# The Economics of Corporate Liability and Enforcement*

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**Abstract**

Enforcing corporate liability, governments seek to deter crime, promote corporate compliance, and secure fair competition in markets, while in practice, they face difficult trade-offs between these aims. This paper analyzes optimal enforcement for three different forms of corporate misconduct by combining approaches from the economic theory of crime and theories of industrial organization. The presented analysis shows why corporate crime is more harmful in large markets, why governments have a disinclination to sanction firms whose crime materializes abroad, and why leniency for those who self-report their crime is a complement, and not a substitute, to independent investigation and enforcement. Upon a review of 50 cases of corporate liability from five European countries, we find enforcement systems and practices are sub-optimal with respect to crime deterrence. Across the countries, enforcement in competition law cases is generally more efficient than enforcement in cases of foreign bribery and violation of anti-money laundering regulations. Europe would benefit from stronger supra-national cooperation in regulation and enforcement of transnational corporate crime.

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# 1 Introduction

Since the turn of the millennium, governments have sharpened regulations regarding corporate misconduct, including bribery, money laundering, and violations of competition law. A common declaration in official references to such regulations is that enforcement must be *effective, proportionate, and dissuasive*. Although this statement has broad acceptance, it is not clear what it means (Cafaggi and Iamiceli, 2017). With respect to sanctions, for example, it is unclear whether fines should be high enough to deter crime, kept within limits for the sake of protecting competition in markets, or structured to promote certain crime-preventive measures. A cross-country expansion in the use of non-trial resolutions (i.e., settlements) in cases of corporate liability does not serve to clarify sanction principles, because in most countries, such enforcement practice is associated with less information shared with the public, compared to enforcement by trials, and high discretionary authority for the enforcement agents who conclude the case (Søreide and Makinwa, 2020). Since governments are not open about how they rank the many objectives behind enforcement of corporate liability and sanctioning, many questions remain unanswered for researchers as well as the general public: How well do current enforcement priorities align with what we know about the consequences of crime? How robust are enforcement systems against political influence if enforcement is becoming more flexible as a result of settlement-based enforcement? What would be the consequence of such influence for different forms of crime? When are enforcement outcomes at risk of being exposed to influence from non-legal factors, such as the firm's market position and whether the crime was committed domestically or abroad?

Motivated by such questions, this article investigates trade-offs between enforcement strategies, focusing in particular on the difficulty of imposing sanctions that deter corporate crime while at the same time avoiding harmful market consequences. We have found no proper investigation of this trade-off in the literature. By combining the insights from the economics of crime and theories of industrial organization[1] for different forms of profit-motivated corporate crime, we get a clearer understanding of the consequences of crime in a market context. Assuming that consequences of crime ought to matter for governments' enforcement priorities (Rose-Ackerman and Palifka, 2016), the approach allows theoretical evaluation of enforcement systems and practices in terms of whether a strategy is consistent with the optimal system that would be chosen by a benevolent (uncaptured) government. By help of this analysis, we explain when law enforcement is likely to deter corporate

[1] A field of economics dealing with the strategic behavior of firms, regulatory policy, antitrust policy and market competition.

crime, assuming the size of corporate profit depends on the features of the crime and the offender's market position, as do the harmful consequences of the corporate behavior.

The analysis allows us to make the following predictions: (a) Corporate crimes are more damaging in markets of large size. (b) Corporate offenses whose consequences materialize in another country will often be tacitly condoned by elected officials, and to the extent that these offenses are investigated and charged at all, we predict that enforcement actions will lead to mild sanctions. (c) It is easier for enforcement systems to uncover crime than to impose sanctions that will effectively deter the acts. (d) The number of cases uncovered through leniency programs increases with the efforts placed in monitoring and enforcement (independent of self-reporting). (e) The reliance on leniency in competition cases, including highly asymmetric sanctions may have a potentially perverse effect on competition.

With respect to the development of efficient systems against corporate crime, with broad corporate liability and sanctions structured for deterrence, the United States has been a front-runner. Also, large parts of the research-based literature in law and economics, including the economics of corporate misconduct, refer to the United States. With this study we provide an EU angle to the debate - where there is a different institutional landscape and different degrees of law enforcement harmonization across forms of corporate misconduct. The research questions are motivated by challenges as they occur in an EU context, and although we do not have data to verify our theoretical results, we present relevant findings about enforcement cases from five European countries that are consistent with the theoretical analysis.

The article proceeds as follows: Section 2 briefly describes the regulation of corporate liability and points to relevant results in the literature on law and economics. In Section 3 we present an economic model for analysis of the above-mentioned questions. First, we describe corporate crime in a market context and explain why different sorts of profit-motivated crime, such as bribery, violations of anti-money-laundering (AML) regulations, and violations of competition law, have different consequences. Second, we investigate governments' incentives to control corporate crime in view of how the incumbent regime values producer surplus relative to consumer surplus (i.e., competition in markets), implicitly the cost of the corporate offences. Third, we explore optimal sanctions under a given set of circumstances, and especially the use of leniency programs when Becker-style deterrence is not an option.[2] In Section 4 we turn to enforcement in practice. With an emphasis on European

[2] Becker (1968) postulated regulation of crime rates through adjustment in the probability of detection and the size of the penalty.

countries, we investigate the extent to which governments are able to secure enforcement of corporate liability in line with the incentives described in Section 3 - to the extent the required information is available. By reviewing practices in five countries – Germany, the Netherlands, Norway, Sweden, and the United Kingdom – we check whether enforcement patterns disclose tendencies to shield certain suppliers from severe sanctions. Limited data availability reduces the scope of empirical studies but we find some support for the theoretical predictions. We discuss policy implications and conclude in Section 5.

## 2 Regulation of corporate liability

Governments regulate and sanction corporate misconduct in different ways (Pieth and Ivory, 2011). With the expansion of corporate regulations in the 20th century, it became possible across the United States and Western Europe to hold firms criminally responsible for economic crime committed by their employees. The basis for enforcement was vicarious liability combined with some form of evaluation of responsibility (Oded, 2013). Most countries criminalized corporate bribery in the late 1990s upon the implementation of international conventions such as the United Nations Convention against Corruption, the Organisation for Economic Co-operation and Development (OECD) Anti-Bribery Convention, and the Council of Europe's Civil Law and Criminal Law Conventions on Corruption.[3] Criminalization of failure to comply with anti-money-laundering regulations (as stipulated by the US Bank Secrecy Act of 1970) started with the US Money Laundering Control Act of 1986; thereafter, other OECD countries followed suit with a largely harmonized combination of criminal and non-criminal regulations, coordinated through the Financial Action Task Force (FATF).[4] Competition in markets is regulated primarily as a non-criminal matter. Today, as a result of EU-cooperation, such regulations are largely harmonized across Europe and is substantially consistent with the even older regulations in the United States.[5]

Normally, criminalization is associated with stricter penalties, a risk of imprisonment for the involved individuals, and compensation for victims. For corporate offenders, it often means indirect consequences such as damages to be settled with business partners, debarment from public procurement, exclusion from some investment funds, and reputational costs. For enforcement agencies, criminaliza-

[3]The United States was early in criminalizing corporate bribery through the Foreign Corrupt Practices Act (FCPA) of 1977, but enforcement of the act was weak until other countries enacted similar anti-bribery statutes (Garrett, 2020)

[4]See van Duyne et al., 2018 for detailed presentation and analysis of the FATF-initiated AML-regime.

[5]The US Sherman Antitrust Act of 1890, which still provides a basis for corporate liability in cartel cases, is one of the earliest regulations of this sort.

tion implies a higher burden of proof, which in many cases means de facto protection against penalties, especially for individuals who act on behalf of an organization.[6] In practice, however, the distinction between criminal and non-criminal enforcement matters less than one might suppose. The regulatory development has gone in the direction of *functional equivalence*. In other words, corporations can be sanctioned in similar ways, regardless of how the jurisdiction in question combines criminal and non-criminal enforcement (Pieth et al., 2014:37-40).

The regulatory regimes for corporate liability have evolved in other ways, too, since the turn of the millennium. Around that time, governments started to recognize the shortcomings in enforcement vis-à- vis corporate offenders, who could easily hide their crimes behind international corporate structures and financial secrecy provisions. Too strict vicarious liability would only serve to strengthen firms' incentives to hide whatever crime they might have conducted, governments realized, and thus such attempts to secure deterrence could harm markets more than it protected them (Khanna, 2000; Arlen, 1994). Today, countries enforce corporate liability with some sort of evaluation of negligence, if not an assessment of guilt (OECD, 2016). This allows enforcement agencies to consider the reasonableness of the penalty in view of the corporation's actual responsibility for misconduct (Miller, 2018; Hjelmeng and Søreide, 2017). While the weight of these circumstances is indeed a question addressed by courts, court assessment of the material facts of a case is costly in complex cases of corporate wrongdoing. It is also a time-consuming process, and society in many cases will be better off if corporate defendants can go on with their business if they do so with stronger internal measures against corporate crime. This aim, governments realize, can be secured if corporate offenders can be "rewarded" with a lower penalty if they have in place roper crime preventive systems, self-report their offences, and cooperate with law enforcers. Across countries, such a *leniency* strategy for self-reporting is especially well-developed within the field of antitrust/ competition law (Wils, 2007, Borrell et al., 2014 , while it makes sense to adapt the strategy for other forms of corporate misconduct too (Bigoni et al., 2015, Arlen, 2020).

This is why governments increasingly allow their law enforcers and corporate offenders to end cases with a *non-trial resolution*, that is, a negotiated settlement that opens for a discretionary evaluation of corporate offenders' compliance system and cooperation with law enforcement (OECD, 2019; Garrett, 2014). Governments defend the practice as a way to align two aims, that of promoting corporate compliance and that of deterring crime (Ivory and Søreide, 2020). Unless the conditions for such

[6]Especially in cases that end with an out-of-court settlement with a corporate defendant, individuals typically are not charged, according to Garrett (2018), who bases this finding on US enforcement statistics.

enforcement are clearer than what we see today, and the benchmark sanctions higher, there is a high risk that governments will achieve neither of these objectives (Garrett, 2014). For the sake of regulatory efficiency, some governments have started to describe what sort of compliance systems firms ought to have in place to merit lenient treatment under non-trial resolutions.[7] Yet there is substantial uncertainty with respect to current regimes, and the level of informality in these processes is generally high. Settlement-based enforcement normally comes with broad discretion for prosecutors, limited transparency for the public, weak protection against double jeopardy, and criminal sanctions below the level of appropriate crime deterrence.[8]

Governments' ambition to structure sanctions in a way that both promotes corporate compliance and deters crime is largely inspired by economic research on corporate crime (Shavell, 2004, Ch 9 and 10). Enforcement may prevent crime if strict liability with severe sanctions is combined with predictable penalty reductions for certain corporate behaviors (Arlen and Kraakman, 1997; Buccirossi and Spagnolo, 2006, Bigoni et al., 2015, Landeo and Spier, 2020). With respect to sanctions, economists typically consider the total impact of consequences, regardless of legal category (criminal or non-criminal), and take into account both direct and indirect consequences of the penalty, including those beyond the control of enforcement agencies. The crime-deterring impact of enforcement hinges on a sufficiently broad definition of liability, a real risk of crime detection, the predictability of a penalty, and multiple consequences for employees (Polinsky and Shavell, 2000; Arlen, 2020). These criteria apply to settlement-based enforcement as well, yet the added flexibility weakens deterrence if offenders believe they can negotiate themselves out of a serious penalty. It also distorts justice if the difference between the offered sanction and the expected trial result becomes too large for alleged offenders to ever refuse an offered settlement and opt instead for court proceedings (Søreide and Vagle, 2020b).

We know less about how enforcement of corporate liability ought to take into account factors such as the perpetrators' market situation, the nature of the crime, and political priorities. A lack of clarity regarding enforcement practices and sanction principles suggests that the barriers against undue influence on enforcement outcomes might be too weak. We need to understand why such influence might happen in relation to different forms of crime, the consequences for markets, and the

[7] The US Department of Justice, the French Anti-Corruption Agency (AFA), and the UK Serious Fraud Office all have provided guidelines on corporate crime preventive measures

[8] In addition, several authors criticize the cost-saving practice of encouraging firms to investigate their own offenses and provide evidence in order to cooperate with enforcement agencies Baer (2018), Lonati and Borlini (2020). For a survey of settlement-based enforcement in corporate bribery cases in 66 countries, see Makinwa and Søreide (2019).

consequences for optimal regulation. The next section presents a theoretical analysis of these concerns.

