Fraud-perception, superegos, and cultural spread of unethical behaviour: theory and evidence from Enron.

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Abstract

The corporate sector has been rocked by managerial fraud and scandals. We analyse, employing a behavioural and psychoanalytical game theoretic approach, two particular phenomena that may lead to managerial fraud in the corporate sector: a) the tendency for fraud to start on a small scale, perceived by perpetrators as insignificant and inconsequential, but which may ‘mount up’ over time to large cumulative fraud. b) Formerly ethical managers becoming ‘infected’ by the behaviour of unethical managers within an organisation. We consider a simple model in which a manager commits a series of small frauds over time (initially perceived as insignificant). At some critical point the frauds accumulate to a magnitude where they ‘activate’ the manager’s superego. At that point, guilt looms large, which may be sufficient to motivate the manager to cease his fraudulent behaviour, and to admit to previous indiscretions. However, if regret dominates, the manager may be ‘entrapped’ into continuing to further hide fraud. In a second version of the model, we consider an organisation consisting of two managers: one ethical/non-fraudulent and one unethical/fraudulent. We consider how the unethical manager’s behaviour may ‘infect’ the ethical manager, so that the latter is induced to commit fraud, due to the unethical culture of the organisation. We employ our theoretical analysis to help to understand a real-world fraud case (Enron) in which fraud began at small individualistic levels, but quickly escalated and became institutionalized throughout the organization, destroying the company. We conclude with policy and ethical implications, and suggestions for future research.
1. Introduction

In recent years, the corporate sector has been rocked by many episodes of destructive managerial fraudulent behaviour and egregious activity. Prominent cases at the firm level (for example, Enron, Parmalat, Xerox, Tyco, American International Group (AIG), Lehman Brothers, Satyam, amongst many others), and at the individual level (‘rogue traders’ such as Nick Leeson at Barings Bank, Jerome Kerviel at Societe Generale, Kweku Adoboli at UBS, and John Rusnak at AIB), have frequently brought the issue of corporate fraud to public attention.

Given the prominence of such high-profile fraud cases, there have been increasing demands for tougher corporate regulation, stronger governance (e.g. by corporate boards), and more stringent reporting and accounting standards (e.g. SOX (2002) in the USA, the EU’s Audit Directive (2014), and numerous updates to the UK’s governance and auditing framework – FRC, 2016). A feature of these tougher financial regulations is that they aim to deter fraud and other bad managerial behaviour through stringent monitoring and harsh economic penalties. However, one may question, just how effective such tough regulations and punishments can be in deterring fraud, given that corporate fraud continues seemingly unabated after the introduction of tougher regulations and standards in the past?

The debate over the efficacy of addressing corporate fraud through tough governance, regulation and punishment threats is important both from an academic and practitioner perspective. Insights into this debate are provided by considering the traditional rational economics framework (the rational choice model, in which agents are fully rational, unemotional, unbiased, perfect, all-calculating maximisers of expected utility: the homo economicus approach), compared with the behavioural economics framework (which incorporates psychology, bounded rationality and emotions: the real-world homo sapiens approach).

In this paper, we take a behavioural economics approach in order to formally model the economic and behavioural factors affecting managerial corporate fraud. We begin by developing a decision-theoretic analysis (a single manager 'playing' against the system). We then extend our analysis to a game-theoretic approach (two managers 'playing against each other' within an organisation), incorporating behavioural (psychological and emotional)
factors. Our formal theoretical analysis provides important insights into the following questions. Why are managers (as human-beings) susceptible to fraudulent activity? Why do some managers engage in such behaviour, while others are able to resist it? Is it easy for managers to face-up to their misdoings, and ‘come clean’? Or is there a form of ‘fraud-entrapment’ with a ‘slippery slope’, particularly when the manager has committed a series of small frauds over time, which may result in a large cumulative amount of fraud? Are some humans naturally more prone to fraud than others, or are fraudulent managers the product of the culture and environment within their organisations (the classic ‘nature’ versus ‘nurture’ debate)?

