorded in the state where the Bank Holding Company operates.

Insert Table 2 about here

Table 2 reports the descriptive statistics of the aforementioned variables. The Governance Indicator (*cgov_bhc*) ranges from 0.12 to 99.65, where lower values indicate lower quality of governance and higher values indicate higher quality of governance. In our sample of Bank Holding Companies, the average score is equal to 48.37, which is lower than the average score among all lobbying banks (53.15). As for the remaining variables it is noteworthy that for the lobbying sample, the average age and number of subsidiary banks is higher. Moreover, the mean distance to DC for the lobbying banks appears to be lower.

Subsidiary level sample In order to identify whether a Commercial Bank or Saving Bank's parent engages in lobbying activities, we follow prior literature (Lambert (2019)) and insert lobbying information for each subsidiary from the Bank Holding Company level. Furthermore, we gathered information on regulatory enforcement actions issued against Commercial and Savings Banks for the time frame between 2002-2017. Data on enforcement actions issued by the three federal regulatory agencies, Federal Reserve Bank (FRB), Federal Deposit Insurance Corporation (FDIC) and the Office of Comptroller of the Currency (OCC), are retrieved from S&P Market Intelligence (prior SNL Financial). These enforcement actions refer to actions taken against Commercial or Savings banks, which are subsidiaries of the Bank Holding Companies in Sample (i). We focus exclusively on severe actions[17] and construct a dummy variable *severe* that takes the value of '1' if a bank received a severe type of regulatory enforcement action in a particular year, and the value of '0' otherwise.

As the CAMELS ratings, which form an integral part of the examination process, are confidential, we follow prior studies (e.g. Lambert (2019), Cole and White (2012)) and consider traditional proxies of each of the components. For this purpose, we take into account the risk-based capital ratio as a measure of capital adequacy *(cap)*, and the risk weighted assets as a measure of asset quality *(asset)*. Moreover, as a measure of earnings/ performance we make use of the Return on Assets ratio *(roa)*, and as a measure of liquidity the liquidity ratio *(liq)*. Finally, we also include the size *(size)* and age *(age)* of the bank. Table 3 reports the summary statistics of the enforcement actions, whereas Table 4 reports the summary statistics for the financial related variables.

Insert Tables 3 and 4 about here

5.3 Empirical Results

Examining BHCs' Lobbying Decision We start by trying to explain a BHC's decision to engage in lobbying activities. To this end, we use the BHC sample to estimate a Probit model with the dependent variable *'lobbying'*. In order to test Prediction 1, the main independent variable of interest is the quality of the BHC's corporate governance *'Governance'*, which serves as a proxy for the unobservable quality of the BHC and its

[17]These are, in order of severity, Deposit Insurance Termination, Cease and Desist orders, Formal Written and Prompt Corrective Action. The reason for this focus is that severe actions are more closely related to safety and soundness issues of banks. In contrast, less severe actions are usually issued against institutional affiliated parties and are, therefore, not related to deficiencies observed over the financial condition of an institution. Moreover, Delis, Staikouras, and Tsoumas (2016) show that less severe actions do not have an impact on a bank's financial condition. A detailed description of each type along with their classification can be found in Appendix D.

subsidiaries. Furthermore, we control for a number of the BHCs' characteristics including financial characteristics and company demographics, such as age or number of depository institutions held. In order to account for observable and unobservable characteristics across states, we include a set of state dummies. Moreover, in order to address variation across time, we also include a set of year dummies. Column (1) in Table 5 shows the result of the Probit regression with robust standard errors.

Insert Table 5 about here

In line with Prediction 1, BHCs with higher corporate governance quality are more likely to lobby, as indicated by a positive and significant coefficient of the *Governance* variable. With regards to the control variables, we find that companies that are older and have a greater number of depository institutions are more likely to lobby. Furthermore, we control for two additional variables that could be potential drivers of lobbying activity. First, the negative and significant coefficient of distance to Washington, DC confirms prior studies (Lambert (2019); Gibson, Odabasioglu, and Padovani (2018)) arguing that a shorter distance enables lobbyists to interact more easily with the aforementioned parties. Second, our results indicate that higher importance of the financial sector, as measured by employment therein is associated with higher lobbying activity (see Cunha (2017)).

In a next step, we seek to test more directly Prediction 2 that suggests that large Bank Holding Companies may lobby on behalf of their ailing subsidiaries in order to secure them more favourable supervisory treatment. In order to test how relevant the possibility of an enforcement action against its subsidiaries is for a BHC, we add the average ROA and non-performing loans ratio over the BHC's portfolio of subsidiaries to our control variables, as these variables play an important role in the supervisory process.

In line with Prediction 2, the coefficient for average non-performing loans is positive and that for average ROA negative (Column (2) of Table 5) and significant on the 1% and the 5% level, respectively. All coefficients of variables that were already included in Column (1) remain qualitatively the same.

Examining Lobbying Success We have just shown that a BHC's decision to lobby is significantly related to the financial variables in its portfolio of subsidiaries. Given our explanation of this relationship, that BHCs' lobbying may shield their subsidiaries from an enforcement action, a plausible next step of the analysis is to examine the impact of a BHC's lobbying activity on how likely its subsidiaries are to receive a regulatory enforcement action. Following Lambert (2019), we perform this analysis on the subsidiary level and make use of the subsidiary sample described in Section 5.2.

We estimate a Probit model with robust standard errors, with the dependent variable *'severe'*, a dummy indicating whether or not a subsidiary has received a regulatory enforcement action of the severe type. The *lobbying* dummy indicates whether or not a subsidiary's parent company (BHC) has engaged in lobbying in a particular year. We additionally control for the quality of the BHC's corporate governance as a proxy for the quality that the BHC communicates to the regulator in the lobbying process.[18] Furthermore, in order to capture the potential heterogeneity of the impact of lobbying on punishment across banks with different levels of governance quality as hypothesised in the theoretical model, we control for the interaction of these variables, the coefficient of which is of main interest. We also control for a set of variables that capture the CAMELS components, namely capitalisation *Capital*, asset quality *Asset*, *Earnings* and *Liquidity*. Moreover, we take a bank's *Size* and *Age* into consideration. Results are reported in Column (1) of Table 6.