# 3 Theoretical analysis

We focus on an economic sector with $N \geq 2$ active firms. Assuming these firms produce collectively a quantity $Q$, the net consumer surplus is denoted $S(Q)$. Let $q_i$ denote the production by firm $i$ and $Q_{-i} = Q - q_i$. The firm's $i = 1, ..., N$ profit is denoted $\pi_i(q_i, Q_{-i})$. The government aims to maximize the objective function:

$$W(N) = S(Q) + \lambda \sum_{i=1}^{N} \pi_i \left(q_i, Q_{-i}\right) \tag{1}$$

where $\lambda \geq 1$ is the weight the government puts on firms' profit compared to net consumer surplus. This weight can reflect macroeconomic concerns, such as employment and taxation, that tilt political objectives toward the industry. More disturbingly it can be the result of capture by the industry in question. An uncaptured government might set $\lambda = 1$ so as to maximize the net surplus from trade. We are interested in national governments' incentives to control corporate crimes that generate a social loss $L(N)$. We analyse the trade-off and coordination problems they face and the impact of the tools they have at hand. To provide the micro foundations for the loss function $L(N)$, we consider in section 3.1 three simple generic models of crime. However, the results presented in sections 3.2 and 3.3 are quite general, and do not depend on the specifics of these illustrative examples.

## 3.1 Modeling corporate crime losses

In what follows we focus on three main types of corporate crime: bribery ($b$), collusion ($c$), and violation of AML regulations ($l$). We show that, since they stall competition, these crimes generate a social loss that is increasing and concave in $N \geq 2$, the total number of firms initially active in the market: $L^j(N)$ $(j = b, c, l)$.

### 3.1.1 Corruption in Public Purchases: Bribery

To illustrate the social cost entailed by corruption in public purchase, we assume that a commodity or service of fixed size $Q$ is to be purchased on behalf of the government (i.e., the people) by public tender, and the commodity will be paid for using taxpayers' money. We assume that $S(Q)$ is large so that the net social surplus (1) associated with the public acquisition is always positive (i.e., it is always worth procuring the commodity). To produce a quantity $q_i \geq 0$ the firm $i = 1, ..., N$ faces

the cost $C_i(q_i) = c_i q_i$ where the $c_i$s are independently and uniformly distributed in $[0,1]$. Since the firms' cost parameters are independently and identically distributed, it is optimal under asymmetry of information to organize a second-price auction (Myerson, 1981). The expected transfer paid for the commodity with such a competitive bidding procedure is $t(N) = \frac{2Q}{N+1}$ while the net profit expected by a producer when being one of $N$ bidders is $\pi(N) = \frac{Q}{N(N+1)}$ (see Auriol and Soreide, 2017).[9] It implies that the net expected social welfare in (1) is: $W(N) = S(Q) - \frac{2Q}{N+1} + \lambda \frac{Q}{N+1}$.

By contrast, if corruption occurs, and if one firm manages to capture the public purchaser so that it implements sole sourcing instead of a fair competitive procedure (see Auriol, 2006), the acquisition cost is equal to the monopoly price $t(1) = Q$, and the firm's expected rent is $\pi(1) = \frac{Q}{2}$.[10] The principal's surplus is $W(1) = S(Q) - Q + \lambda \frac{Q}{2}$. The firm's rent from bribing the public purchaser to win the contract is therefore

$$\Delta\pi^b(N) = \pi(1) - \pi(N) = Q\frac{N(N+1)-2}{2N(N+1)} > 0 \quad \forall N \geq 2. \tag{2}$$

We deduce that the social loss of corruption is:

$$L^b(N) = W(N) - W(1) = \left(\frac{2-\lambda}{2}\right)\frac{N-1}{N+1}Q. \tag{3}$$

The loss from bribe, $L^b(N)$, is strictly positive, increasing and concave in $N \geq 2$ when $\lambda < 2$. It varies between $L^b(2) = \left(\frac{2-\lambda}{2}\right)\frac{Q}{3}$ and $\lim_{N\to+\infty} L^b(N) = \left(\frac{2-\lambda}{2}\right)Q$. Indeed, when the number of bidders increases, they collectively bid more aggressively. This reduces the final purchase cost, thereby increasing consumers'/taxpayers' net surplus. If the government cares enough about consumers/users so that $\lambda < 2$ (i.e., if the weight placed on the corporate sector relative to the consumer surplus is not too large), it will value this social benefit. Moreover the loss increases with $Q$, the size of the market. Intuitively when the market is small, it is not essential to secure a low unit price, as the total bill will be low anyway. By contrast, when the quantity to be procured is very large, it is crucial to obtain the lowest possible per-unit price. Any increase in the unit price paid for the commodity translates into large surcharge for taxpayers. Finally, if $\lambda > 2$, the "loss" is actually a gain: when the government is

[9] Auriol and Soreide (2017) explore the market effects of debarment as a sanction for corruption in an infinite-horizon repeated procurement game. Debarment is found to make little difference in markets with high competition, while in markets with low competition it may deter corruption as long as firms value public procurement contracts in the future and there is an appreciable risk that the corruption will be detected.

[10] The rent will be shared between the firm and a bribe payment. If the bribe takes the form of an illegal transfer to a decision-making official, such a bribe would typically be small compared to other figures in the corporation's calculations. If the bribe is made as a political donation, it will be larger but is often subject to tax exemption.

captured by the corporate sector, it favors monopoly distortion and rent over consumer surplus.

### 3.1.2 Collusion in Markets: Violation of Competition Law

We focus next on the possibility that firms might collude to raise price and industry profit. To ease the exposition we consider a linear demand, $Q = a - p$, and $N > 2$ symmetric firms with constant marginal cost, $c > 0$, competing in Cournot fashion. In equilibrium each firm produces a quantity $q = \frac{a-c}{N+1}$ so that the total production in the absence of collusion is $Q(N) = (a-c)\frac{N}{N+1}$. The total quantity then varies between the monopoly quantity $Q(1) = \frac{a-c}{2}$ and the perfect competition quantity $\lim_{N\to+\infty} Q(N) = a - c = Q^*$. The total corporate profit of the sector is $\sum_{i=1}^{N} \pi_i(N) = N\left(\frac{a-c}{N+1}\right)^2$ and the net consumer surplus is $S(N) = \left(\frac{N}{N+1}\right)^2 \frac{(a-c)^2}{2}$.[11] Substituting these values in (1) yields $W(N) = \frac{(a-c)^2}{2}\frac{N(N+2\lambda)}{(N+1)^2}$.

When collusion occurs the firms collectively behave as a monopolist, so that the aggregated corporate rent from collusion, $\Delta\pi^c(N) = \pi(1) - \sum_{i=1}^{N} \pi_i(N)$, is

$$\Delta\pi^c(N) = \left(\frac{a-c}{2}\right)^2 \left(\frac{N-1}{N+1}\right)^2 > 0 \qquad \forall N \geq 2 \tag{4}$$

Assuming the firms share the rent equally they each get a rent from collusion: $\frac{\Delta\pi^c(N)}{N}$. The government's objective function becomes $W(1) = \frac{(a-c)^2}{2}\frac{1+2\lambda}{4}$. The loss from collusion is:

$$L^c(N) = W(N) - W(1) = \left(1 - 2\lambda + 2\frac{N+1}{N-1}\right)\left(\frac{N-1}{N+1}\right)^2 \frac{(a-c)^2}{8}. \tag{5}$$

It can now be confirmed that $L^c(N) > 0$ if and only if $\lambda < \frac{3N+1}{2(N-1)}$, which implies that the loss is always positive if $\lambda \leq \frac{3}{2}$. Moreover $L^c(N)$ increases with $N$ iff $\lambda \leq \frac{N}{N-1}$ and is concave in $N$ iff $\lambda \leq \frac{2N-1}{2(N-2)}$. It is, for instance, concave when $\lambda = 1$. In other words if the government values consumer surplus enough (e.g., as much as it values corporate rents), the social loss of collusion is positive, increasing and concave with $N$. Finally, as in the corruption case, the harm caused by collusion in (5) increases with the total market size, $Q^* = a - c$. Collusion in a small market is far less socially damaging than collusion in a large one. By contrast, if the government is captured by the corporate sector so that $\lambda$ is large (i.e., larger than $\frac{3N+1}{2(N-1)} > \frac{3}{2}$) the "loss" in (5) is negative: it is valued as a gain. In this case the government favors firms' rent over consumer surplus.

[11] Accordingly, when $N = 1$ the price is equal to the monopoly price $p^m = \frac{a+c}{2}$ and it converges toward the perfect competition price $p^* = c$ when $N \to +\infty$. With a linear demand $P(Q) = a - Q$, the net consumer surplus is $S(Q) = \int_0^Q P(x)dx - P(Q)Q = \frac{Q(N)^2}{2}$.

### 3.1.3 Money Laundering: Violation of AML Regulations

Banks failure to comply with AML regulations, which means money laundering can occur, is a different offence compared to corruption in public procurement or collusion in markets because the social loss related to money laundering is quite external to the sector itself and is often diffuse at the international level, as the main impact of money laundering is to facilitate organized crime, global financial criminality, financing of terrorism, and tax evasion. In other words, on top of the distortions of competition in the banking sector it generates, money laundering creates negative externalities, often at the international level.

In the absence of money laundering, the social surplus is as defined in (1) with $Q(N)$ resulting from the fair competition between the banks. For instance, if they enjoy some market power and play Cournot, in the linear demand case studied above it yields $Q(N) = (a-c)\frac{N}{N+1}$ and $W(N) = \frac{(a-c)^2}{2}\frac{N(N+2\lambda)}{(N+1)^2}$.

If money laundering occurs in a proportion $n \in [0,1]$ of the banks (i.e., $nN$ banks are errant) it yields an increase in these banks aggregated profit of $\Delta\pi^l(nN)$ increasing with $nN$. Assuming they are symmetric each errant bank earns $\frac{\Delta\pi^l(nN)}{nN}$. The criminal activity at the origin of the illicit money generates a world negative externality $M^l(nN)$, increasing in $nM$. Indeed the volume of laundered money increase with the number of banks indulging into this activity, increasing their aggregated profits and the total level of externalities. We focus on crimes such that the function $M^l(nN) - \Delta\pi^l(nN)$ is strictly increasing and convex $\forall n \in [\frac{1}{N}, 1]$ with the normalization that $M^l(1) - \Delta\pi^l(1) = 0$. This assumption ensures that the optimization problem is concave. For instance, assuming that each bank can launder an amount $D > 0$ of dirty money then a loss function of the type $M^l(nN) - \Delta\pi^l(nN) = D^{nN} - nND$ is strictly increasing and convex in $n \in [\frac{1}{N}, 1]$. In other words, the benefit of the banks that launder illicit money is lower than the global negative externality it creates, and the gap increases with the number of errant banks. In addition to the negative externalities they create outside the banking sector, the errant banks can stall competition by proposing a better deal to their customers than the honest banks, thanks to their undue rents. The AML offence impacts the surplus of the banks' customers by creating an unfair competitive edge. In equilibrium this reduces the number of banks to the level of the errant ones as they are making rents they can use to stall competition. The social surplus becomes: $W^l(nN) = W(nN) + \lambda\Delta\pi^l(nN) - \alpha M^l(nN)$ where $\alpha M^l(nN)$ is the fraction $\alpha \in [0,1]$ of the total world negative externality $M^l(nN)$ generated by the criminal activity at the origin of the illicit money that is brought into the country. The social loss generated by money

laundering for a given $n \in (0, 1]$ is:

$$L^l(N, n) = W(N) - W(nN) + \alpha M^l(nN) - \lambda \Delta \pi^l(nN). \tag{6}$$

We will now consider two relevant polar cases: $n \in \{\frac{1}{N}, 1\}$, although the results are easily generalized to any $n \in [\frac{1}{N}, 1]$.