A further question for scholars to consider is whether managerial fraud is primarily the result of an economic, cost-benefit type decision, or whether behavioural/psychological/emotional factors are typically at play? This final question is particularly important and relevant to the debate over whether tough regulations and punishment threats alone can be effective in deterring managerial corporate fraud.

1.1. Corporate Fraud: Economic Versus Behavioural Factors

How effective can tough financial regulation and strong punishment threats be at deterring corporate fraud? In this paper, we consider this question by developing a behavioural game-theoretic analysis of managerial fraud, incorporating both a dynamic aspect (current managerial fraud activity may be affected by past, accumulated, misdemeanours over time: thus, managers at the individual level may become entrapped into fraudulent activity), and an organisational/cultural/environmental aspect (such that ethical managers may be dominated and induced into fraud by the existence of unethical managers and an organizational culture which nurtures unethical behaviour: consider, for example, the culture of fraud at Enron).

The seminal work on the economics of crime was developed by Becker (1974) who considers criminal activity occurring as a result of a fully-rational cost-benefit analysis. That is, he considered criminals who weigh up the benefits of the crime (for example, how much money will they be able to steal?) against the costs of the crime (the cost of effort of committing it, the probability of being caught, the extent of the punishment if they are caught, and so forth). Hence, according to Becker, criminals are fully-rational, all-calculating, unemotional, self-interested maximisers of expected utility. Becker’s approach implies that tough financial regulation and strong punishment threats can be effective at deterring corporate fraud. In a review of a series of frauds, and legislative responses that occurred throughout the twentieth century, Rockness and Rockness (2005) for example, focus on purely economic reasons for
managerial fraudulent behavior. Following Becker’s (1974) analysis, they argue that “The incentives for management to engage in unethical practices were driven by personal gain, ego and greed illustrated by opportunistic and exploitative executive behavior to achieve personal objectives…. The use of incentive-based compensation schemes provided the incentives… for fraudulent financial reporting”.

No doubt, inappropriate compensation schemes can be a fraud factor, but the seemingly frequent recurrence of scandals points to potentially inadequate or inappropriate legislative responses, which gives rise to the question whether more fundamental issues are being overlooked. Findings from cognitive psychology and behavioural studies suggest that decision making is not exclusively based on logical reasoning, but is also subject to numerous heuristics and cognitive biases (Tversky and Kahneman, 1974; Kahneman and Tversky, 1979; Fischhoff, 2002), affect (Slovic et al., 2002, 2004), visceral factors (Schelling, 1984; Loewenstein, 1996; Loewenstein and Lerner, 2003), and pressures towards conformity with the group or authority (Asch, 1951; Janis, 1972). Divergence from utility maximization over time adds a temporal dimension to this literature (Strotz, 1955; Thaler, 1981; Laibson, 1997). Cohan (2002) considers corporate governance failings at Enron in terms of information blockage and information myopia. He analyses how these effects may have been driven by a combination of factors: economic (e.g. deliberate concealment of information by officers: “only telling the boss what one perceives the boss wants to hear”), behavioural (e.g. bounded rationality, cognitive dissonance, confirmatory bias, group-think, false-consensus effect), and unconscious emotions.

In the present paper, we have been motivated by two specific departures from Becker’s (1974) economic calculus of criminal (fraudulent/unethical) activity. Discussing the psychological/psychoanalytical underpinnings of fraud at the individual level, Ariely (2008) suggests:

“Sigmund Freud explained it this way. As we grow up in society, we internalise the social virtues. This internalisation leads to the development of the superego. In general, the superego is pleased when we comply with society’s ethics, and unhappy when we don’t.”