Insert Table 6 about here

The *lobbying* dummy, which represents the conditional relationship between lobbying and punishment for subsidiaries of *low-governance* BHCs, is positive and statistically significant at the 1% level. Prediction 3 suggests a negative relationship between lobbying and punishment only for high-quality banks, and the negative coefficient of the interaction term of lobbying and governance is in line with this. Table 7, which depicts the predicted marginal effects of the lobbying parameter for different values of corporate governance quality, confirms that this marginal effect is indeed negative if governance quality is sufficiently high and, thus, supports Prediction 3.[19] The picture is even clearer in Figure 1, which plots the marginal effects.

Insert Table 7 and Figure 1 about here

It is apparent that, as the *Governance* score increases, the relationship between lobbying and enforcement action likelihood becomes inverse. In particular, this monotonic relationship between the *Governance* score and the extent to which lobbying banks are shielded from enforcement actions lends support to the main version of our theoretical

[18] Although the subsidiary has its own board and governance policies, prior studies (Adams and Mehran (2003)) have highlighted that there could be a potential influence of corporate governance in a parent company on its subsidiaries.

[19] Ai and Norton (2003) outline potential complications regarding the interpretation of interaction terms in non-linear models. Norton, Wang, and Ai (2004) however, provide several alternative solutions in order to address these complications. We use these suggestions to estimate the marginal effects for different values of the Governance measure.

model discussed in Section 3.2, where lobbying is typically welfare enhancing. By contrast, the model version in Section 4, where enforcement is delegated to a self interested agent, and where lobbying is potentially welfare reducing, predicts that it is intermediate types of offenders who lobby to avoid enforcement and is, therefore, not supported by the evidence.

In terms of the remaining control variables, most appear to be in line with prior literature. In particular, we find that banks with low levels of capital and profitability are more likely to be punished. These findings are to be expected, as these financial characteristics are known to be important components of the CAMELS ratings and, thus, to determine whether a bank is at risk of being penalized.[20]

An important concern at this point is that lobbying might be endogenous. For instance, the BHC's lobbying decision might be correlated with some unobservable variable that also drives the regulator's enforcement decision. Alternatively, BHCs might anticipate that their subsidiaries are at risk of being penalized and accordingly choose to lobby the regulator. In either case, the parameter estimates related to lobbying in Table 6 would be biased. Indeed, Prediction 2 and Table 5 have indicated that the financial situation of a subsidiary, which the regulatory enforcement decision is partly based on, is also an important determinant for its BHC's lobbying decision.

In order to address these concerns, we take into account the determinants of BHCs' lobbying decisions by simultaneously estimating the lobbying decision and the impact of lobbying on enforcement actions. As the decision of whether to lobby is made by the BHC, a strong instrument will most likely be a variable on the BHC level. As argued above, the most obvious candidates are the mean ROA and non-performing loans within their portfolio of subsidiaries, which satisfy the exclusion restriction as a specific bank's probability of being penalized is unlikely to be related to the average financial characteristics of all the subsidiaries in its BHC's portfolio. Based on our results from Table 5, we also add the Bank Holding Company's geographical distance to Washington, DC and the economic importance of the financial sector in the BHC's home state. We include all of the BHC-level variables into the subsidiary-level analysis by assigning their value to each subsidiary of this BHC. As both of these dependent variables are binary, we employ a recursive Bivariate Probit model.

The second-stage results of this estimation is reported in Column (6) of Table 6.[21]

[20]We performed a host of robustness checks, in which we excluded certain types of banks or regulators, almost all of which resulted in the interaction term of governance and lobbying to be significantly negative. In order to strengthen the identification of our model we also estimate the baseline model with a linear probability model with bank fixed effects. Results are available upon request.

[21]To conserve space we report the second stage results of the Bivariate Probit estimations. The first stage results incur instrument coefficients which are in line with expectations. In particular, we find that

In order to obtain diagnostics regarding the validity of the instruments and the overall identification of the equations, we independently re-estimate the model in the first stage in order to obtain the values of the LR- chi-square statistic. The p-value obtained is below 0.001, which confirms the significance of the model.[22] With regards to the results, the sign and significance of the coefficients of the lobbying and governance variables and their interaction in the enforcement equation are consistent with the baseline Probit estimation in Column (1) of Table 6. Finally, in unreported results available upon request, we use a linear probability model for the first (i.e., the lobbying) stage as a robustness check and use IV-probit to estimate this. Results remain intact.

Lobbying and performance In the theoretical model, we had assumed that a higher type g is linked to higher expected performance of risky projects. As high-g banks choose these risky projects in equilibrium, they also perform better in equilibrium than low-g banks (Prediction 4). Therefore, we test how lobbying banks in our sample perform some time after the lobbying has occurred.[23] In particular, we seek to explain future bank performance in the short term (i.e. at t+1 years) and long term (i.e. at t+5) years. As a proxy for performance, we use the Return on Assets ratio (ROA) as our dependent variable and estimate a linear regression model with bank fixed effects. Our core variable of interest is the lobbying dummy and its interaction with governance quality, but we also control for bank-level characteristics, such as capitalisation, liquidity, non-performing loans, size and age.

Insert Table 8 about here

The results from this model are presented in Table 8. Our findings in Column (2) suggest that, after 5 years, lobbying banks perform better than non-lobbying ones if they have high governance quality, which is in line with Prediction 4. These results are robust to correcting for endogeneity treating the lobbying variable as endogenous as in the

financial sector employment and mean non-performing loans are positively associated with the likelihood to lobby, whereas distance to DC and mean ROA are negatively associated with it. The significance of the coefficients is at the 1% for all instruments, apart from mean ROA, which is significant at the 10% level.

[22]Recall that the significant coefficients of the instruments in our estimations in Table 5 may serve as further evidence for their relevance.

[23]Prior studies have found mixed evidence on the impact of political connections on firm performance: For example, Gropper, Jahera Jr, and Park (2013, 2015) find that banks connected to politicians through important Finance Committees perform better, whereas, focusing on the lobbying context, Lambert (2019) finds that in the short to medium run, lobbying banks perform worse in comparison to non-lobbying banks.

previous section (Table 8, Columns 3 and 4).[24] Given that the analysis in this section aims to explore the moderating effect of governance between lobbying and bank performance, one may question the extent to which governance becomes endogenous. We address this issue in the following ways: First, the specification of the model per se is such that we make use of bank fixed effects in order to control for invariant bank-level heterogeneity, as well as eliminate omitted variable bias Adams and Mehran (2012). Second, the control variables are inserted in one (or more) year lags in order to address potential issues related to reverse causality, following prior empirical studies (Anginer, Demirguc-Kunt, Huizinga, and Ma (2016), Gaganis, Lozano-Vivas, Papadimitri, and Pasiouras (2020))[25].