First, in countries where financial secrecy appears to be an essential element of the private sector's business model (i.e., in tax havens[12]) $n = 1$. This implies that $W(N) - W(nN) = W(N) - W(N) = 0$: When money laundering is not fought at the country level, all the potential banks offer such illicit arrangements and there is no anti-competitive effect on the bank sector of this illegal activity. The social loss generated by money laundering in tax havens is:

$$L^l(N) = \alpha M^l(N) - \lambda \Delta \pi^l(N). \tag{7}$$

The offenders are typically laundering money for crimes committed outside the country's borders. Their society does not suffer directly, at least not more than other countries, from the terrorism, organized crime, or financial criminality that money laundering favors. In other words, in many countries where criminal money is laundered and secrecy is exploited to facilitate tax evasion by foreigners, citizens do not experience the negative externalities of the crime. For the most part, these countries are quiet, affluent, peaceful places.[13] Concretely, this means that for many of the countries where AML offenses happen on a large scale, $\alpha << \frac{\Delta \pi^l(N)}{M^l(N)}$ so that the "loss" $L^l(N)$ from this specific corporate crime is in fact a gain.

The second interesting polar case is when money laundering is not condoned by the government, and therefore, few firms offer such illicit arrangements. This will typically be the case if the crime plays out domestically. For example, if a German bank assists its rich clients in a scheme for evading German taxes or helps German criminals launder their criminal proceeds, the country bears the whole cost of the criminal activity. Hence, $\alpha = 1$, and in this case the government will fully internalize the cost of this crime (e.g., domestic tax evasion). When few banks are errant in this way the competitive

[12] an economy that functions primarily as a financial secrecy provider

[13] According to the International Monetary Fund, the eight major pass-through economies are the Netherlands, Luxembourg, Hong Kong SAR, the British Virgin Islands, Bermuda, the Cayman Islands, Ireland, and Singapore. They host more than 85 percent of the world's investment in special-purpose entities, which are often set up for tax reasons (see Damgaard et al., 2018; countries listed in the order as presented in the report).

impact of money laundering is large. For instance when $n = \frac{1}{N}$ the social loss becomes:

$$L^l(N) = W(N) - W(1) + \alpha M^l(1) - \lambda \Delta\pi^l(1). \tag{8}$$

In this case, the government will have an incentive to fight the illegal practices, unless it is captured by the corporate sector (i.e., unless $\lambda$ is very large).

## 3.2 National government incentives to fight corporate crimes

Given the micro-foundations provided for the loss function $L(N)$, we now examine what prevention measures and sanction mechanisms will optimally prevent the crimes. We distinguish between two sets of circumstances, one in which the crimes are confined nationally, and another, in which the crimes generate negative international externalities. The expected social losses from these crimes are very different as shown in sections 3.2.1 and 3.2.2

### 3.2.1 Domestic corporate crimes

When a corporate crime is committed domestically, without generating international externalities, a benevolent government will fully internalize it. For this discussion we assume a benevolent government that aims to maximize net consumer surplus, i.e., it is not captured by firms potentially involved in the misconduct, a scenario reached by setting $\lambda = 1$.[14] Its incentive to fight corporate crimes is then proportional to the national social loss caused by the crimes. Such an assumption rules out countries that serve as tax havens, while it includes all circumstances where the consequences materialize 'at home', such as violation of AML regulations for the sake of (national) tax evasion. It implies that $\alpha = 1$ in (8), which yields $L^l(N) = W(N) - W(1) + M^l(1) - \Delta\pi^l(1) = W(N) - W(1)$. For other crimes, such as corruption (3) and collusion (5), a benevolent government has incentives to control the crime when they occur at home. The investment in controlling the crimes is then justified up to the point where the cost of doing so becomes larger than the loss $q^j(N)L^j(N)$ that the crimes are expected to generate, where $q^j(N)$ is the probability that crime $j = b, c, l$ occurs and goes undetected. On the one hand, the preceding analysis reveals that the loss $L^j(N)$ increases in $N$ when $\alpha = \lambda = 1$. Stalling competition is more damaging for consumers when markets are not concentrated. In very concentrated markets, firms have market power anyway, and even when their prices are regulated,

[14] Indeed, it is easy to see from (1) that when $\lambda = 1$, the government objective function is the net consumer surplus $\int_0^Q P(x)dx - C(Q)$.

they enjoy some rents. So when they stall competition, collude or make corrupt deals, the loss for consumers is, all else being equal, smaller.[15] On the other hand, these crimes are more likely to occur in concentrated markets than in more competitive ones. This is especially true of collusion, where coordination and enforcement become more difficult as the number of conspirators increases.[16] If offences are carried out more easily under circumstances of few competitors, it means that in general $q^j(N)$ should be decreasing in $N$. Therefore the net effect of an increase in $N$ on the expected social loss is ambiguous. In what follows we show how these conflicting forces interact. We drop the index $j = b, c, l$ in the proposition, as the result is the same for the three types of crimes, and because it makes the exposition simpler.

**Proposition 1.** *Assume that $q(N) \in [0,1]$, the probability that the corporate crime goes undetected, is strictly decreasing and log-concave in $N \geq 1$ with $q(1) = 1$ and $\lim_{N\to+\infty} q(N) = 0$. Assume that $L(N) \geq 0$, the social loss generated by the corporate crime is strictly increasing and log-concave in $N$, with $L(1) = 0$ and $\lim_{N\to+\infty} L(N) = \overline{L} > 0$. It exists $N^* > 1$ so that the expected social loss from corporate crime, $q(N)L(N)$, is increasing for $N \leq N^*$ and decreasing for $N > N^*$.*

*Proof.* See appendix 6.1 □

The examples of losses defined in (3), (5) and (8) are log-concave (in fact they are concave when $\lambda = 1$, which is stronger than log-concave). Now if the probability of the crime going undetected $q(N)$ is also log-concave, then the expected social loss from corporate crime, $q(N)L(N)$, is first increasing and then decreasing, and therefore reaches a maximum for some finite value of $N$.

For instance, if in a collusive agreement with $N$ firms there is a chance $p \in (0,1)$ that each firm is a whistle-blower, then $q(N) = (1-p)^N = exp\big(Nlog(1-p)\big)$, which is log-concave. More generally, all functions such that $q(N) = exp(-\rho N)$ with $\rho > 0$ are log-concave, and the result of proposition 1 holds. In this case the value of $N^*$ is such that $\frac{L'(N)}{L(N)} = \rho$. Substituting, for instance, the loss function (3), yields the function $N^* = \sqrt{\frac{2}{\rho} + 1}$.[17] It shows that the market structure conducive of the largest social damage for a corporate crime is relatively concentrated and decreases with $\rho$, that is with the probability that a crime occurs and is detected when $N$ increases.

[15] Clearly, crime carried out for anti-competitive purposes could be the very reason why a market is (already) concentrated. In such circumstances a benevolent government should investigate and impose controls to ensure that the market is sufficiently open to entry.

[16] See for instance Motta, 2004 and Combe and Monnier, 2010 for empirical evidence on cartel size in the EU.

[17] Similarly, substituting the value from (5) yields that $N^*$ is such that $N^3 + 3N^2 - N - 3 - \frac{8}{\rho} = 0$. For $\rho \to +\infty$, $N^* = 1$, for $\rho = 0.5$ $N^* \simeq 2$, for $\rho = 0.1$ $N^* \simeq 3.62$.

In other words, under general assumptions, the expected social loss from corporate crime, $q(N)L(N)$, reaches its maximum for some value $N^* \geq 1$. Moreover, it increases with $Q$, the size of the market, since $L(N)$ increases with the market size. This implies that governments need sanctions guidelines that allow law enforcers to take the market situation into account in cases of corporate crime. A benevolent government that wishes to control domestic corporate crime ideally should tailor its efforts to the specific sector under consideration. In particular, enforcement agencies should give priority to oligopolistic sectors, where the market concentration is relatively high, where collusion and corruption are real threats, and where the market size is large enough for anti-competitive practices to substantially harm consumers/taxpayers. This pragmatic case-by-case approach seems optimal in cases where the government is benevolent, but comes with the cost of reduced sanction predictability.

#### 3.2.2 International externalities of corporate crimes

Now we turn to corporate crimes that generate negative externalities in foreign countries – violation of anti-money laundering regulations and bribery conducted to win public contracts abroad being two cases in point. With money laundering in tax-havens the social "loss" is given equation (7). When $\alpha$ is small (i.e. $\alpha \simeq 0$) then (7) becomes $L^l(N) = -\lambda \Delta \pi^l(N)$ which is negative. In other words, the increase in profit for the banks is larger than the direct negative externality borne by the country hosting them. It is therefore not surprising that tax havens are not doing much to fight money laundering, as this specific crime generates a positive dividend for them. This is a typical free-riding problem insofar as the loss is spread across several jurisdictions while the benefit accrues to one country. It implies that unless there is a coordinated international intervention to fight money laundering, with economic sanctions large enough to make it socially unprofitable in tax havens, it will continue unabated.

More generally, when negative externalities occur outside a country, while the extra criminal profits reaped by corporate offenders increase the country's gross domestic product, a benevolent government will have very few incentives to control the problem. From this country's perspective, there is only a fiscal cost to be paid in this effort for international integrity, and no direct benefit to be reaped - at least not in the short run. For instance, if a firm that behaves honestly at home pays bribes in a foreign country to win a procurement contract, or colludes with other firms to share export markets, the home government in the country where the firm is headquartered will have few incentives to control these extraterritorial crimes. Committing resources to investigate and sanction the extraterritorial criminal

behavior will easily be perceived as a cost to domestic producers and taxpayers, while benefiting primarily foreign societies and competitors. Unless there is strong international solidarity in society, punishing these firms harshly for their crime is unlikely to be popular among voters, who are both employees and taxpayers.

To be more specific, if the crime occurs in another country without creating distortions on the domestic market, a government under political pressure, such as an upcoming election, will put a weight of 0 on the interests of foreign consumers/taxpayers. It is easy to show that in this case (3), (5) and (6) imply that $\lim_{\lambda\to+\infty}\left(q^j(N)L^j(N)/\lambda\right) = -q^j(N)\Delta\pi^j(N) < 0$ for $j = b, c, l$. When the government does not care about consumer surplus at all, because those consumers are in a foreign country, then the "loss" from corporate crimes is a gain. It generates new taxes and employment at home, while the harm (to taxpayers or consumers) is abroad. *We therefore predict lax enforcement of punishment for corporate crimes that hurt consumers and taxpayers in a foreign country only.*

These are cases where internationally coordinated actions are required to internalize the negative externalities generated by international corporate crimes. As illustrated by the tense discussions around taxation of multinationals and remedies to curb their fiscal "optimization" practices, this is not an easy task. However, in some specific contexts such as the European Union (EU), the existence of supra-national authorities such as antitrust bodies might help coordinate sanctions against those crimes that harm all while benefiting only a few. Large economies, such as the European Union or the United States, can impose sanctions that are large enough to curb the incentives of countries benefiting from the crimes. They have the power to make these countries internalize the negative externalities they impose on others. For example, the EU's listing of non-cooperative tax jurisdictions has triggered changes in countries known to offer financial secrecy and has promoted fairer taxation.[18] Similarly, the United States is in a stronger position than most to issue threats to other countries and impose sanctions on international corporations. They have for instance forced Switzerland to enhance financial transparency and cooperate in investigation of tax matters (see Church, 2016).

### 3.3 Deterrence of crime through optimal sanctions: leniency programs and precautionary measures

In this section we focus on domestic crimes which a benevolent government has an incentive to control (i.e., $\alpha = \lambda = 1$). We drop the index $j = b, c, l$ as the results are qualitatively the same for the

[18] For details, see press release on "Fair Taxation: EU publishes list of non-cooperative tax jurisdictions."

three types of crimes, and because it makes the exposition simpler. We examine the optimal structure of the sanctions that a benevolent government should inflict on firms to curb corporate crimes (i.e., crimes that benefit the firm by increasing its profits). Taking the perspective of the firm, we focus on its gain/loss from crime. Compared to the government, the management of the firm is far better positioned to monitor crime committed by employees or other representatives of the corporation. The firm has two types of tools for monitoring crime committed by employees. First, it can invest ex-ante $K \geq 0$ in preventive measures that will make the detection of crime easier for all parties (e.g., double-checking/endorsing of sensitive information and clearance procedures, digitization to safeguard all actions and corporate information exchanges, procedures to facilitate whistleblowing, etc). Second, the firm can invest $m \geq 0$ to monitor employees on a daily basis. The probability that the firm will discover crime when committed, $p^f(m/K) \in [0,1]$, is increasing and concave in $m \geq 0$ for all $K \geq 0$. We assume that precautionary measures ease the monitoring of crimes $p^f(m/K_1) > p^f(m/K_2)$ when $K_1 > K_2 \geq 0$ and $m > 0$. Finally, $p^f(0/K) = 0$ for all $K \geq 0$. In other words, the firm must invest in some monitoring if it aims to detect corporate crime.