Ariely notes that, according to this Freudian framework, the superego provides us with the warm-glow that comes from charitable, other-regarding and ethical acts, such as returning a lost wallet to its owner. However, given the existence of a superego, and our resulting desire to be honest, why are criminal activity and fraud so widespread? According to Ariely, the superego is only active (helping, monitoring and managing our honesty) when we are
engaged in large transgressions. For small crimes or frauds, Ariely argues that the superego stays asleep, and we do not consider how these small crimes reflect on our honesty. The crimes are simply too small to activate the superego. In our model, we take this analysis a stage further by arguing that there may come a point in the process where, after committing a series of small frauds, the manager suddenly realises the cumulative extent of those frauds, and the superego awakes. At this point in time, the manager may then own up to past misdemeanours, or become entrapped in fraud, due to regret1.

Our model is close in spirit to the analysis of Van Winden and Ash (2012). These authors analyse the behavioural economics of crime, and develop a "Competing Forces" model of criminal/fraudulent behaviour. As they point out, current crime-deterrence policies (from governments, law-makers, regulators, and other organisations) suffer from being based on Becker's (1974) standard economics approach, in which criminals conduct a fully rational cost-benefit (CBA) analysis of crime-commission. Becker's approach emphasises strong punishment threats as an effective deterrence: the behavioural economics approach calls this finding into question.

In this paper, we have been further inspired by, and we develop, the behavioural economics model of Van Winden and Ash (2012). Their "Competing Forces" model incorporates rationality, cognitive biases, and emotions. They analyse people as being "boundedly rational, being motivated by emotions as well as cognition. Analytically, this approach conceptualises criminal behaviour (B) as the product of a dual process of cognition (C) and emotion (E)"

Interestingly, Van Winden and Ash consider a linear "action space" of criminality, ranging from zero (minimum criminality) to 1 (maximum criminality level). Then, "We conceptualise the criminal's cognitive and emotional decision systems as generators of force-fields in the action space.... (the model) can be used to show the action tendencies or forces on behaviour at a given level of x". Their model provides a useful means of considering when cognitive and emotional forces act in the same direction, or opposite directions, to push the criminal to more or less crime. We will demonstrate parallels in our behavioural /psychoanalytical model: we,

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1 The pioneers of regret theory were Loomes and Sugden (1982), and Bell (1982). These authors developed economic models incorporating the emotion of regret, and, in particular, the potential for humans to exhibit regret aversion. In our fraud model, we are appealing to their idea, based on psychological evidence, that individuals are able to anticipate the regret that they will feel from a bad decision, or bad outcome. Furthermore, according to regret theory, individuals are able to postpone regret by postponing the actualisation of the bad outcome. In our model, when the superego awakes, the manager realises the regret that he will feel due to the cumulative fraud that he has committed, but is able to postpone that by continuing to hide it. He anticipates that, once the fraud is discovered, his regret will ‘flood his consciousness.’
too, consider an action space for fraud (the manager can commit fraud each period in an interval from zero to a maximum amount). Further, we consider cases where there are competing cognitive and emotional forces "pushing" the manager in one direction or the other (towards maximum or minimum fraud).

Motivated by the model of Van Winden and Ash (2012), we note the following departures:

a). We focus on conscious and unconscious emotions in a psychoanalytical framework (considering a human's superego, which may be asleep for small frauds, or awake for larger frauds), and the interaction between these emotions and a rational cost-benefit analysis.

b). We incorporate the emotions of regret, guilt, and pride. Our approach implies a dual-selves model.

c). We introduce the effect of managerial fraud-hiding efforts, and we consider the possibility of **managerial entrapment into fraud** (neither of which are included in the model of Van Winden and Ash, 2012).

Our analysis of managerial entrapment into fraud has parallels with the work in behavioural corporate finance of Statman and Caldwell (1987), who incorporate regret theory, and regret aversion, into a prospect theory framework to understand managerial entrapment into a failing corporate project, thus refusing to abandon it. The losing project induces the manager to be risk-seeking (prospect theory: people are risk-seeking when facing losses), and regret aversion further cements this entrapment, as the manager postpones the pain of revealing (to the market and to himself) that he made a mistake in investing in a bad project. In our model, we can think of the manager being entrapped into fraud, and continuing to hide it to postpone the painful regret of revealing his fraud.