For subsidiaries of low-governance BHCs, the opposite relationship holds. Another interesting result of Table 8 is that punished banks perform slightly worse (better) in the short (long) run. This suggests that the reputation effect of a regulatory enforcement action might be rather short-lived, whereas in the long run, the benefits of disciplining banks to comply with the regulation seem to dominate.

6 Conclusion

In this paper, we have argued that the communication of otherwise private information to an enforcement agent can serve as an explanation for lobbying in the context of enforcement. In order to show this, we extended a standard model of crime and enforcement, in which potential offenders are heterogenous with regards to their private gain from an offense ('types'), to include the possibility of offenders using lobbying to communicate their type to the enforcement agent. From the enforcement agent's perspective, lobbying may be beneficial as it allows her to let types of offenders that are least worthwhile to investigate off the hook in order to focus her costly investigation effort on types that are more important to deter because their offense would be socially more harmful. As the enforcement agent can discourage certain types selectively from lobbying, we derive the straightforward result that the availability of lobbying is always welfare enhancing whenever it is used in equilibrium, provided the enforcement agent's objective is to maximise welfare. However, in an extension of the model we have shown that this is no longer

[24]We estimate the baseline model by applying a 2-stage Instrumental Variable analysis. The instruments used for this exercise are the same to those used in the previous section. The diagnostics for over-identification (Hansen J) pass the recommended thresholds.

[25]In unreported results, we also implement a GMM approach, where the lagged dependent variable, the lower (i.e. governance score and lobbying) and upper multiplicative terms (i.e. governance score x lobbying) are set as endogenous variables. These are instrumented with different combinations of their lags in a collapsed form (see Roodman (2009)) or using factors of the instruments (see Kapetanios and Marcellino (2010)). Results remain intact.

true if enforcement is delegated to a self interested agent: If the enforcement agent's compensation can only depend on the number of detected offenses, she will inefficiently induce those types to lobby who would have been deterred absent lobbying.

We used both versions of the model to derive results on the distribution of offending, lobbying and enforcement over types of offenders, in the special case where those types of offenders with the highest private gains from the offense impose the least harm on society. In the main version of the model with a welfare maximising enforcement agent, the highest types of offenders lobby and escape enforcement, whereas intermediate types offend without lobbying and face some enforcement risk. By contrast, with delegated enforcement, it is intermediate types, who would otherwise be deterred, who offend, lobby and escape enforcement, whereas the highest types commit an offense without being given the option to avoid enforcement by lobbying.

Then, we demonstrated that these predictions can be used to rationalise some features of lobbying found by previous literature (Lambert (2019)) in the context of enforcement of bank regulation, such as the finding that lobbying banks are less likely to be penalised. Extending Lambert's (2019) empirical analysis, we showed furthermore that these features are heterogenous among banks with different quality of corporate governance. Specifically, the negative relationship between lobbying and enforcement found by Lambert (2019) is only confirmed for banks with high corporate governance score, whereas this relationship is reversed if that score is low. When interpreting corporate governance quality as a proxy for banks 'type' in the sense of our theoretical model, these results are in line with the predictions from the main version of our model, in which the enforcement agent's objective is to maximise welfare.

It is important to emphasise that neither our theoretical model nor the empirical exercise have been designed to disprove any other potential motivation for lobbying such as the one based on exchanges of favours that we have mentioned in the Introduction. As a result, we do not claim our explanation to be any more important or plausible than others. In fact, we believe that it is far more plausible that both motivations play some role in lobbying in the enforcement context. What this paper has contributed to this discussion is to show that there is some scope for socially beneficial aspects of lobbying even in this context, and to point out the limitations of these beneficial aspects.

We sought to formulate our theoretical model in a most general way, which comes at the cost of yielding less specific results, but our application to the enforcement of bank regulation illustrates that it can easily be augmented with more specific assumptions that are tailored to a particular institutional setting. Despite this generality, we still had to make some assumptions to fix ideas or to keep the model tractable. First, our assumption that enforcement agents can perfectly commit to an enforcement strategy beforehand

may not be an exact representation of reality in all situations. One might conjecture that without commitment, punishing a lobbying individual, whose lobbying has already let on that they have committed an offense, is just too tempting for the enforcement agent, such that lobbying will vanish from the equilibrium. However, this is only true for the case of delegated enforcement. If the enforcement agent's objective is to maximise welfare, she only induces those types to lobby for whom the investigation costs are above the benefit from enforcement, even with full commitment. Therefore, a welfare maximising enforcement agent is not tempted to break the promise of sparing offenders who lobby in equilibrium.[26] This conclusion might change, though, if there is a general public that inefficiently exerts pressure on enforcement agents to uniformly investigate offenses with the same intensity. In such a case, commitment to a low investigation probability for lobbying, less harmful types of offenders may only be possible if the enforcement agent is shielded from that political pressure. Such an argument would then add to existing concerns that more transparency in informational lobbying is not always beneficial (e.g. Minaudier (2020)).

A second potentially debatable assumption is that the only optimisation variable for the enforcement agent in our model is the investigation strategy. In reality, legislators often choose the severity and nature of punishment for certain crimes so as to optimise deterrence. If, like in our model, deterrence is monotonically increasing in the severity of the punishment for any given enforcement probability, previous literature such as Polinsky and Shavell (1979) has argued that it is optimal to set punishment at its maximum possible level in order to save on costly investigation effort. This maximum possible severity of punishment is exogenously given by legal restrictions (such as that the punishment must fit the crime) or economic ones: Wealth constraints restrict the use of fines, and non-monetary punishment cannot exceed the death penalty, the deterrent effect of which is debated in the literature but certainly less than perfect.[27] In this sense, T may be interpreted as the exogenously given maximum severity of the punishment, and α as being implied by the exogenously given nature of punishment for this particular offense.