The government too can detect corporate crime, but is far less efficient than the firm in this task because it is external to the firm's operations. Let $p^g(m/K) \in [0,1]$ be the probability that the government finds out that a corporate crime has been committed in the firm when such a crime has in fact occurred. We have $p^g(m/K) < p^f(m/K)$, $\forall m > 0$. As for the firm, preventive actions make crime detection easier: $p^g(m/K_1) > p^g(m/K_2)$ when $K_1 > K_2 \geq 0$ and $m > 0$.

#### 3.3.1 Self-reporting and deterrence

If the firm discovers that a corporate crime has occurred, it can report it to the public authorities in exchange for a reduced fine. It can also hide it from the authorities to avoid a fine. However, if the government finds out about the crime on its own, it will conduct a thorough investigation that will reveal whether the firm was aware of the problem and covered it up, or not. If it turns out that the firm staged a cover-up, the sanctions will be harsher. Consistent with results by Bigoni et al. (2015) and Spier (1992), we show why differentiated treatment of offenses, depending on whether or not the firm reports them and tries to limit future offenses by investing in monitoring and preventive actions, can help uncovering the occurrence of corporate crime. To be more specific, let $F > 0$ be the base fine – that is, the fine in cases where the firm did not report the crime but there is also no evidence that it tried to cover it up. Let $F^h \geq 0$ be the fine in cases where

there is evidence that the firm detected the crime and hid it. Finally, let $F^r \geq 0$ be the fine in cases where the firm reported the crime to the authorities. This implies that if a corporate crime is committed and $\beta \in [\frac{1}{N}, 1]$ is the firm's fraction of the rent,[19] then the firm's expected profit is: $E\pi = p^f(m/K)\Big[\mathbb{1}_{\{r\}}(\pi(1) - F^r) + \mathbb{1}_{\{h\}}\left(1 - p^g(m^g/K))\beta\pi(1) + p^g(m^g/K)(\beta\pi(1) - F^h)\right)\Big] + \left(1 - p^f(m/K)\right)\left(1 - p^g(m^g/K)\right)\beta\pi(1) + p^g(m^g/K)\left(1 - p^f(m/K)\right)\left(\beta\pi(1) - F\right)$, where $\mathbb{1}_{\{r\}}$ equals 1 if the firm reports the crime and 0 if it does not, and $\mathbb{1}_{\{h\}}$ equals 1 if the firm hides the crime and 0 if it does not. It simplifies to:

$$E\pi = \beta\pi(1) - \left(1 - p^f(m/K)\right)\Big(p^g(m^g/K)F\Big) - p^f(m/K)\Big(\mathbb{1}_{\{r\}}F^r + \mathbb{1}_{\{h\}}p^g(m^g/K)F^h\Big) \qquad (9)$$

The standard Beckerian model of crime deterrence is obtained simply by setting $K = m = 0$ so that $p^f(m/K) = 0$. In this case (9) becomes $E\pi = \beta\pi(1) - p^g(m^g/K)F$, so that crime is deterred if and only if $E\pi \leq \pi(N)$, where $\pi(N)$ is the firm's profit when it behaves honestly. We deduce that to deter crime the fine must be set so that $F \geq \frac{\beta\pi(1)-\pi(N)}{p^g(m^g/K)}$. Since monitoring is costly for the government, it is optimal to set $m^g$ as close as possible to 0 so that the punishment $F$ goes to infinity. The problem with this Beckerian solution is that it fails to capture limited liability and bankruptcy constraints. The firm will never pay the infinite penalty, and therefore, the expected loss from corporate crime is not large enough to prevent the crime when $p^g(m^g/K)$ is very small. For instance, according to EU Council Regulation (EC) No 1/2003 of 16 December 2002 (rules on competition) Article 23.2: "For each undertaking and association of undertakings participating in the infringement, the fine shall not exceed 10% of its total turnover in the preceding business year".

Taking into account that in practice $F \leq \overline{F}$, we deduce that the government needs to detect the corporate crime with at least probability $p^g(m^g/K) \geq \frac{\beta\pi(1)-\pi(N)}{\overline{F}} > 0$ with $\beta \in \left(\frac{\pi(N)}{\pi(1)}, 1\right]$. In many cases the government will be unable to meet this deterrence condition, since governments are rather inefficient when it comes to monitoring firms.

Next we consider how a more sophisticated approach to sanctions, one that provides incentives to firms to cooperate with law enforcers, might improve the detection of crime, even if this approach will not necessarily be sufficient to prevent the crimes from taking place.

The firm will invest sequentially, first in preventive measures $K$ and second in day to day monitoring $m$. We solve the problem backward. Let $K > 0$ be the level of firm investment in preventive measures,

[19] In the examples analyzed in sections 3.1.1, 3.1.2, 3.1.3, we had implicitly $\beta^b = \beta^l = 1$ and $\beta^c = \frac{1}{N}$.

the optimal level of monitoring $m$ solves: $\max_m\{E\pi - c(m)\}$, where $E\pi$ is defined in (9) and $c(m)$ is the cost of investing in monitoring increasing and convex in $m$. Optimizing this problem yields the first order condition (FOC):

$$\frac{\partial\big(E\pi - c(m)\big)}{\partial m} = \frac{\partial p^f(m/K)}{\partial m}\Big(p^g(m^g/K)F - \min\{F^r, p^g(m^g/K)F^h\}\Big) - c'(m) \leq 0 \tag{10}$$

First, this expression makes it clear that a firm will have no incentive to invest in monitoring if $p^g(m^g/K) = 0$. In this case $\frac{\partial\big(E\pi - c(m)\big)}{\partial m} \leq 0$ and the optimum is reached for $m = 0$. In fact, when $m^g = 0$, (9) becomes $E\pi = \beta\pi(1) - p^f(m/K)\mathbb{1}_{\{r\}}F^r$, which is decreasing both in $m$ and $K$: at the optimum the firm chooses $m = K = 0$ and never reports any crime. In other words, a firm will never monitor crime if the government is not monitoring it, and therefore, government monitoring is an essential public good for the sake of controlling corporate crimes. Managers in firms need to be aware that the government monitors them, for example by providing sufficient budget for enforcement agencies and encouraging or rewarding whistleblowers. Moreover, once a crime is uncovered, the government needs to investigate the firm thoroughly to determine the management's ex ante awareness of the crime and what, if anything, it did to prevent it. In general, interim monitoring and ex-post enquiries about crime are easier and less costly when preventive measures are in place (i.e., when $K$ is larger).

Second, it is not enough that $p^g(m^g/K) > 0$. If the government wants the firms to invest in monitoring, sanctions must be set so that $p^g(m^g/K)F - \min\{F^r, p^g(m^g/K)F^h\} > 0$. Assuming $p^g(m^g/K)F > \min\{F^r, p^g(m^g/K)F^h\}$ then $m^* > 0$ is so that

$$\frac{\partial p^f(m/K)}{\partial m}\Big(p^g(m^g/K)F - \min\{F^r, p^g(m^g/K)F^h\}\Big) = c'(m) \tag{11}$$

Totaling differentiating $m^* > 0$ with respect to $m^g$ yields:

$$\frac{dm^*}{dm^g} = \frac{-p^f_m(m/K)p^g_{m^g}(m^g/K)\Big(F - \mathbb{1}_{[F^r > p^g(m^g/K)F^h]}F^h\Big)}{p^f_{mm}(m/K)\Big(p^g(m^g/K)F - \min\{F^r, p^g(m^g/K)F^h\}\Big) - c''(m)} \geq 0 \tag{12}$$

where $\mathbb{1}_{[F^r > p^g(m^g/K)F^h]}$ is equal to 1 if $F^r > p^g(m^g/K)F^h$ and 0 otherwise. Equation (12) hence shows that, for any level of preventive measures $K > 0$, private monitoring and public monitoring are strategic complement. We therefore predict that *the probability that a firm monitors, uncovers and reports corporate crime increases with the effort made by the government to monitor its activities.*

The next Proposition summarizes the results from the preceding discussion.

**Proposition 2.** *Firms will always cooperate with the authorities and report crimes if:*

$$p^g(m^g/K)F^h \geq F^r \geq 0. \tag{13}$$

*To deter them from committing corporate crime, the sanctions scheme should be structured so that*

$$\beta\pi(1) - \pi(N) \leq \big(1 - p^f(m^*/K)\big)p^g(m^g/K)F + p^f(m^*/K)F^r \tag{14}$$

*where $m^*$, solution to (11) if $p^g(m^g/K)F > \min\{F^r, p^g(m^g/K)F^h\}$ and 0 otherwise, is increasing in $m^g$.*

Proposition 2 shows that it is always possible for authorities to induce firms to cooperate when the firms discover crime in their operations. Indeed, whatever the maximum value of the fine $\overline{F}$ that can be imposed on the firm when it has covered up the crime, the government can always decide to set $F^r < p^g(m^g/K)\overline{F}$.

As is clear from Proposition 2, the fact that a firm has an incentive to report its crime does not mean that it is deterred from committing it. Indeed the firm always has an incentive to commit the crime unless (14) holds. Everything else being equal (i.e., for a given $p^g$ and $p^f$), this condition is not going to improve upon the standard Beckerian deterrence condition as $p^g(m^g/K)\overline{F} \geq \big(1 - p^f(m/K)\big)p^g(m^g/K)F + p^f(m/K)F^r$ since $F^r \leq p^g(m^g/K)\overline{F}$ by (13) and $F \leq \overline{F}$. The maximum deterrence occurs when $F^r = p^g(m^g/K)\overline{F} < F = F^h = \overline{F}$. Substituting these values in (14) yields the Beckerian constrained solution: $p^g(m^g/K) \geq \frac{\beta^j\pi(1)-\pi(N)}{\overline{F}}$. In other words, whether firms have incentive to self-report crimes or not, the probability of detection by the government must be large enough to deter them from committing corporate crime.

### 3.3.2 The limits of leniency programs

Antitrust authorities in the United States and in the EU rely heavily on leniency programs to uncover cartel cooperation. According to Carmeliet (2012) a clear majority of EU cartel infringements are discovered through a leniency program. However, over the last years there has been a noticeable decrease in the number of immunity applications from firms operating in a cartel, and thus, a possible weakening of the Commission's ability to detect cartels. By reference to statistics from Global

Competition Review, Ysewyn and Kahmann (2018) document a clear decline in the number of leniency applications between 2014 and 2016. According to them, the number of leniency applications (including immunity applications) fell by almost 50% over two years, from 46 applications in 2014 to 24 applications in 2016. While such statistics are difficult to obtain in detail in Europe, there are indications that this might be a trend, as evidenced by statistics on leniency applications published by the German Federal Cartel Office. The figures confirm a trend towards a decreasing number of applications, with 37 applications in 2017, 25 in 2018, and only 16 in 2019.[20]

In the EU, there is a risk that the Commission and the antitrust enforcement agencies at the national level are relying too heavily on leniency programs to uncover cartel cooperation. Ysewyn and Kahmann (2018) conducted a review of cartel cases decided under the Commission's 2006 Leniency Notice, and finds that for most years since then, 100% of investigations were sourced from immunity applicants. Yet, as shown in equation (12), the deterrent effect of offering leniency for those who self-report corporate crime depends critically on governments' ability to uncover and sanction such offences on its own. When $m^g$ is close to 0, firms have no incentive to invest in monitoring of corporate crimes, and none is reported. In other words, the number of cases uncovered through leniency programs increases with the independent monitoring efforts made by the authorities.