The second point of departure for our analysis has been motivated by the work of Kulik et al (2008), who analyse the effect of organisational group culture on the spread of unethical practice throughout the organisation. Particularly, they consider how a culture that rewards unethical behaviour may result in the spread of unethical behaviour from unethical to ethical managers. After developing their conceptual framework, Kulik et al (2008) apply this to the case of Enron, with its stacking system for managerial promotion/firing which effectively rewarded and motivated unethical behaviour.

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2 Trinkaus and Giacalone (2005) present an interesting analysis of the spread of unethical behaviour across a broader set of stakeholders (beyond internal management) in Enron: specifically, they consider
Our analysis considers how the Freudian psychoanalytical framework, with the existence of a superego, can explain how managers may fall onto the ‘slippery slope’ to fraud, and may become entrapped in fraud, due to emotions such as regret. In a similar vein, Schrand and Zechman (2011) consider how the behavioural factor of managerial overconfidence may result in this slippery slope to fraud. These authors empirically analyse how overconfident executives with an optimism bias initially and unintentionally overstate earnings. In subsequent periods, when the executives become aware of their financial mis-reporting, they may then become entrapped into intentional mis-statement to cover it up. Our formal analysis supports Schrand and Zechman’s conceptual framework, and their results: in the initial period, the superego is asleep: at a critical point, the superego awakens, and the manager may then be entrapped in deliberate mis-statement.

Fleming and Zyglidopoulos (2007) present a process model that analyses the escalation of deception in organizations. Similar to our analysis, they consider how once-ethical organizations (“Enron, WorldCom, Arthur Andersen and Lucent, did not start out deceitful”) can become involved in a process of fraud-escalation and entrapment (“If undetected, an initial lie can begin a process whereby the ease, severity and pervasiveness of deception increases overtime so that it eventually becomes an organizational level phenomenon.”), noting that their paper contributes to “a growing body of research that looks beyond ‘bad’ individuals for the causes of corporate illegality.” This emphasises the importance of the ‘nature versus nurture’ debate, and sets the scene our analysis, inspired by Kulik et al (2008), that ethical managers may be ‘infected’ by an unethical culture.

Finally, we note that our work has parallels with Davis and Pesch (2013), who develop an agent-based modelling (ABM) approach to examine the emergent dynamics of the spread of fraud across organizations. In their ABM, they draw from Cressey’s (1953) ‘fraud triangle’, in order to consider heterogeneous agents working within an organisation, characterised by differing levels of motive, opportunity, and attitude towards fraud: these varying characteristics contribute to an agent being honest or, conversely, fraudulent. In their simulation, 100 heterogeneous agents (honest or fraudulent) interact with each other. Similar to our work, Davis and Pesch (2013) wish to examine factors and characteristics leading to the spread of fraud across organizations. In their analysis, the emergence and spread of fraud is affected by tone at the top, the number of fraudulent and honest employees, and the systems why the external watchdogs (such as institutional investors, and external auditors) were not ‘barking’: ie were acquiescing in the widespread fraud.

3 Indeed, Sims and Brinkmann (2003) argue that Enron’s collapse was driven by its culture, and the authors argue that “Culture matters more than codes.”
and interventions that the organization has in place to prevent fraud and promote honest behaviour.

Our work complements Davis and Pesch’s (2013) analysis: there are a number of differences in our approaches. By considering an ABM approach, they have a rich and dynamic environment/setting in which to work. They can alter key variables, and create simulations with random effects. In contrast, in our decision-theoretic/game-theoretic analysis, we focus more deeply on the underlying economic, behavioural, emotional and psychological factors affecting individual fraud commission, and spread across organizations. Furthermore, we consider a ‘moral hazard’ (hidden action) element, not considered in Davis and Pesch (2013): that is, we consider a manager who chooses how much fraud to commit each period, and how much costly effort to exert on hiding it from monitors. This is a contribution of our analysis: these managerial decisions are driven by the economic and behavioural incentives in his utility function/payoff structure.