Our results shed a new light on lobbying in the context of enforcement as we demonstrate how lobbying can enhance welfare by allowing an enforcement agent to focus on potentially more harmful cases. In particular, our evidence from bank regulation is in line with a version of our model in which lobbying can only be welfare enhancing. In this

[26]The impact of removing commitment in this case would be that enforcement agents would no longer take offenders' lobbying costs into account when designing the investigation strategy, which would actually mean that there would be excessive lobbying in equilibrium.

[27]For instance, even the use of capital punishment requires, at the same time, a sufficiently high enforcement probability to achieve deterrence (e.g. Mocan and Gittings (2003)).

sense, this paper supports a less sceptical view on lobbying and recognizing the virtues of lobbying in making enforcement more efficient. On the other hand, our extended model with delegated enforcement has illustrated potential sources for inefficient lobbying, so that it remains as a task for future research to identify those areas of enforcement where lobbying is welfare enhancing or reducing. Any attempt of explaining why our empirical evidence is more on line with the model version where lobbying is efficient is beyond the scope of this analysis, but it seems plausible given the fact that, in the example of bank regulation, it is the regulator herself who is in charge of enforcement.

Table 1: Variable description

Variable	Variable code	*Description*	*Source*
Panel A. Bank Holding Company related variables			
Lobbying	*lobbying*	Dummy that takes "1" if BHC files a lobbying report in year t, "0" otherwise	Centre of Responsive Politics
Governance	*cgov_bhc*	Index measuring a company's commitment and effectiveness towards following best practice corporate governance policies Higher values indicate higher quality and vice versa.	Datastream
Performance	*roa_bhc*	Income (loss) before applicable income taxes and discontinued operations divided by total assets	SNL
Capitalisation	*cap_bhc*	Total qualifying capital divided by risk-weighted assets net of allowances and other reductions	SNL
Number of depository institutions	*depository_number*	Sum of depository institutions owned by BHC	SNL
Age	*age_bhc*	Natural logarithm of number of years that the bank's parent company is operating	SNL
Distance to DC	*distance_bhc*	Flying distance (in km) from BHC's headquarter location to DC	SNL
Fin. sector employment	*fin_employment*	Natural logarithm of the total number of individuals employed in the financial services and insurance industry at the state level	U.S. Census Bureau
Mean Performance (Subsidiary)	*ROA(mean)*	Average value of ROA,of BHC's subsidiary in year t	SNL
Mean Non-perf. Loans (Subsidiary)	*NPL (mean)*	Average value of Non performing loans of BHC's subsidiary in year t	SNL
Panel B. Subsidiary related variables			
Severe Enf. action	*severe*	Dummy that takes "1" if bank received a severe-type regulatory enforcement action in year t, "0" otherwise	SNL
Capitalisation	*cap*	Total qualifying capital divided by risk-weighted assets net of allowances and other reductions	SNL
Asset Quality	*asset*	Risk-weighted assets net of allowances and other reductions divided by total assets	SNL
Performance	*roa*	Income (loss) before applicable income taxes and discontinued operations divided by total assets	SNL
Liquidity	*liq*	Cash and cash balances plus US treasury securities divided by total assets	SNL
Non performing loans	*npl*	Non-accrual and restructured loans as a percent of total loans and leases	SNL
Size	*size*	Natural logarithm of total assets	SNL
Age	*age*	Natural logarithm of number of years that the bank's parent company is operating	SNL

Table 2: Summary statistics for Bank Holding Company characteristics

Panel A. Full sample					
Variable	Obs	Mean	Std. Dev.	Min	Max
Governance	715	48.37365	28.38413	0.12	99.65
Capitalisation	689	11.97855	2.596312	6.79	33.6
Performance	695	0.0088751	0.0067993	-0.0600171	0.0364328
Number of depository institutions	715	1.551049	1.464274	0	16
Age	710	105.2662	55.8259	1	218
Fin. Sector employment	703	15.08818	0.860954	12.72089	16.4873
Distance to DC	715	7.005628	1.1123	2.547414	9.092468
ROA (mean)	715	1.490437	2.823402	-7.043333	24.10333
NPL (mean)	715	1.846481	2.208688	0	14.91
Panel B. Lobbying sample					
Governance	218	53.15284	28.29258	1.05	99.65
Capitalisation	216	11.4331	2.36886	6.79	19.15
Performance	216	0.0081356	0.0093224	-0.0600171	0.025473
Number of depository institutions	218	1.949541	1.453496	1	6
Age	218	133.2936	48.85194	14	218
Fin. Sector employment	209	15.29248	0.6620064	12.91844	16.4873
Distance to DC	218	6.939166	1.130203	5.725819	9.092468
ROA (mean)	218	1.114252	1.530599	-5.325	8.21125
NPL (mean)	218	2.813809	2.998015	0.1293333	14.91

Table 2 reports the descriptive statistics of the variables included in the first section of our analysis, which focuses on the lobbying decision of Bank Holding Companies. For a detailed definition of variables see Table 1. The sample period is 2002-2017. Panel A provides the descriptive statistics of the full sample. Panel B, provides the descriptive statistics for Bank Holding Companies engaged in lobbying activities.

Table 3: Summary statistics Enforcement Actions

Year	All Actions	FDIC	FED	OCC
2002	2	0	1	1
2003	4	1	2	1
2004	2	1	1	0
2005	3	0	0	3
2006	1	0	0	1
2007	0	0	0	0
2008	8	3	2	3
2009	14	8	4	2
2010	16	10	3	3
2011	12	3	1	8
2012	9	5	0	4
2013	6	2	1	3
2014	12	3	1	8
2015	8	2	1	5
2016	6	4	1	1
2017	2	0	1	1
Total	105	42	19	44

Table 4: Summary statistics for Subsidiary banks

Panel A. Full sample					
Variable	Obs	Mean	Std. Dev.	Min	Max
Capitalisation	2874	40.08364	97.0501	-1.49	570.92
Asset quality	2839	74.06471	20.28402	9.64	250.05
Performance	2858	1.398523	4.104111	-28.2	69.7
Liquidity	2736	26.06557	53.32765	0	497.64
Non-performing loans	2682	1.898576	3.49462	0	39.72
Size	2876	14.29704	2.402639	7.600903	21.48444
Age	2875	66.50157	54.47093	0	217
Panel B. Punished sample					
Capitalisation	105	12.41914	7.674172	-1.49	43.53
Asset quality	104	76.19663	11.8039	35.68	111.22
Performance	104	-0.7854808	2.88302	-11.68	4.54
Liquidity	105	19.17676	14.77127	1.42	79.23
Non-performing loans	105	7.554952	7.499041	0	27.95
Size	105	15.49523	3.022346	10.12607	21.45322
Age	105	75.59048	64.73447	2	20

Table 4 reports the descriptive statistics of the variables included in the second section of our analysis, which examines the probability of a Commercial and Savings banks being punished. These entities are all subsidiaries of the Bank Holding Companies included in the sample of our first section analysis. For a detailed definition of variables see Table 1. The sample period is 2002-2017. Panel A provides the descriptive statistics of the full sample. Panel B, provides the descriptive statistics for banks that receied a regulatory enforcement action.