The second concern raised by leniency programs to uncover collusion, is the consequences of such asymmetric treatment of guilty parties on the market structure and competition. In collusion cases the firm that self-reports its offense first can get full immunity (i.e., a fine $F^r = 0$) and on top of that a competitive advantage if its competitors are sanctioned.[21] To illustrate the anti-competitive effect of leniency programs, assume the sanctions are set so that maximal deterrence occurs: $F^r = 0$ and $F = F^h = \overline{F}$. This means that the self-reporting corporation benefits in term of profitability as it is stronger in the market after reporting the crime, while its competitors are weaker.[22] More specifically, the instantaneous profit of the $N-1$ whistleblower competitors is $\frac{\pi(1)}{N} - F^h$. Assuming these $i = 1, ..., N-1$ firms face random shock $\epsilon^i$ in their operations affecting their financial viability with $\epsilon^i$ independently and identically distributed in $(-\infty, \frac{\pi(1)}{N}]$ according to the the density $g(\epsilon)$ and c.d.f $G(\epsilon)$. They go bankrupt if $\frac{\pi(1)}{N} - F^h \leq \epsilon^i$. The proportion of firms impacted by the

[20] Figures found online in the Annual Reports of the German Bundeskartellamt. Such statistics are not readily available from other competition authorities.

[21] For the self-reporting firm there is no guarantee that any competitor will be sanctioned, and governments sometimes also offer benefits for the second and third cartel members who want to self-report. According to the following EU statistics for the last five years there were 80 out of 441 cases where a firm received zero penalty (immunity) but a larger number of cases where the penalty is between 0 and 0.99% of global turnover; statistics available here (last page): https://ec.europa.eu/competition-policy/cartels/statistics$_e n$

[22] Ring-leaders are typically excluded from leniency programs with the aim of avoiding strategic use of the system.

penalty that goes bankrupt is: $Prob\left(\epsilon^i \geq \frac{\pi(1)}{N} - F^h\right) = 1 - G\left(\frac{\pi(1)}{N} - F^h\right)$. We deduce that there are in expectation $EN^c = 1 + (N-1)\left(1 - G\left(\frac{\pi(1)}{N} - F^h\right)\right) \leq N$ firms left to serve the market.[23] *Concentration might therefore rise following such an asymmetric treatment of the guilty firms.* We return later to the question of whether this correlation between higher concentration and sanctions related to collusion holds in the EU. When it comes to other crimes such as corruption or money laundering, there is not such a big asymmetry in consequences for the involved partners, if any. The reduced penalty for those who self-report is still a punishment for the guilty firm, which gains no competitive advantage vis-a-vis its competitors.

### 3.3.3 Optimal investment in public monitoring and precautionary measures

If the government wants to increase the deterrent effect of the sanction it might try to relax the constraint (13), as a larger $F^r$ implies an easier way to meet (14). Toward this end it might require the firm to take precautionary measures to ensure transparency and induce employees to report crime to the authorities. For instance, the government might impose a minimum level of $K$, either to warrant leniency in case of crime self-reporting or simply as a mandatory legal requirement. Not investing adequately in crime prevention will be treated ex-post as corporate negligence and crime condonation. It will lead to harsher sanctions, possibly including criminal prosecution against individuals. Typically the investment in crime prevention must be ex-post verifiable. Prevention involves a set of ex-ante and interim measures, which should be easily checked ex-post.

If the probability that a crime goes undetected, $q(N/K)$, is decreasing and convex in $K$,[24] the optimal level of prevention measures solves:

$$\min_K \{L(N)q(N/K) + NK\} \tag{15}$$

Under our assumptions the first-order condition is also sufficient. We deduce that the optimal investment in prevention measures, $K^*$, is such that

$$\frac{-\partial q(N/K)}{\partial K} L(N) = N \tag{16}$$

[23] We have considered a static problem for the sake of simplicity. However the results can be easily generalized to an infinite horizon dynamic setting. Assuming the firms play a grim-trigger strategy following the breach of the collusive agreement. When $F^r = 0$ the expected profit of the whistleblower is $\frac{\pi(1)}{N} + \delta \frac{E\pi(N^h)}{1-\delta}$, where $\delta < 1$ is the discount factor of future profits.

[24] For instance assume that each firm has a probability $p^f(m/K)$ of being a whistle-blower increasing and concave in $K$. Then $q(N/K) = \left(1 - p^f(m^*/K)\right)^N$ where $m^*$ is solution to (11).

At the optimum, the marginal benefit of increasing $K$ in terms of crime reduction should be equal to the marginal cost of increasing it, which is $N$, the number of firms active in the sector that would all have to bear the cost $K$.

Assuming the cross-derivative of $q$ with respect to $N$ and $K$ is negative, $\frac{\partial^2 q}{\partial N \partial K} \leq 0$, it is easy to show that $\frac{dN^*}{dK} < 0$ for $K \geq 0$ and $N^*$ defined in Proposition 1.[25] The expected loss function is decreasing in $K$ so that increasing preventive measures decreases the number of firms that maximizes the social loss of stalling competition. Minimizing social loss by imposing preventive measures of level $K^* \geq 0$ defined in (16) on firms, decreases their ability to commit a corporate crime that will go undetected. In other words, *imposing preventive measures limits the number of firms that can conspire without being detected, and therefore, the extent of corporate crimes.*

# 4 Enforcement in practice

Let us now consider the extent to which governments have the regulatory leeway to influence enforcement practices in line with the incentives outlined above, and whether they appear to make use of that leeway. For this exercise we consider different sources of information. Obtaining relevant data has, however, proven difficult. Detailed facts about enforcement cases are generally shielded from public scrutiny, including from researchers. Evaluating public enforcement of corporate liability is made even more difficult by the use of non-trial resolutions, for which documentation is far more limited than for court proceedings, and where the calculation of the sanction is often poorly substantiated if it is described at all.

For our case studies we selected five countries - Germany, the Netherlands, Norway, Sweden, and the United Kingdom. For the three areas of corporate liability that we investigated – corruption, money laundering, and violations of competition law (some places referred to as antitrust) –countries in Northern and Western Europe have similar regulations, as described in Section 2, and this applies to our case countries as well.[26] Nonetheless, European jurisdictions differ in important ways with respect to both regulatory details and enforcement practice, and in the choice of countries, we capture some important differences. The UK is a common law country, with a stronger plea bargain tradition

[25] Totally differentiating yields: $\frac{dN^*}{dK} = \frac{-L'(N)q_K(N/K) - L(N)q_{NK}(N/K)}{q_{NN}(N/K)L(N) + 2L'(N)q_N(N/K) + L''(N)q(N/K)}$ where $N^*$ is solution to $L(N)q_N(N/K) + L'(N)q(N/K) = 0$. Under our assumptions the denominator (SOC of the optimization problem of $N^*$) is always negative, while the numerator is positive when $q_{NK}(N/K) = \frac{\partial^2 q(N/K)}{\partial N \partial K} \leq 0$.

[26] Norway is not an EU member, but as a party to the European Economic Area (EEA) Agreement it is required to comply with relevant EU legislation on a similar basis as Member States of the EU.

than the other four countries. Germany is a federation with slightly different practices across its 16 federal states, while criminal law is exclusively a matter of national regulation and enforcement. Sweden and Germany have yet to introduce corporate criminal liability, although enforcement of non-criminal corporate liability is functionally equivalent, as described in Section 2. Although such aspects matter for regulatory performance, we simplify our presentation by focusing on specific features of enforcement as they are reflected in the research material and as they compare to the Section 3 results.

Considering the mentioned five countries, we conducted a search of their legal databases as well as other publicly available databases, supplemented by a general internet search using search engines. Further information was gathered by contacting relevant authorities in the five jurisdictions, with follow-up phone calls as well as formal applications for access to decisions for the purpose of research. This investigation, carried out between June and November 2019, yielded a total of 50 non-criminal and criminal corporate liability cases, including 20 competition law cases, 19 bribery cases, and 11 AML cases (listed in the Appendix). We studied this information, along with complementary data, in order to explore the empirical side of our theory's implications.[27]

Given the 50 cases and the five jurisdictions, we investigate the predictability of sanctions and leniency (4.1) and the relevance of market size as well as the geographical location of the consequences of crime (4.2). In a sub-study of competition law cases at the EU-level, for which more facts are available compared to the other two sorts of offences, we investigate the market consequences of a sanction (4.3).

## 4.1 Predictability of sanctions and leniency

It follows implicitly from the analysis above, as well as general results in the economics of crime, including those derived in section 3, that an enforcement system's ability to deter future crime requires a certain ex-ante predictability of sanctions. Potential offenders ought to know what actions are subject to criminal liability and how the liability is enforced. Likewise, for leniency to spur crime detection as described in Section 3, it must be possible for self-reporters to rely on the enforcement agency to reduce the penalty in return for cooperation. Based on the information we collected about country enforcement systems, we placed countries on a 1-5 scale along these two dimensions, as shown in Table 1, where the country scores are also broken down by type of offence (bribery, AML, antitrust). The scores are the result of our systematic assessment of the regulations and enforcement practices in the

[27] Apart from a sub-study where we investigate the market impact of sanctions, we do not make use of EU competition law cases from the European Commission when comparing enforcement practices in national jurisdictions.

50 cases reviewed. On the left-hand side of Table 1, the country scores reflect the extent to which facts about corporate misconduct and sanctions are available to the public and presented in a manner that makes it possible to assess the proportionality between penalty and corporate misconduct. The harder it is to learn the facts, the higher the score. In countries that score 1, the public has complete access to information about the crime and the sanction, while in those that score 5, it is not even possible for researchers to apply for access to such basic information. The right-hand side of the table presents our scores on the ease with which offenders can predict the sanction reduction (i.e., leniency) they will receive if they self-report and cooperate with law enforcement agencies. Clear guidelines made public and demonstrated application of stated principles in cases earns a score of 1. The score increases the closer we get to a situation where firms have no clear information about the use of sanction reductions upon self-reporting and there is no systematic use of leniency demonstrated in the case material. Hence, Table 1 illustrates variation across the five countries in the extent of access to information about enforcement practices and the clarity with which law enforcers offer leniency to those who self-report.

Table 1: Sanction predictability

| Country | Facts availability | | | Predictable leniency | | |
|---|---|---|---|---|---|---|
| | Bribery | AML | Antitrust | Bribery | AML | Antitrust |
| Germany | 4 | 5 | 2 | 4 | 5 | 2 |
| Netherlands | 4 | 3 | 1 | 3 | 3 | 2 |
| Norway | 4 | 2 | 2 | 4 | 4 | 2 |
| Sweden | 3 | 2 | 2 | 4 | 4 | 2 |
| United Kingdom | 3 | 2 | 1 | 3 | 2 | 1 |

Note: The results on each of the two dimensions of sanction predictability are presented along a 1-5 scale, where a lower score reflects clearer consistency with deterrence (i.e., a better performing system).

On each of the two dimensions, we find sanction predictability to be greater in competition law cases than in corruption or AML cases. Information about sanctions is more available to the public in antitrust cases, and the benefits offered to firms that self-report are more predictable. In this respect, enforcement of competition rules seems better aligned with economic ideas of incentives to report crime and deterrence than enforcement of anti-bribery laws and AML regulations. One likely explanation is the presence of a European supra-national enforcement agency (the Directorate-General for Competition, or DG Comp) in the case of antitrust and the systematic cooperation between competition agencies within the European Competition Network (ECN). There is no equivalent for enforcement of anti-bribery laws and AML regulations. In addition, the rules and conditions for leniency are spelled

out much more clearly in legal instruments and case law, bringing about harmonization as well as predictability across jurisdictions.[28] For the sake of predictability, there is limited discretion with regard to negotiated settlements in cartel cases; either a firm will meet the conditions for leniency, or it can accept a cartel settlement under a procedure adopted in 2008 (with a maximum reduction in the fine of 10 percent).[29]

With respect to bribery and AML-cases, sanction predictability is not only a matter of how well rules are aligned, but also the 'flexibility' with which enforcement agents enforce the regulations. The more discretionary authority (i.e., flexibility) associated with law enforcement, the less predictable the sanctions. Although such flexibility might be used to optimize sanctions, it likely reduces the deterrent effect of sanctions if it implies reduced sanction predictability.

Enforcement flexibility depends on several factors, such as the content of regulations, the relevant agencies' de facto and de jure independence, and most importantly, enforcement agencies' ability to conclude cases without a trial, turning instead to a settlement, formally referred to as a *non-trial resolution*[30] For insight into such variations across the five case countries, we consider the results of a recent survey of regulatory regimes for non-trial resolutions in corporate bribery cases, conducted by the International Bar Association for 66 countries. These data were used to construct a Prosecutor Discretion Index (Søreide and Vagle, 2020a). Scores on this index for our five case countries are shown in Table 2. This index indicates the position of criminal law enforcement agencies, which is normally responsible for pursuing corporate bribery and AML cases (and not, non-criminal regulation, like competition law cases).