Given our research objectives, it is sufficient for us to analyse a dyad: two (types of) manager: fraudulent (unethical) and honest (ethical). Our setup allows for deeper analysis, employing utility functions, to examine economic incentives (such as punishment threats and lost reputation), behavioural and psychological factors (such as overconfidence: underestimating the level of fraud being committed, and the reputation costs if discovered) and emotions (such as regret and guilt). Furthermore, we cast our analysis in a psychoanalytical framework, motivated by Ariely (2008), in which we consider the effect of conscious and unconscious emotions, and the role of the super-ego (being asleep or awake) in monitoring the manager’s fraudulent behaviour. In contrast, Davis and Pesch model the effect of the fraud triangle using the programing methods within ABM.

Similar to Davis and Pesch (2013), we consider the spread of fraudulent behaviour across organizations. Davis and Pesch incorporate an influence function. We consider fraudulent spread in terms of differing utility functions for fraudulent and ethical managers, interacting with the unethical culture of the organization, which we model using fraud-infection and fraud-reward parameters. In short, Davis and Pesch’s ABM approach has breadth, but not depth, whereas we have depth, but not breadth. However, our work provides a basis for ABM modelling.

Furthermore, Davis and Pesch obtain dynamic and cyclical results for fraudulent behaviour, while our focus is on managerial fraud-entrapment, and snowballing effects across organisations. Hence, we focus on fraudulent organisations, such as Enron, where a set of

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4 Indeed, they note that “Since agent-based models are simulations, they rely on both deduction and induction. While each such model is a strict deduction and constitutes a sufficiency theorem (that proves existence but not uniqueness), multiple simulations can be thought of as a distribution of theorems that together are used to inductively test a proposition (Epstein 2006). Thus, the flavor of ABM research is more similar to laboratory experimentation than to deductive proofs.”
forces were set in motion, such that fraud escalated, and eventually destroyed such companies. However, similar to Pesch and Davis, we could extend our model to consider how ethical behaviour can spread instead, and how we could obtain cycles of fraud and honesty.

1.2. Game Theory, Corporate Governance and Ethics

Our model employs a game-theoretic analysis to consider the economic and behavioural factors affecting managerial fraud in organisations such as Enron. Other game-theoretic approaches exist that analyse various aspects of corporate governance and ethics. For example, in a series of papers, Sacconi (1999, 2006, 2007) develops a conceptual, philosophical and game-theoretic analysis of a social contract approach (which considers all stakeholders) to understanding ethical behaviour in an organisation. Cast in the new institutional theory of the firm framework, Sacconi’s contractarian approach focuses on unethical behaviour regarding the abuse of authority, and the effects of contracts necessarily being incomplete, due to ex post uncertainty and unforeseen circumstances that cannot be fully understood or described in the ex ante initial contract. In Sacconi’s papers, this ex post uncertainty can be mitigated in the initial contract by appealing to “fuzzy logic” and “fuzzy set” theory. In practical terms, this approach argues for loose, principles-based contracts, rather than strict rules-based contracts. Furthermore, Sacconi argues that the social contract can be considered, in practical terms, as a firm’s code of ethics.