Table 5: Probability to lobby (Bank Holding Company level)

	(1)	(2)
VARIABLES	dep. var.: Lobbying	dep. var.: Lobbying
Governance	0.0132***	0.0164***
	(0.00307)	(0.00337)
Capitalisation	-0.0491	-0.0973*
	(0.0547)	(0.0591)
Performance	-10.44	-7.487
	(10.07)	(10.56)
Number of dep. Inst	0.225***	0.235***
	(0.0804)	(0.0811)
Age	0.00517*	0.00734***
	(0.00288)	(0.00266)
Fin. Sector employment	9.011**	9.662**
	(3.71)	(3.849)
Distance to DC	-0.244**	-0.285***
	(0.099)	(0.102)
ROA (mean)		-0.114***
		(0.0328)
NPL (mean)		0.0963**
		(0.0486)
Constant	-125.1**	-133.8**
	(52.37)	(54.27)
Observations	437	437
State Dummies	YES	YES
Time dummies	YES	YES
R-sq	0.358	0.379

Table 5 reports the baseline results of a Probit model with robust standard errors. Sample period is 2002-2017. The dependent variable in both (1) and (2) is the lobbying indicator variable. For detailed variable description see Table 1. The ***, ** and * signs denote statistical significance at the 1,5 and 10% level.

Table 6: Probability to receive a regulatory enforcement action (Subsidiary level)

	Baseline model	Excl. high cap.	Excl. low cap.	Excl. large banks	Excl. small banks	Endogeneity
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	dep. var: severe	dep. var: severe	dep. var: severe	dep. var: severe	dep. var: severe	dep. var: severe
Lobbying	0.681***	0.681***	0.335	0.746***	0.671***	1.664 ***
	(0.242)	(0.244)	(0.287)	(0.260)	(0.246)	(0.3187)
Governance	0.00658**	0.00630**	0.00432	0.00646**	0.00596**	0.007 **
	(0.00286)	(0.00283)	(0.00321)	(0.00287)	(0.00285)	(0.0026)
Lobbying x Governance	-0.0119***	-0.0118***	-0.00884**	-0.0146***	-0.0115***	-0.0116***
	(0.00380)	(0.00381)	(0.00422)	(0.00441)	(0.00381)	(0.0035)
Capitalisation	-0.0424***	-0.0436***	-0.00932	-0.0355**	-0.0354**	-0.0030726
	(0.0140)	(0.0145)	(0.00887)	(0.0152)	(0.0156)	(0.0041528)
Asset Quality	-0.00415	-0.00400	-0.00181	-0.00398	-0.00333	-0.0405844 ***
	(0.00494)	(0.00481)	(0.00361)	(0.00512)	(0.00462)	(0.0130015)
Performance	-0.165***	-0.166***	-0.0786**	-0.156***	-0.186***	0.000862
	(0.0277)	(0.0281)	(0.0311)	(0.0296)	(0.0341)	(0.0048382)
Liquidity	0.00117	0.00121	-0.00108	-0.00538	-0.000211	-0.1478458 ***
	(0.00538)	(0.00545)	(0.00444)	(0.00674)	(0.00546)	(0.0271895)
Size	0.0230	0.00954	0.0408	-0.0574	0.0153	-0.0459045
	(0.0350)	(0.0378)	(0.0403)	(0.0446)	(0.0383)	(0.0367345)
Age	9.21e-05	-4.62e-06	0.000946	-0.000581	7.43e-05	0.0006127
	(0.00151)	(0.00147)	(0.00153)	(0.00155)	(0.00148)	(0.0013727)
GDP(state)	-0.0675	-0.0683	0.0586	-0.192	-0.0368	0.1002968
	(0.298)	(0.302)	(0.322)	(0.285)	(0.307)	-0.292409
Constant	-1.713**	-1.615**	-2.743***	-0.341	-1.772**	1.779347
	(0.805)	(0.819)	(0.897)	(0.890)	(0.820)	(43.79482)
Method of estimation	Probit	Probit	Probit	Probit	Probit	Biprobit
Observations	2,279	2,201	1,916	2,148	2,215	2655
Regulator Dummies	YES	YES	YES	YES	YES	YES
State Dummies	YES	YES	YES	YES	YES	YES
Time dummies	YES	YES	YES	YES	YES	YES
R-sq	0.261	0.256	0.201	0.269	0.261	
LR-stat						1411.67

Table 6 reports the baseline results of a Probit model with robust standard errors (Columns 1-5) and the results obtained by estimating the baseline model using a Bivariate Probit model to address endogeneity (Column 6). Sample period is 2002-2017. The dependent variable across models is the severe enforcement action indicator variable. Column (1) reports the baseline results , whereas Columns (2) - (5) report the results of additional robustness tests performed. Column (6) reports the second stage results of the BiProbit model. The instruments used in the model are 'Financial Sector employment', 'Distance to DC', mean ROA and Non-performing loans of the subsidiaries of each Bank Holding Company. For detailed variable description see Table 1. The ***, ** and * signs denote statistical significance at the 1,5 and 10% level.