According to these results, prosecutors' discretionary authority is higher in the Netherlands than in the other four countries, and lower in the UK. The UK has the most explicit regulations for the use of non-trial resolutions, and it is the only jurisdiction that requires judicial review of such enforcement actions. However, in some of the cases reviewed, such as the Rolls Royce bribery case and the XYZ/Sarclad case, the enforcement processes have spurred debates about too-soft treatment of firms that might be considered strategically important by the government.[31] Nonetheless, the regulatory

[28] See, for example, the Model Leniency Programme adopted by the ECN.

[29] See Commission Regulation No. 622/2008. There is more flexibility with regard to commitments under Regulation No. 1/2003, Article 9, where the European Commission has power to make commitments offered by firms legally binding. However, that procedure is not applicable in cases where the Commission intends to impose a fine.

[30] When it comes to corporate liability, the otherwise substantial difference between criminal regulation and non-criminal/administrative regulation is less pronounced. This is because of the above-mentioned practice of functional equivalence, the use of fines as the main penalty, and an increasing consideration of compliance-based defense. Therefore, for our purpose, we can compare systems regardless of the criminal/non-criminal distinction.

[31] This was so also in the case against BAE Systems, a British defense producer (which is not part of the 50 cases in our review). Then Prime Minister Tony Blair, despite clear evidence of crime, stopped investigation of corruption

Table 2: Prosecutor discretionary authority in corporate bribery cases across the case countries

| Country | Prosecutor Discretion Index | Opportunity to skip the case | De jure bargaining freedoms | De facto bargaining freedoms | Ex-post monitoring |
|---|---|---|---|---|---|
| Netherlands | 3.50 | 4.0 | 4.0 | 4.0 | 2.0 |
| Norway | 2.75 | 4.0 | 1.0 | 2.0 | 4.0 |
| Germany | 2.25 | 1.0 | 1.0 | 3.0 | 4.0 |
| Sweden | 2.25 | 2.0 | 1.0 | 2.0 | 4.0 |
| England &Wales | 1.75 | 1.0 | 1.0 | 3.0 | 2.0 |

Note: The Prosecutor Discretionary Index (Søreide and Vagle 2020a), shown in the data column on the far left, presents the arithmetical average of the scores in the other four columns. The lower the score, the less flexibility there is for prosecutors who enforce corporate liability by means of non-trial resolutions.

space for flexible enforcement is at least as broad in the other countries. The Netherlands has fewer regulations when it comes to the use of non-trial resolutions, and often appears lenient with corporate offenders (Makinwa, 2014). Germany and Sweden, on the other hand, have no criminal liability for corporate offenders, and despite strict criminal law procedure, the lack of explicit regulations on non-trial resolutions give their enforcement agencies more leeway when it comes to corporate liability cases. Similarly, Norway has no stipulated principles for non-trial resolutions and no judicial review of such enforcement actions. Taking into account governments incentives, as found in Section 3, such leeway might be counter-productive with respect to maximization of consumer surplus.

Summarizing our observations of sanctions predictability across the five case countries, we find far more consistency in enforcement practices in competition law cases compared to bribery and AML violations, regardless of enforcement mode, as reflected by the low scores for antitrust in Table 1. The scores presented in Table 2 apply to the enforcement in corporate bribery cases, yet the scores are relevant for AML cases too. Here we find the enforcement systems of the UK and Sweden being the least flexible with respect to corporate liability, and according to Table 1, comparing all three offences, these two countries have the highest sanction predictability in general as well. Among the five case countries, the Netherlands have the most flexible enforcement in corporate liability cases, and probably, the lowest sanction predictability. Generally, our results are consistent with the fact that prohibitions on bribery and money laundering are subject to the more traditional regimes of criminal law, and such rules are not subject to enforcement at the EU level. Competition law, by contrast, implies that EU Member States are required to introduce legal instruments similar to the

in December 2006, claiming that enforcement of anti-bribery law in this case went against the public interest by undermining British jobs and contracts abroad.

powers of the European Commission in their legal orders, and this applies to leniency programs and cartel settlement procedures. Upon this comparison, we find the enforcement procedure and outcome are more predictable where independent specialized agencies have operated for a long time with supra-national cooperation and oversight, and with a clear aim of encouraging offenders to self-report.

### 4.2 Market size, sanction size, and the geographic location of crime

For sanctions to make a crime unrewarding, the penalty level divided by the risk of detection (expressed as a variable below 1) must exceed the gain from the crime. Clearly, the offenders in the 50 cases considered were not deterred by the risk of a sanction. From the outset, however, we do not know if the reason was a miscalculated risk of detection, an anticipated sanction level below what it would take to make the crime unrewarding, an assumption that if detected, one can negotiate oneself out of the problem by accepting a non-trial resolution, or simply, too little information about enforcement to make such calculations. Therefore, we want to know if the sanctions in the cases considered held a level high enough to deter similar crime in the future, although in practice, it is difficult to estimate the necessary variables. The detection rate is impossible to quantify correctly unless we know the actual amount of crime incidents. The burden of a penalty is not expressed by the size of the fine alone; it also includes the enforcement process, the payment of damages, the indirect consequences of the case, and any charges brought against employees and business partners. Not all these facts are known, and those that are available are not necessarily shared with the public, not even for research. In this context, therefore, we have only estimated whether the fine is of a magnitude that *might* deter the sort of crime for which it is imposed. The calculation, which results follow in Table 3, depends on available information that allows estimation of the gains from the crime, and what we consider reasonable expectations about the detection rate. In 26 of the 50 cases, we were not able to obtain reliable information on the the final sanction. For the other 24 cases, we have a rough estimate of the gain from crime and the financial size of the corporate fine. Considering these figures, we calculate what the detection rate required for the penalty to deter crime. For example, in a cartel case from 2012 against Virgin Atlantic Airlines (VAA) and British Airways (BA), VAA reported the offense, and upon leniency received no penalty. Here the sanction principle applied appears to be consistent with the aim of having the firms cooperating with the authorities (as expressed in Section 3.3 proposition 2) because VAA was rewarded fully for self-reporting. Meanwhile, BA received a fine of £58.5 million, and the enforcement agency estimated that BA had a £29 million gain from the offense. For the

Table 3: Market concentration and severity of penalty

| | **High penalty** | **Low penalty** |
|---|---|---|
| **Concentrated** | Ragn-Sells and Bilfrakt $(c, h)$<br>Deutsche Bank $(l, a)$<br>Standard Bank 2015 $(b, a)$<br>Dutch Railways $(c, h)$<br>TeliaSonera $(c, h)$<br>Santander $(l, ?)$ | British Airways $(c, ?)$<br>Rolls Royce $(b, a)$<br>XYZ/Sarclad $(b, a)$<br>Airbus $(b, a)$<br>MAN Ferrostaal $(b, a)$<br>ING Groep $(l, a)$<br>Yara $(b, a)$<br>VimpelCom $(b, a)$<br>Telia $(b, a)$<br>DNB $(l, ?)$<br>Koppang $(l, h)$ |
| **Not concentrated** | Smith & Ouzman $(b, a)$<br>SBM Offshore $(b, a)$<br>Ragn-Sells AB and Bilfrakt $(c, h)$<br>Svenska Förpacknings $(c, h)$ | Siemens $(b, a)$<br>DB Schenker $(b, a)$<br>SBM Offshore $(b, a)$<br>Ballast Nedam $(b, a)$<br>Sædberg and Hodne $(l, h)$ |

Note: Letters $b$, $l$ and $c$ refer to bribery, AML and competition law crime, respectively, while $a$ and $h$ refer to abroad and home.

penalty imposed on BA to deter crime, however, the detection rate must have been nearly 50 percent, which we consider unrealistically high. Therefore, we conclude that the fine imposed on BA was too low for the penalty to deter future cartel cooperation. In a similar manner, and with an assumption that any detection rate above 25 percent is unrealistic, we find that the fines might be high enough to deter similar crimes in a similar situation in seven of the cases, and too low in 17 of the cases, as categorized in Table 3.

Among the cases where the offender was given a relatively low fine, twelve are bribery cases (Rolls Royce, XYZ/Sarclad, Siemens, Airbus, MAN Ferrostaal, DB Schenker, Ballast Nedam, VimpelCom, Telia, SBM Offshore, Standard Bank (2015-case), and Yara); four are AML cases (ING Groep, Santander, DNB, and Sædberg); and two are competition law cases (Asphalt and the above-mentioned airline price-fixing case). Cases where the penalty might be high enough to deter the offense include three competition law cases (Dutch Railways, TeliaSonera, and the case against Ragn-Sells AB and Bilfrakt Bothnia AB), two bribery cases (Smith & Ouzman and Standard Bank 2015-case), and two AML cases (Santander and Deutsche Bank). Yet the estimated gain is very uncertain in the AML cases. Hence, this material indicates that penalties are often below the level necessary for deterrence in bribery and AML-cases, and appear more likely to reach the level of deterrence in competition law cases. One explanation might be the more explicit regulation of the calculation of sanctions in competition law cases, a matter we will return to below.

Given the theoretical results, we also wanted to check if the size of sanctions (i.e., whether considered high or low) varied systematically with the offender's market position and with geographical location of the crime. Calculating the ratio between market concentration and sanctions size is not straightforward. Estimates of market concentration are often uncertain because they require identification of a market, and this is complicated for multinationals that operate across industries. Furthermore, crime is more likely in concentrated markets, as predicted in Section 3, and this may explain systematically higher losses - leading to systematically higher sanctions. Moreover, as we have described above, a penalty that appears to be low might be a result of the offender's self-reporting, thus consistent with the aim to fight crimes by uncovering them.

Considering our 50 cases we could estimate the ratio between penalty and market position for 26 of them. For the assessment of concentration, we use the Herfindahl-Hirschman index score, when such information is available, and otherwise, the concentration ratio (Alexeev and Song, 2013, Cavalleri et al., 2019). For each case, we estimated the mark-up ratio for the specific offenders, as a modified Lerner index, and checked for relevant remarks from market analysts and government. Based on this scant material, Table 3 shows in the upper-right quadrant of the matrix those offenders that both operated in concentrated markets and received a relatively low penalty. The letters $b$, $l$ and $c$ refer to the sort of offence, i.e. bribery, laundering (AML) and competition law, while the letters $a$ and $h$ in the parentheses behind the shortened case-name refer to geographical location of consequences, i.e. abroad and home, as we return to below. Given these estimates, we find there are more cases of corporate liability in concentrated markets than in markets where firms are exposed to tougher competition. The cases where the penalty is clearly below a level able to deter crime outnumber the cases where the penalty might be at a level high enough to prevent future crime. Regarding the sectors that happen to be included in our material, banks appear to be more severely sanctioned than other types of businesses, while defense producers and telecom operators have received low penalties. When it comes to variation across the jurisdictions, the ratio between low and possibly deterrent penalties shows Sweden (0/3) and the UK (3/3) are the more likely to impose severe sanctions, while Germany (5/0), the Netherlands (5/0) and Norway (4/1) are the jurisdictions most inclined to impose low penalties.

Turning to the matter of geographical location of the crime, we categorize the cases listed in Table 3 according to crime happening abroad (a) or at home (h). Among the 16 cases playing out abroad, for which we have evaluated the level of sanctions, only four cases resulted in a penalty that might

have been high enough to deter future crime, while 12 of them resulted in a low penalty. In contrast, in the seven cases where the consequences harmed the domestic market, five cases resulted in a tough penalty, while in two of the cases the penalty was too low for future crime deterrence. In this material, there is a clear overweight of low penalties when the consequences of crime materialize abroad. The table also shows, if there is a tendency to shield powerful firms from heavy sanctions, it happens more frequently when they are liable for bribery in a foreign market than when they are implicated in cartel cooperation or AML violation, regardless of market concentration.[32]

In sum, we find some support for our theoretical results. Crimes for which the consequences materialize abroad, especially bribery cases, are sanctioned less severely than the other categories of offenses. Whether powerful firms are shielded from sanctions is difficult to tell on the basis of these cases, although Table 3 shows firms operating in concentrated markets are often treated too mildly by law enforcers.