In addition to arguing for a principles-based ‘fuzzy’ social contract, Sacconi’s series of papers gradually develop the ‘story’ along the following lines. First, he considers the optimum framework for the initial social contract. Sacconi (2006) argues that the contract should be ex ante acceptable to all parties, and hence implementable. The way that Sacconi deals with this is as follows. The social contract is based on economic bargaining models, particularly Nash bargaining over the expected economic surplus generated from the organisational relationship. This bargaining is structured in such a way to ensure fairness and impartiality: hence all parties are happy to sign it, and it is indeed implementable. In Sacconi (2007), he argues that ex ante implementability is one thing: however, ex post compliance is quite another. Why should parties adhere to the initial agreement as the situation unfolds? This speaks directly to the ex post abuse of authority. Sacconi (2007) argues that such ex post opportunism can be mitigated by long-run and dynamic reputation effects, and he considers a repeated Prisoner’s Dilemma game in which reputation drives compliance and mutual cooperation.

Sacconi’s work is based on a homo economicus approach, in which the players are self-interested, fully-rational, unemotional, non-psychological, unbiased maximisers of expected
utility. Hence, compliance has to be individually rational, and is enforced by fear of damaged future reputation if agents defect from the agreement (the ‘shadow of the future’ in repeated prisoner dilemma terminology)\textsuperscript{5}. Furthermore, it is assumed that agents, being fully rational, can calculate, and can fully comprehend, the extent of the effects of their defection. In our model, we consider homo sapiens, not homo economicus. The manager in our analysis is capable of feeling emotions and may be psychologically biased. Particularly, we consider a psycho-analytical approach, in which a manager’s ethicality is governed by his superego, not by external economic factors, such as reputation. In our dynamic model, the manager may not be able to ‘look ahead’ rationally (unlike in Sacconi’s approach), since his superego may be asleep for small frauds. Sacconi’s rational economics approach may be considered in terms of standard economics and standard game-theory: our approach, on the other hand, may be considered as falling into the realm of behavioural economics and behavioural game theory. Comparing our approach with Sacconi’s is useful for considering real-world fraud cases, such as Enron. The Enron case demonstrates that the fully-rational homo economicus approach may not be appropriate in real-world fraud cases: fraud and abuse of authority can arise in an organisation through psychological, behavioural and emotional channels.

Another game-theoretic approach has been developed by Cosimano (2004). He employs a repeated Prisoner’s dilemma framework, with punishment threat, to analyse why tier 1 financial institutions failed to carry out their fiduciary duties in auditing, monitoring and controlling Enron. Cosimano’s approach is heavily based on the economic approach in which fully rational self-interested utility-maximising agents act opportunistically unless constrained by future punishment threats. Hence, Cosimano argues for strong contracts, legal codes and punishment. We argue, supported by our behavioural game-theoretic analysis, that policy-makers need to understand both the economic and the behavioural/psychological factors affecting fraud-commission and fraud-entrapment.

Our work has parallels with the modelling approach of Corona and Randhawa (CR 2010). These authors develop a two-period game-theoretic model, consisting of a manager (of two possible types: honest or dishonest) and an auditor (of two types: high-ability or low-ability in fraud-detection). They consider the incentives for managerial fraud, and the possibility for the auditor to fall onto a ‘slippery slope’ whereby the auditor may become

\textsuperscript{5} We do not focus on the reputation-damaging/economic punishment threat mechanism for enforcing ethical compliance/non-abuse of authority in our present paper. Instead, we focus on the latter issue: control of unethical behaviour by the superego, and the ‘bounded rationality’ of managers when committing small frauds, such that the superego remains asleep. In a future paper, we will work on developing Sacconi’s work to consider whether players may comply to the Social Contract due to social preferences (fairness, trust, empathy) in a one-shot game, rather than the punishment threat in a repeated game.
entrapped into hiding the manager's fraud. CR focus on the reputation-incentives for the auditor to hide the fraud. The idea is, if the auditor missed fraud in the first period, then he is less inclined to reveal fraud in the second period, as this may damage his reputation: the market will believe that he is likely to have missed previous, first-period fraud. Effectively, the auditor may become entrapped in hiding the manager's fraud, as, missing it in the first period, the auditor may feel it is better to hide it again in the second period.