Table 7: Average marginal effects for Baseline model in Table 6

Percentile	Governance values	Average Marginal effects
1	0.12	0.0495546**
		(0.0195924)
5	4.13	0.0460462**
		(0.0183349)
10	7.24	0.0433367 **
		(0.017428)
25	23.39	0.029386 **
		(0.0137015)
50	50	0.0065305
		(0.0112972)
75	79.93	-0.0197278
		(0.0139971)
90	92.21	-0.0308887 *
		(0.0166313)
95	95.32	-0.0337641 **
		(0.0174379)
99	98	-0.0362595 **
		0.0181786)

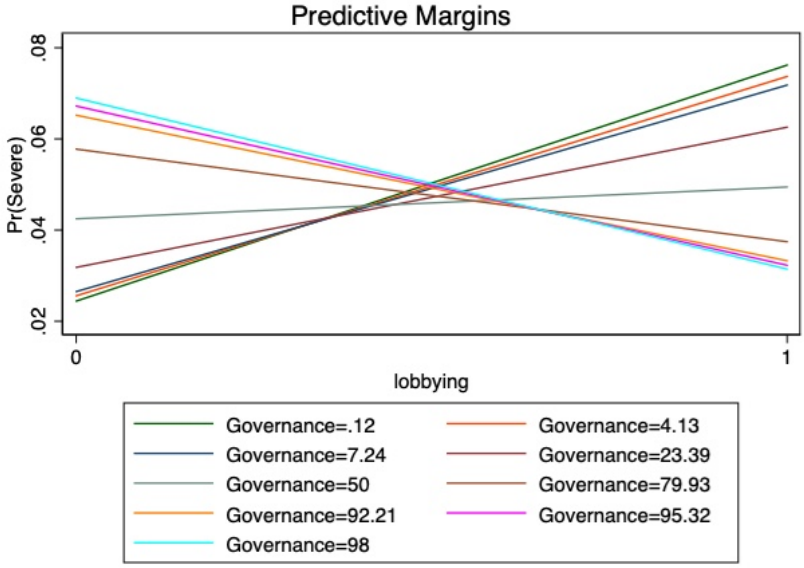
Table 7 reports the average marginal effects of the Baseline model in Table 6, Column (1) obtained by the Delta-method. The marginal effects refer to nine values of the Governance index in the range of 1-98 as observed in the sample. The marginal effects are reported in Column (3). Standard errors are in parentheses. The output post-estimation is based on Stata's 'margins' command (see Williams et al.,2012). The ***, ** and * signs denote statistical significance at the 1,5 and 10% level.

Table 8: Lobbying and performance

	(1)	(2)	(3)	(4)
VARIABLES	Dep. var: ROA t+1	Dep. var: ROA t+5	Dep. var: ROA t+1	Dep. var: ROA t+5
Lobbying	0.203	-0.902**	0.155	-0.7105 *
	(0.200)	(0.413)	(0.194)	(0.399)
Governance	0.00223	-0.0159***	0.003	-0.0144 **
	(0.00262)	(0.00580)	(0.002)	(0.0068)
Lobbying x Governance	0.00181	0.0199***	0.003	0.0203 **
	(0.00346)	(0.00644)	(0.003)	(0.007)
Severe	-0.301*	0.335*	-0.346 *	0.314
	(0.161)	(0.193)	(0.191)	-0.214
Constant	8.813***	14.13***	9.079 **	-25.479 **
	(1.361)	(2.721)	(3.675)	-11.036
Method of estimation	OLS	OLS	IV	IV
Observations	2,002	734	1976	722
R-squared	0.182	0.241	0.58	0.66
Bank controls	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES
Time dummies	YES	YES	YES	YES
State dummies	YES	YES	YES	YES

Table 8 reports the results of a linear model examining the impact of lobbying on bank performance estimated with OLS (Columns 1 and 2) and IV (Columns 3 and 4). Sample period is 2002-2017. The dependent variable in all cases is the return on assets ratio. In Columns 1,3 the dependent variable is the return on assets ratio for year t+1. In Columns 2,4 the dependent variable is the return on assets ratio for year t+5. Columns 3 and 4 report the second stage results of an IV analysis, estimated to address endogeneity concerns in regard to the model estimated in columns 1 and 2. For detailed variable description see Table 1. The ***, ** and * signs denote statistical significance at the 1,5 and 10% level.

Figure 1: Margins plot - Average margins showcasing the moderating effect of Lobbying on the probability of enforcement for different values of the Governance index



Appendix

A Proof of Proposition 1

Note first that $w^L(g;0)$ and, except for $g = \widetilde{g}(p^N)$, $w^N(g;p^N)$ are continuous. Hence, we can find some type $g_k^+(p^N)$ such that $w^N(g_k^+(p^N);p^N) = w^L(g_k^+(p^N);0)$ whenever $w^L(g;0) - w^N(g;p^N)$ switches sign from negative to positive, and some type $g_k^-(p^N)$ such that $w^N(g_k^-(p^N);p^N) = w^L(g_k^-(p^N);0)$ whenever $w^L(g;0) - w^N(g;p^N)$ switches sign from positive to negative. Furthermore, $\frac{dg_k^+(p^N)}{dp^N} < 0$ and $\frac{dg_k^-(p^N)}{dp^N} > 0$.

Next, define $g_i^o(p^N) := \frac{1}{\rho}\left(\frac{L}{p^N} - T\right)$ the type of potential offender who is indifferent between (i) lobbying after committing an offense and (ii) offending without lobbying.[28] The corresponding type who is indifferent between (i) lobbying after committing an offense (payoff $g - L$) and (ii) not offending at all (payoff zero) is just $g = L$. Therefore, the derivative of the integral terms on the right-hand side of the second line of (15) exists and is equal to