### 4.3 The impact of sanctions on competition in markets

A problem for governments that are accountable and want to sanction offenders fairly is the risk that the sanction itself may have harmful market consequences. This concern may help explain why governments sometimes seem to shield corporate offenders from sanctions. To understand whether the sanctions themselves make a difference in markets, we did a separate study of antitrust cases at the EU-level. Information about (de facto) sanction principles is far more available for cartel cases than for criminal cases because the European Commission provides detailed information about all its cases.

Reviewing all antitrust and cartel cases in the period from 1 January 2010 to 10 March 2020, we found 89 cases that resulted in a formal decision. In addition to investigating market concentration, we studied the frequency of mergers in markets after a sanction. In 73 of the cases that resulted in a sanction, the offenders operated in a clearly distinguished sector (with a unique NACE code), and that fact allowed us to consider systematic variation across sectors. Considering 3,363 merger and acquisition (M&A) cases,[33] we first found that the average number of M&As is 14 in the sectors where an offender is fined for anti-competitive behavior (with a median of 8), while it is 8.1 in other sectors (with a median of 4). This finding suggested a pattern across sectors of M&A cases being

[32] As we are interested in the specific jurisdictions' inclination to impose sanctions that deter crime, we have not included any additional sanctions imposed by other jurisdictions in the same case. Therefore, the total corporate penalties in a given case might be higher than what is described.

[33] This material is limited to cases notified to the EU Commission under the European Merger Regulation.

far more common (nearly double) in sectors where one or more firms have been sanctioned for anti-competitive behavior, compared to other sectors.[34] To investigate the strength of the pattern we run linear regressions, as explained in the Appendix 6.3, which confirmed a significant difference in the rate of M&A between industry groups with and without a sanction. By conducting a linear regression with the sanction and the sectors as explanatory variables, we observe that on average, the yearly M&A rate is 2.12 times higher (95% CI: 1.66 to 2.74) when a sanction has been imposed.

While this result confirms the initial finding, the analysis has some weaknesses. It was not possible to make comparisons of categories drawn from the same data set. On one hand, we have data on all the M&A cases submitted to the EU Commission, and on the other hand, we have all the cases of antitrust sanctions by the EU Commission. Hence, the data does not allow for conclusions with respect to the causality between a specific M&A case and a specific sanction. Besides, many M&A cases have been assigned several NACE codes, which means that the sum of M&A cases in the analysis is higher than the actual amount of M&A cases, which means, some NACE codes may be over-represented. Despite these aspects, the analysis confirms a higher M&A frequency in sectors where firms have been subject to anti-trust sanctions. The observation might be a result of market structure, since markets prone to cartelization might be more inviting to horizontal mergers as well. For example, we observe that the fined sectors contain a higher number of cases related to network utility sectors, such as production and trade of electricity and gas, industries that are already more concentrated by nature, akin to their natural monopoly characteristics. There appears to be a clear over-representation of high-concentration markets in the sectors where firms have been sanctioned, and the likelihood of M&A cases taking place after a sanction might be much higher where markets are concentrated. In these settings, a heavy sanction, with a negative impact on profitability, makes mergers even more attractive than in other markets. Of course, competition authorities may intervene against M&As that are harmful to competition, but the standard for intervening under, for instance, the EU Merger Regulation – "a significant impediment of effective competition"[35] – implies that mergers may inflict a loss on the society long before the threshold for intervention is met. It would be sensible for governments to take such concerns into account when they impose sanctions on corporate offenders; however, under the current state of law, a reduction in the level of fines in order to prevent future M&As in the market would not be permissible.[36]

[34] We are indebted to Wouter P. J. Wils (King's College London/European Commission) who suggested we might want to check this pattern.

[35] Regulation No 139/2004 Article 2(3).

[36] See the EU Commission's guidelines on the level of fines in cartel cases.

# 5 Conclusion and policy implications

Internationally, and especially across OECD countries, we are witnessing rapid evolution in the regulation of corporate liability and sanction practices. In this article we investigate the relationship between the nature of a corporate offense, the offender's market position, and political priorities, and clarify why and how governments must take such aspects into account in their efforts to efficiently control corporate crime. Our analysis combines classic results in law and economics with insights from theories on industrial organization and places enforcement challenges in a political economy context. On this basis, we explain why regulation and enforcement are often sub-optimal. Sanctions are not structured optimally, governments are not open about their enforcement practices, and in some circumstances governments prefer to shield corporations from sanctions. Drawing on case material from Europe, we find enforcement practice more efficient when it is subject to supra-national regulation and enforcement.

Our results disclose room for improvement with respect to government priorities in crime control, their sanction principles, and organization of law enforcement institutions. Specifically, the results suggest that governments should consider whether their investigative priorities with respect to profit-motivated crime sufficiently target the offenses with the most harmful impacts on society. The consequences of corporate misconduct are more serious in large markets, especially when the crime distorts competition in markets. The narrow mandate of European competition authorities excludes many forms of profit-motivated crime (Auriol et al., 2017), and therefore the risk of serious market consequences ought to steer priorities for criminal law enforcers and financial oversight bodies as well.

The research discloses significant variation in governments' leeway to enforce corporate liability inconsistently. While there are cross-country variations of several sorts, the differences are more pronounced across the crime-specific enforcement regimes. Compared to corporate bribery cases and AML violations, enforcement in competition law cases is more predictable, more transparent, and more harmonized across countries, and the relevant enforcement agencies are better able to structure sanctions for the sake of inducing offenders to self-report their offenses. In this context, our results emphasize the complementary roles of public and private monitoring. Governments must avoid the temptation to rely too heavily on the crime-detecting effect of their leniency programs: Unless there is a risk of detection by public enforcement agencies, independently of whether corporate offenders cooperate or not, the impact of the leniency programs will deteriorate.

To the extent that there is a government inclination to shield corporate offenders from sanctions,

it is expressed most clearly in corporate bribery cases. In these cases, as in the AML cases, facts about the corporate offenses are far less available, and despite variation across countries, the use of leniency appears more arbitrary, than in competition law cases. We associate this result with the supra-national character of antitrust regulation and enforcement. When it comes to AML regulations and corporate bribery rules, these too are highly harmonized, with enforcement supposed to happen independently, and a certain degree of cooperation between the agencies involved in enforcement. However, for these offences, the supra-national character of regulation and enforcement is weaker, and this fact may explain the categorical differences in de facto regulations across the forms of offences.

The research investigates the relevance of whether the crime happened within the jurisdiction of the enforcement case. While our theory predicts that governments do not sufficiently internalize the consequences of crime that materialize outside their jurisdiction, we find in our empirical material a clear overweight of low penalties in the cases where the harmful effects are felt abroad, which is the case in foreign bribery cases and in a share of AML cases. While this could be a coincidence, the cases reviewed do not negate the concern that corporations whose crime is committed abroad are shielded from severe penalties, and in that respect, the results of the review supports the theoretical predictions. If confirmed upon more comprehensive scrutiny, the result discloses an enforcement pattern that stands in sharp contrast to the uttered government motivations and legal commitments behind foreign bribery and AML regulations.

We also explored whether market concentration matters for the sanction in question, and specifically, if governments' inclination to shield certain corporate offenders might reflect its true trade-off between producer surplus and consumer surplus. Reviewing a large number of competition law cases decided by the European Commission, we found a systematically higher incidence of mergers in markets where corporations have been sanctioned for cartel cooperation. This suggests that there is a serious risk that a penalty for anti-competitive behavior will make the market in question more concentrated. Considering the 50 main cases in this research, we checked to see whether corporate offenders in concentrated markets appear to receive systematically lower penalties, and could not identify any such pattern. Here too, the result is highly policy relevant, yet a clear conclusion requires deeper scrutiny.

More generally, our study shows that governments can do better when it comes to transparency about their enforcement principles and practices. We have explained why there are both legitimate and unacceptable reasons for governments to shield a corporation from severe sanctions. Unless the

legitimate reasons, such as harmful consequences for markets, are reflected in transparent enforcement practice, the public will easily suspect more nefarious reasons for protecting a corporation, such as crony capitalism. Across our selection of cases, we find that sanction predictability and transparency are higher when governments cooperate closely with each other in law enforcement, when there are elements of supra-national authority, and when the offense is regulated by a separate legal instrument. Such features of enforcement reduce the risk that governments will act less forcefully against offenses whose consequences materialize abroad. Hence, the results of our analysis and review show why accountable governments ought to accept international oversight and enforcement for international cases.

In that respect, the European Union's supra-national regulation for competition in markets is a success. For efficient enforcement of profit-motivated crime, however, Europe might have benefited from the presence of an authority like the Federal Bureau of Investigation (FBI) in the United States. In spring 2020 several movements in such direction took place. The European Union established the European Public Prosecutor's Office, an independent EU body with competence to investigate and prosecute crimes that harm EU finances, including at the level of Member States. Europol launched a new European Financial and Economic Crime Centre that will enhance the operational support provided to EU Member States and EU bodies in the fields of financial and economic crime and strengthen financial investigations. In the same period, the European Commission published an ambitious and multifaceted action plan for AML regulation and enforcement. While these initiatives are promising, the development of efficient enforcement mechanisms has been too slow, in large part because governments want to keep control of their criminal law regulations. This barrier to efficient enforcement of corporate misconduct suggests that such offenses ought to be regulated in non-criminal ways, in addition to whatever criminal prosecutions countries may choose to pursue.[37]

# 6 Appendix

## 6.1 Proof of Proposition 1

Note first that under our assumptions $q(1)L(1) = 0$ and $\lim_{N\to+\infty} q(N)L(N) = 0$. Moreover, $\big(q(N)L(N)\big)' = q'(N)L(N) + q(N)L'(N)$ so that $\big(q(N)L(N)\big)' \geq 0$ if and only if $\frac{L'(N)}{L(N)} \geq \frac{-q'(N)}{q(N)}$.

[37] Rui and Søreide (2019) explain the benefits of a two-track enforcement system for corporate bribery cases.

It can now be confirmed that under our assumptions of log-concavity the LHS of the inequality is decreasing in $N$, while the RHS is increasing in $N$. Now we have $\left(q(N)L(N)\right)^{'}_{|N=1} = L^{'}(1) > 0$ and $\lim_{N\to+\infty}\left(q(N)L(N)\right)^{'} = \overline{L}\lim_{N\to+\infty} q^{'}(N) < 0$. This implies that the decreasing function $\frac{L^{'}(N)}{L(N)}$ and the increasing function $\frac{-q^{'}(N)}{q(N)}$ cross once and only once at $N^{*} > 1$ defined so that $\frac{L^{'}(N)}{L(N)} = \frac{-q^{'}(N)}{q(N)}$. QED

## 6.2 Case material

Table 4 presents an overview of the cases considered for this research. All three categories of offenses are listed for all countries in the study, apart from Germany, where facts about AML cases could not be retrieved. Each case is listed with the name of the offender (if the perpetrator's identity is known) or commonly used keywords, plus the year, industry, market concentration (as estimated), the penalty, whether the penalty might deter crime or not, and whether the harms from the crime were felt in the corporation's home country or abroad. The listed penalty includes the total agreed amount reached through trial or settlement, including fine payment, disgorgement, asset recovery, and in some cases compensation. The amount does not include additional fine payments to other countries, such as the United States, which are relevant in several of the cases. The parentheses (m/n) in the penalty column indicate total penalty for m out of n corporate offenders involved. The letters d.m. stands for 'details missing'.