We note interesting parallels and differences between CR's and our current model. In CR's model, the manager and the auditor are rational. Furthermore, CR focus on the dishonest type in their analysis. This rational dishonest manager conducts an economic cost-benefit analysis of fraud-commission, given the manager's expectation of auditor behaviour. In contrast to CR, we do not consider the auditor as a player in the game: in our game, the manager faces an exogenous probability of fraud-discovery. This enables us to focus more deeply on the manager's fraud-incentives.

In contrast to CR, we consider both economic and behavioural/emotional/psychological/psychoanalytical factors affecting the manager's fraud level (in the spirit of Van Winden and Ash 2012, as outlined above). This enables us to consider more deeply why a manager may commit fraud, rather than simply assuming types. Furthermore, our analysis considers the complexity whereby the manager is not simply an honest or dishonest type, but his dishonesty may be governed by his superego, which may be asleep for small frauds, and may wake up at a critical level of cumulative fraud: his superego awakening changes his payoff function, incentives and behaviour. In our model, the manager may become entrapped in fraud, for economic and/or behavioural reasons (in contrast to CR, who consider a rational manager influencing the auditor's rational entrapment behaviour).

We note that our model has the potential to complement that of Corona and Radhawa (2010). CR consider the game-theoretic interaction between the auditor and the manager, where both players are rational (homo economicus). In contrast, our model ignores the auditor, but focuses on the behavioural/psychological conduct of the manager. Furthermore, we consider managerial fraud-hiding efforts (not considered in CR). Thus, in our model, the manager is making two decisions in each period: how much fraud to commit, and how much effort to exert in hiding it. Our model enables deeper analysis of managerial fraud behaviour than CR provide. However, we note that, for future research, it would be desirable to combine our approach with CR to gain a more complete picture of behavioural managerial fraud in the face of auditor fraud-detecting efforts.
We now proceed to our analysis, which considers both the economic and behavioural/psychological reasons for fraud and fraud-entrapment.

2. Our model

We begin by considering a firm run by a single manager, before extending the model to consider dyadic management. Thus, our first model enables us to focus on individual managerial fraudulent behaviour, and the role of the superego in fraud entrapment, abstracting from any environmental and organisational effects. Our second model incorporates environmental, contextual and organisational effects by considering ‘fraud-infection’ across the dyad.

2.1: Model 1: Single Manager

We consider a behavioural model that analyses managerial fraudulent behaviour. We consider a risk-neutral manager who has the opportunity to commit fraud in each period of his firm’s existence. Particularly, we focus on a manager who initially considers fraud on a period-by-period (myopic) basis, and considers fraud as small and inconsequential. Each period, there is a probability that the fraud is discovered (by, for example, external stakeholders, such as auditors, regulators, investors, the general public). Since the manager views this fraud as small and inconsequential, he underestimates his utility-loss in terms of lost reputation and financial punishment. During this period of the game, the manager focuses on an economic cost-benefit analysis of fraud-commission. However, at a critical period, the manager is ‘hit’ with the realisation that each period’s small fraud has ‘mounted up’ to a large cumulative fraud. This activates his ‘superego’, which is capable of considering behavioural feelings of guilt and regret. Hence, the manager now conducts a behavioural cost-benefit analysis of fraud commission.

We model this game formally as follows. During the first time-period from period 1 to critical period $n_c$, the manager’s superego remains asleep. At the critical period $n_c$, the manager’s superego awakes. In each period, the unethical manager makes two decisions: a) how much fraud to commit, and then b) how much effort to exert in hiding the fraud. We solve each period’s optimal decision-making ‘backwards’: that is, in each period, we solve for the manager’s optimal fraud-hiding efforts, given the fraud level, and then move back to determine his optimal fraud-level in that period. We denote fraud in period $n$ as $f_n$, and we assume that there is a maximum level of fraud $\tilde{f}$ that he can commit each period. We denote
his fraud-hiding effort as \( e \). Effort is costly for the manager: his cost-of-effort function is \( \beta e^2 \). This exhibits increasing marginal cost of effort.