$$
\begin{aligned}
&\frac{d[W_L(p^N) - W_{NL}(p^N)]}{dp^N} = \\
&C'(p^N)\int_{G^L(p^N)\cap[\underline{g},\widetilde{g}(p^N)]} f(g)dg + \int_{G^L(p^N)\cap[\widetilde{g}(p^N),\overline{g}]} \left(\rho v(g) + \alpha T + C'(p^N)\right) f(g)dg \\
&- \mathbb{1}_{g_i^c(p^N)\in G_e^L(p^N)\cap[\underline{g},\widetilde{g}(p^N)]} \left[p^N(\rho v(g_i^c(p^N)) + \alpha T) + C(p^N) - L\right] f(g_i^c(p^N))\frac{dg_i^c(p^N)}{dp^N} \\
&- \sum_{k:g_k^+(p^N)\in[L,\widetilde{g}(p^N)]} \left[v(g_k^+(p^N)) + C(p^N) - L\right] f(g_k^+(p^N))\frac{dg_k^+(p^N)}{dp^N} \\
&+ \sum_{k:g_k^-(p^N)\in[L,\widetilde{g}(p^N)]} \left[v(g_k^-(p^N)) + C(p^N) - L\right] f(g_k^-(p^N))\frac{dg_k^-(p^N)}{dp^N} \qquad (25) \\
&- \sum_{k:g_k^+(p^N)\geq\max\{g_i^c(p^N),\widetilde{g}(p^N)\}} \left[p^N(\rho v(g_k^+(p^N)) + \alpha T) + C(p^N) - L\right] f(g_k^+(p^N))\frac{dg_k^+(p^N)}{dp^N} \\
&+ \sum_{k:g_k^-(p^N)\geq\max\{g_i^c(p^N),\widetilde{g}(p^N)\}} \left[p^N(\rho v(g_k^-(p^N)) + \alpha T) + C(p^N) - L\right] f(g_k^-(p^N))\frac{dg_k^-(p^N)}{dp^N} \\
&+ \mathbb{1}_{p^N\geq\widetilde{p}^N} \left[\max\{v(\widetilde{g}(p^N)) + C(p^N) - L, 0\}\right. \\
&\qquad \left. - \max\{p^N(\rho v(\widetilde{g}(p^N)) + \alpha T) + C(p^N) - L, 0\}\right] f(\widetilde{g}(p^N))\frac{d\widetilde{g}(p^N)}{dp^N}
\end{aligned}
$$

The second line of (25) is positive as all types g over which the integral runs are in $G^L(p^N)$, and as convexity of $C(p^N)$ implies $C'(p^N) \geq \frac{C(p^N)}{p^N}$. The third line is positive as

[28] Recalling that type $g = L$ is indifferent between (i) lobbying after committing an offense and (ii) abiding by the law, this definition means that $g_i^L(p^N) = \max\{g_i^o(p^N), L\}$.

$g_i^c(p^N) \in G_e^L(p^N)$ whenever this line is non-zero. The remaining lines except the last one are all zero by definition of the g_k^+ and g_k^-.

The last line is zero whenever $p^N < \widetilde{p}^N$, i.e., the type $\widetilde{g}(p^N)$ offender strictly prefers either not offending or offending without lobbying over offending with lobbying. If $p^N \geq \widetilde{p}^N$, it is non-negative whenever condition (16) is satisfied, as in this case the term in the second maximum operator is zero. However, if condition (16) is violated, it is easy to see that the last line of (25) may be negative and, thus, create a countervailing effect.

We have thus established that, under condition (16), $W_L(p^N) - W_{NL}(p^N)$ is increasing in p^N over the interval $[0, p_{NL}^N]$. Using theorem 4 in Milgrom and Shannon (1994), $W_L(p^N) - W_{NL}(p^N)$ being increasing on some interval $P := [p_1, p_2]$ implies that $M_L(P) := \arg\max\{W_L^N(p^N) \mid p^N \in P\}$ is 'higher' than $M_{NL}(P) := \arg\max\{W_{NL}^N(p^N) \mid p^N \in P\}$ in the following sense: If we take any pair consisting of some $m_L \in M_L(P)$ and $m_{NL} \in M_{NL}(P)$, then either $m_L \geq m_{NL}$ or both elements are included in both sets. By definition, $p_{NL}^N = \max M_{NL}([0,1])$. Hence, the result that we have proven so far, that $M_L([0, p_{NL}^N])$ is higher than $M_{NL}([0, p_{NL}^N])$, implies that $M_L([0,1])$ is higher than $M_{NL}([0,1])$, which is what the Proposition claims. ■

B Proof of Proposition 2

Recall first that the potential offender prefers lobbying over both offending without lobbying and abiding by the law if and only if $g \geq g_i^L(p^N)$ given by (13). Furthermore, due to the assumption that $v(g)$ is non-decreasing, there are $g_e^a(p^N)$ and $g_e^o(p^N)$ such that society prefers a type-g offender to lobby over abiding by the law if and only if $g \geq g_e^a(p^N)$ and to lobby over offending without lobbying if and only if $g \geq g_e^o(p^N)$, where these thresholds are given by

$$v(g_e^a(p^N)) = L - C(p^N) \tag{26}$$

$$v(g_e^o(p^N)) = \frac{\frac{L - C(p^N)}{p^N} - \alpha T}{\rho} \tag{27}$$

Specifically, both society and the potential offender himself prefer him to commit an offense and lobby over abiding by the law if and only if $g \geq \max\{L, g_e^a(p^N)\}$. Therefore, Proposition 2 is equivalent to $\max\{L, g_e^a(p^N)\} \geq \widetilde{g}(p^N)$, which we will prove by contradiction.

Suppose that $\max\{L, g_e^a(p^N)\} < \widetilde{g}(p^N)$. Then,

$$G^L(p^N) = \begin{cases} \left[\max\{L, g_e^a(p^N)\}, \overline{g}\right], & \text{if } g_e^o(p^N) \leq \widetilde{g}(p^N); \\ \left[\max\{L, g_e^a(p^N)\}, \widetilde{g}(p^N)\right] \cup \left[g_e^o(p^N), \overline{g}\right], & \text{otherwise.} \end{cases} \tag{28}$$

In the first case of (28), the derivative of the welfare function (15) is

$$\frac{dW_L(p^N)}{dp^N} = -C'(p^N)\int_0^{g^L(p^N)} f(g)dg - [v(g^L(p^N)) - L + C(p^N)]f(g^L(p^N))\frac{dg^L(p^N)}{dp^N} \quad (29)$$

where $g^L(p^N) = \max\{L, g_e^a(p^N)\}$. If $g^L(p^N) = L$, it is constant in p^N and, therefore, the second summand on the right-hand side of (29) is zero. On the other hand, if $g^L(p^N) = g_e^a(p^N)$, then, by definition, $v(g^L(p^N)) - L - C(p^N) = 0$, so that the second summand is again zero. Hence, $\frac{dW_L(p^N)}{dp^N} < 0$ in this range.