Table 4: The case material

| Violation | Case | Industry/market | Market | Penalty | Deterrence | Location |
|---|---|---|---|---|---|---|
| | **United Kingdom** | | | | | |
| Competition | British Airways (2012) | Air transport | Concentrated | EUR 65.6 million | No | Uncertain |
| Competition | Galvanised steel tanks (2016) | Water storage local market | d.m. | d.m. | | Home |
| AML | Standard Bank (2014) | Banking industry global market | Concentrated | EUR 8.52 million | | Abroad |
| AML | Deutsche Bank (2017) | Banking industry global market | Concentrated | EUR 182.7 million | Yes | Abroad |
| AML | Standard Chartered Bank (2019) | Banking industry global market | Concentrated | EUR 114.6 million | d.m. | Abroad |
| Corruption | Standard Bank (2015) | Banking industry global market | Concentrated | EUR 29.6 million | Yes | Abroad |
| Corruption | Rolls Royce case (2017) | Aerospace industry, energy industry | Concentrated | EUR 752.1 million | No | Abroad |
| Corruption | Smith & Ouzman Ltd. (2014) | Security printing market | Competitive | EUR 2.5 million | Yes | Abroad |
| Corruption | XYZ/Sarclad case (2016) | Technology for steel production | Concentrated | EUR 7.3 million | No | Abroad |
| Competition | Beer price fixing (2015-2016) | Beer production | d.m. | EUR 112 million (11/11) | | Home |
| | **Germany** | | | | | |
| Competition | Candy price fixing (2015) | Candy retail | Concentrated | EUR 60 million (7/7) | d.m. | Home |
| Competition | Asphalt manufacture price fixing (2018) | Asphalt manufacturing | d.m. | | No | Home |
| Competition | SodaStream abuse of dominant position (2015) | Soda maker market | d.m. | EUR 225,000 | d.m. | Home |
| Competition | ZEG bicycle wholesaler (2018) | Bicycle wholesale | Concentrated | EUR 13.4 million | d.m. | Home |
| Corruption | Siemens resolution (2008) | Electronics and appliances | Competitive | EUR 1.45 billion | No | Abroad |
| Corruption | Airbus Defence and Space GmbH (2018) | Aerospace industry | Concentrated | EUR 81 million | No | Abroad |
| Corruption | MAN Ferrostaal (2011) | Oil and gas plant construction | d.m. | EUR 10 million | No | Abroad |
| Corruption | DB Schenker (2016) | Logistics market | Competitive | EUR 2 million | No | Abroad |
| Corruption | No identity Case Bav 2011/2 | Industrial/unknown | d.m. | EUR 35 million | d.m. | Abroad |
| Corruption | Atlas Elektronik (2017) | Arms production | d.m. | EUR 48 million | d.m. | Abroad |
| | **The Netherlands** | | | | | |
| Competition | Concrete cartel case (2015) | Concrete garage manufacturing | Concentrated | EUR 306,500 (1/2) | d.m. | Home |
| Competition | Vinegar cartel (2015) | Natural vinegar manufacturing | d.m. | EUR 1.8 million (1/2) | d.m. | Home |
| Competition | Dutch Railways NS (2017) | Railway operations | Concentrated | EUR 40.95 million (+ contract lost) | d.m. | Home |
| Competition | Forklift truck batteries | Forklift truck battery import | Concentrated | EUR 17.5 million (7/7) | d.m. | Home |
| AML | ING Groep NV (2018) | Banking industry | Concentrated | EUR 775 million | No | Abroad |
| AML | No identity (2018) | Banking industry | d.m. | EUR 40,000 | d.m. | Uncertain |
| Corruption | Ballast Nedam case (2012) | Construction and engineering | Competitive | EUR 17.5 million | No | Abroad |
| Corruption | Telia case (2017) | Telecom market | Concentrated | EUR 274 million | No | Abroad |
| Corruption | VimpelCom case (2016) | Telecom market | Concentrated | EUR 397.5 million | No | Abroad |
| Corruption | SBM Offshore case (2014) | Offshore oil drilling equipment | Competitive | EUR 217.8 million | No | Abroad |
| | **Sweden** | | | | | |
| Competition | Svenska Förpacknings- och Tidningsinsamlingen AB (2018) | Waste management | Competitive | EUR 1.9 million | Yes | Home |
| Competition | Ragn-Sells AB and Bilfrakt Bothnia AB (2016) | Waste management | Concentrated | EUR 0.43 million (2/2) | Yes | Home |
| Competition | Däckia/Euromaster (2014) | Tires and tire service | d.m. | EUR 0.24 million (2/2) | d.m. | Home |
| Competition | TeliaSonera case (2013) | Telecom market | Concentrated | EUR 3.4 million | Yes | Home |
| Competition | Scandorama AB and Ölvemarks Holiday AB (2012) | Tourism | d.m. | EUR 1.06 million (2/2) | d.m. | Home |
| Competition | Asphalt cartel (2009) | Asphalt paving | Concentrated | EUR 26.6 million (5/5) | d.m. | Home |
| AML | Nordea decision (2015) | Banking industry | Concentrated | EUR 4.8 million | d.m. | d.m |
| AML | Handelsbanken decision (2015) | Banking industry | Concentrated | EUR 3.3 million | d.m. | d.m. |
| Corruption | Bravur and Dynamic Sailing (2016) | Construction industry Sailboat manufacturing | NA | EUR 0.3 million (2/2) | d.m. | Home |
| Corruption | KEWB (2018) | Street maintenance | NA | EUR 28,836 | d.m. | Home |
| | **Norway** | | | | | |
| Competition | Gran & Ekran (2012) | Contracting industry | d.m. | EUR 0.2 million | d.m. | Home |
| Competition | Telenor case (2018) | Telecom market | Concentrated | EUR 73 million | d.m. | Home |
| Competition | El-proffen case (2017) | Electrical services | d.m. | EUR 0.1 million (6/6) | d.m. | Home |
| AML | Santander (2019) | Banking industry | Concentrated | EUR 0.8 million | Yes | d.m. |
| AML | DNB case (2019) | Real estate market (commercial) | Concentrated | EUR 27,783 | No | d.m. |
| AML | Koppang Landbruks- og Næringsmegling AS (2019) | Real estate market (agricultural) | Concentrated | EUR 18,522 | No | Home |
| AML | Sædberg & Hodne AS (2019) | Real estate market (commercial) | Competitive | EUR 18,522 | No | Home |
| Corruption | Peab/Vannverk-saken (2008) | Construction industry | Competitive | EUR 0.3 million | d.m. | Home |
| Corruption | Yara (2014) | Fertilizer | Concentrated | EUR 27.3 million | No | Abroad |
| Corruption | Store Norske (2011) | Shipping | Concentrated | EUR 0.4 million | d.m. | Abroad |

### 6.3 Section 4.3 results: sanctions and M&As

The purpose of this sub-analysis is to assess the effect of the anti-trust sanctions from the EU Commission on the rate of mergers and acquisitions (M&A) within the European Union. The analysis is based on data retrieved from the EU Commission database: anti-trust sanction cases and M&A cases from 01/01/2010 to 03/10/2020. The analysis shows there is a significant difference in the rate of M&A between groups with and without a sanction. Upon regression analysis, we find that on average, the yearly M&A rate is multiplied by 2.12 (95% CI: 1.66 to 2.74) when a sanction has been enforced, yet there is substantial variation across sectors.

Reaching this result, M&A cases were grouped by their NACE codes, corresponding to a specific sub-sector (denoted with capitalized letters below), so that each NACE code represents an observation. 'Cases' is the number of M&A cases in each NACE. 'Time' is the duration in years between the date of the first sanction (or 01/01/2010 if there is no sanction) and the end of the period (which is the date of the last M&A case, on the 03/10/2020). 'Sanction' is a dummy variable indicating whether there has been a sanction or not in the corresponding NACE. The observations fit the negative binomial distribution, which is a discrete probability distribution that models the number of failures in a sequence of independent and identically distributed Bernoulli trials before a specified (non-random) number of successes occurs. To test whether the distribution of observations between the group with sanctions and without is significantly different, we used a Mann–Whitney U test, also called Wilcoxon test. This was done to test the median values between the group with sanctions and the group without.[38] The test yielded a statistical value of 17004. The location shift is equal to -1.999 within a 95% confidence interval (-3.999979 - -1.231777e-06) with a p-value of 0.024 (¡0.05). Therefore the alternative hypothesis "true location shift is not equal to 0" is verified. Thanks to the p-value we can assert that there is a significant difference between the groups with and without sanctions.

Several linear regressions were run to assess the effect of a sanction on the M&A rate. First, we used the sanction as an explanatory variable, with the date of the sanction as a control. Secondly, we used the global sectors (A to S) as an additional explanatory variable (sector). Thirdly, we did a regression similar to the second, now with a different grouping of sectors, in order to check variation across sectors (sectors with few observations were grouped together). Eventually, a fourth regression gave the interaction between the grouped sector and the sanction. The regression with 'sector' as

[38] A parametric test would not suit the data since the model is not following a Normal distribution but a Negative binomial distribution. The Mann–Whitney U test uses the ranks to compare the two groups.

a predictor variable (all sectors) is favored by the likelihood ratio test, and these are the results we show here.[39] The table below shows that the effects of Sanction and Sector are both highly significant (p-value¡0,001).

Table 5: Likelihood ratio tests of Negative Binomial Models

| Model | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Theta | 0.9751574 | 1.2709476 | 1.0968403 | 1. 97897 |
| Resid. df | 641 | 623 | 635 | 629 |
| 2 x log-lik. | -4113.699 | -3941.044 | -4036.944 | -4017.984 |

An alternative parametrization of the regression is presented for a more meaningful interpretation of the coefficients of the model (deviation from the mean, specified by "contr.sum"). The table below shows that the effects of Sanction and Sector are both highly significant (p-value less than 0,001).

Table 6: Analysis of Deviance Table (Type III tests)

| Variable | LR Chisq | Df | Pr(>Chisq) |
|---|---|---|---|
| Sector | 224.729 | 19 | < 2.2e-16 *** |
| Sanction | 38.319 | 1 | 6.009e-10 *** |

The effect of Sanction and Sectors are detailed below. The Variable Sector is analyzed with "contr.sum" contrasts, the coefficients are thus interpreted as deviation from the mean effect, and the results show that the annual rate of M&A in sectors A, C, K, L, N, P, R, S deviate significantly from the overall mean.

[39] More details of this sub-analysis can be provided upon request.

Table 7: Coefficients regression with all sectors as main effect

| Variable | Estimate | Std. Error | z value | Pr(> \|z\|) |
|---|---|---|---|---|
| SectorA | -1.57525 | 0.24405 | -6.455 | 1.08e-10 *** |
| SectorB | -0.13138 | 0.24478 | -0.537 | 0.591467 |
| SectorC | -0.46788 | 0.06331 | -7.390 | 1.47e-13 *** |
| SectorD | 0.74602 | 0.27850 | 2.679 | 0.007391 ** |
| SectorE | -0.62313 | 0.27300 | -2.283 | 0.022460 * |
| SectorF | -0.40826 | 0.20610 | -1.981 | 0.047599 * |
| SectorG | -0.20576 | 0.09805 | -2.099 | 0.035854 * |
| SectorH | 0.36605 | 0.17280 | 2.118 | 0.034152 * |
| SectorI | -0.00863 | 0.29763 | -0.029 | 0.976867 |
| SectorJ | 0.08230 | 0.15338 | 0.537 | 0.591586 |
| SectorK | 0.68347 | 0.17743 | 3.852 | 0.000117 *** |
| SectorL | 1.34240 | 0.34068 | 3.940 | 8.14e-05 *** |
| SectorM | -0.55240 | 0.20861 | -2.648 | 0.008096 ** |
| SectorN | -0.57079 | 0.16112 | -3.543 | 0.000396 *** |
| SectorO | -1.51023 | 0.55481 | -2.722 | 0.006487 ** |
| SectorP | -1.91570 | 0.49219 | -3.892 | 9.93e-05 *** |
| SectorQ | -0.32111 | 0.27657 | -1.161 | 0.245626 |
| SectorR | -1.16651 | 0.30352 | -3.843 | 0.000121 *** |
| SectorS | -2.13715 | 0.47231 | -4.525 | 6.04e-06 *** |
| SanctionY | 0.75156 | 0.12796 | 5.873 | 4.28e-09 *** |
| Theta | | 1.2709 | | |
| Std. Err. | | 0.0782 | | |
| 2 x log-likelihood | | -3941.0440 | | |

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

In result of this analysis we find the M&A yearly event rate is multiplied by 2.12 (95% CI: 1.66 to 2.74) when a sanction occurred. The effect is highly significant even after adjusting for the effect of sector. However, the data applied include M&A cases submitted to the EU Commission, on one hand, and antitrust sanctions by the EU Commission, on the other. We have not demonstrated causal connection between sanctions and M&As, and M&As can occur for a range of other reasons than an antitrust sanction. Nonetheless, the result does not reject a hypothesis that sanctions may lead to more concentration in markets.

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