In the second case of (28), the derivative of the welfare function is

$$\begin{aligned}\frac{dW_L(p^N)}{dp^N} = &-C'(p^N)\int_0^{g^L(p^N)} f(g)dg - [v(g^L(p^N)) - L + C(p^N)]f(g^L(p^N))\frac{dg^L(p^N)}{dp^N} \\ &- \int_{\widetilde{g}(p^N)}^{g_e^o(p^N)} [\rho v(g) + \alpha T + C'(p^N)]f(g)dg \\ &+ [p^N(\rho v(\widetilde{g}(p^N)) + \alpha T) + C(p^N) - L]f(\widetilde{g}(p^N))\frac{d\widetilde{g}(p^N)}{dp^N} \\ &- [p^N(\rho v(g_e^o(p^N)) + \alpha T) + C(p^N) - L]f(g_e^o(p^N))\frac{dg_e^o(p^N)}{dp^N}.\end{aligned} \quad (30)$$

The fact that $\rho v(g) + \alpha T + C'(p^N) > \rho L + \alpha T + C'(p^N) - \rho C(p^N) > \rho L + \alpha T + p^N C'(p^N) - C(p^N) > 0$ for all $g \geq g_e^a(p^N)$ implies that the summand in the second line of (30) is negative. As, by definition of this case, $g_e^o(p^N) > \widetilde{g}(p^N)$, $p^N[\rho v(\widetilde{g}(p^N)) + \alpha T] + C(p^N) - L < 0$, so that the summand in the third line is negative. Furthermore, $p^N[\rho v(g_e^o(p^N)) + \alpha T] + C(p^N) - L = 0$ by definition of $g_e^o(p^N)$, so that the summand in the last line is zero. As the first line is identical to the right-hand side of (29), which we have already shown to be negative, $\frac{dW_L(p^N)}{dp^N}$ is again negative. As a consequence, a choice of p^N such that $\max\{L, g_e^a(p^N)\} < \widetilde{g}(p^N)$ can never be optimal. ■

C Proof of Proposition 3

Recall the definitions (26) and (27) of types of offenders $g_e^a(p^N)$ and $g_e^o(p^N)$ such that society is indifferent between them lobbying and not lobbying while abiding by the law or committing an offense, respectively. The difference is now that these threshold types are increasing in p^N as $v(g)$ is decreasing. Furthermore, we can express $G^L(p^N) = G_1^L(p^N) \cup G_2^L(p^N)$, where

$$G_1^L(p^N) = \begin{cases} \left[L, \min\{g_e^a(p^N), \widetilde{g}(p^N)\}\right], & \text{if } L < \min\{g_e^a(p^N), \widetilde{g}(p^N)\}; \\ \emptyset, & \text{otherwise.} \end{cases} \quad (31)$$

is the set of types who lobby in equilibrium and who would have abided by the law absent lobbying, and

$$G_2^L(p^N) = \begin{cases} \left[\max\{\widetilde{g}(p^N), g_i^o(p^N)\}, \min\{g_e^o(p^N), \overline{g}\}\right], & \text{if } \max\{\widetilde{g}(p^N), g_i^o(p^N)\} < \min\{g_e^o(p^N), \overline{g}\}; \\ \emptyset, & \text{otherwise.} \end{cases} \tag{32}$$

is the set of types who lobby and who would otherwise have committed the offense without lobbying.

Suppose now that p^N is so high that there is some $g^L < \widetilde{g}(p^N)$ such that $[g^L, \overline{g}] \subset G^L(p^N)$, which requires that $p^N > \widetilde{p}^N$, $\widetilde{g}(p^N) < g_e^a(p^N)$ and $\overline{g} \leq g_e^o(p^N)$. Under these assumptions, $G^L(p^N) = [g_i^a(p^N), \overline{g}]$. Then, the first derivative of welfare at this p^N is

$$\frac{dW_L(p^N)}{dp^N} = -C'(p^N) \int_0^{g_i^a(p^N)} f(g)dg - [v(g_i^a(p^N)) - L + C(p^N)] f(g_i^a(p^N)) \frac{dg_i^a(p^N)}{dp^N}, \tag{33}$$

which is negative as $\frac{dg_i^a(p^N)}{dp^N} = 0$. Therefore, p^N cannot be optimal.

D Classification of Enforcement Actions

Enforcement actions classification

ENFORCEMENT ACTIONS ISSUED AGAINST BANKS	
A.1. SEVERE (ordered from most severe to less severe):	
Deposit Insurance Termination /Threat	Decision to threat to suspend or terminate a bank's deposit insurance scheme by the FDIC, when unsound and unsafe banking practices are detected or when violations of laws and regulations have taken place. Deposit Insurance Termination can be imposed if a bank has neglected previous enforcement actions issued against the bank.
Cease and Desist Order	Banks that receive Cease and Desist orders are required to follow specific actions outlined by their primary supervisor. C&D orders can be enforced by law, in the federal banking system. Typical reasons or the issuance of C&D orders are the engagement in unsafe and unsound activities, violations of laws and regulations. A C&D may impose specific orders to stop the bank engaging in specific banking practices or may outline a particular strategy in order to improve asset quality, promote growth, decrease risk, etc.
Formal written agreement	The institutions subject to this type of action, enter into an agreement with their primary regulator to take particular actions or to follow particular proscriptions in written agreement. Unlike the C&D orders, although FAs are also legally enforceable, they are however, not enforceable through the federal court. FAs can nonetheless lead to the issuance of Civil Money Penalties, when they are ignored. Reasons that FAs are imposed are unsound practises, mismanagement policies, or "insider" abuse. FAs can lead to more severe types of enforcement actions if not taken into consideration.
Prompt Corrective Action	Prompt Corrective Actions are issued usually when undercapitalization issues are detected. These actions order banks on taking remedial actions in order to overcome the deficiencies in their level of capital. Among the corrective measures outlined, in some cases there may be dismissal of management, restrictions on executive payments, asset growth, rates paid on deposits or even prohibition on certain activities, such as approval for acquisition deals from the regulatory authorities.
A.2. LESS SEVERE TYPE	
Civil Money Penalty (CMP)	Monetary penalties against banking institutions that engage in unsafe or unsound banking practices, violations of laws or failure to comply with an order issued previously.
Call report penalty (CR-P)	Monetary penalties against banking institutions that fail to file Call Reports on time or in accordance to the general outline or even for misreporting information on Call Report files.

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