Each period, there is an exogenously-given probability \( q \in [0,1] \) that the manager’s fraudulent activity will be discovered (by external stakeholders, such as the company’s auditor, the regulator, the investors, the general public). We assume that, if any level of fraud is discovered, the organisation collapses (as in the Enron case), and the manager suffers a huge economic (lost job, lost reputation, lost future employment elsewhere) and behavioural (guilt, regret) utility loss. He may also suffer legal punishment/imprisonment (which has huge economic and behavioural costs).

In order to solve the game, we need to specify a payoff function for the period in which the superego is asleep, and for the period when the superego awakes. When the superego is asleep, the manager’s expected payoff in each period \( n \in [1,n_c) \) is:

\[
\Pi_n = (1-q)f_n + q[f_n(1-(1-e\gamma)\hat{\gamma})] - \beta e^2
\]  

(1)

The first term represents the manager’s expected payoff in the case that fraud is not discovered. \( f_n \) represents the level of fraud that the manager commits in period \( n \) (one of the manager’s two decisions each period). The first term captures the idea that the unethical manager gains positive utility from committing fraud. If the fraud is not discovered (which happens with probability \( 1-q \)), this utility is undiminished. The second term represents the manager’s payoff in the case that fraud is discovered (which occurs with probability \( q \)). In that case, the manager’s payoff from committing fraud is diminished by his perception of lost reputation \( \hat{\gamma} \) from being discovered as fraudulent. \( \gamma \) represents his fraud-hiding ability: recall that \( e \) is his fraud-hiding effort. Thus the higher is the product of his ability and effort \( e\gamma \), the more fraud he is able to hide in the case that fraud is discovered. For example, if \( \gamma e = 0 \), he does not hide any fraud: if fraud is discovered, he suffers ‘full-utility loss’: \( f_n(1-\hat{\gamma}) \). As \( \gamma e \) increases, his utility loss due to perceived loss of reputation reduces. At the maximum level of \( \gamma e = 1 \), the manager suffers no utility loss when fraud is discovered: \( f_n(1-(1-\gamma e)\hat{\gamma}) \) becomes \( f_n \). The final term in equation (1) is the manager’s cost of fraud-hiding effort.
In equation (1), we are modelling the idea that, when the superego is asleep, the manager only considers fraud in the current period: he ignores/writes-off previous fraud: he does not consider cumulative fraud: he focuses on current period fraud. This reflects the idea that he considers fraud as ‘small and inconsequential’.

Furthermore, in the period when the superego is asleep, he focuses on an economic cost-benefit analysis: thus, he considers the economic cost of lost reputation. Furthermore, he considers his perception of lost reputation. We assume that he underestimates this factor: the true lost reputation is $R > \hat{R}$. Note that the true lost reputation will appear in payoff (2) below, when the manager’s superego awakes.

We solve for the manager’s optimal (that is, payoff maximising) fraud-level and fraud-hiding efforts in the period of the dormant superego ‘backwards’: that is, we first take as given the manager’s choice of fraud level in period $n$, and find his optimal effort level by solving

$$\frac{\partial \Pi_n}{\partial e} = 0$$

in equation (1). We then substitute that optimal effort level into equation (1), and solve $\frac{\partial \Pi_n}{\partial f_n}$. Under certain parameter assumptions, we obtain the following.

**Lemma 1:** In the period when the superego is asleep: $n \in [1, n_c)$,

a) The unethical manager only considers fraud in each period (ignoring previous cumulative fraud): Therefore, he views fraud as small and inconsequential, and he commits maximum fraud per period: $f_n = \bar{f}$.

b) The unethical manager exerts fraud-hiding effort $e^* = \frac{q\bar{f} \gamma}{2\beta}$.

Therefore, M’s fraud-hiding effort is positively related to the probability of fraud-discovery, the level of (maximum) fraud in period $n$, his ability to hide fraud, and his perceived lost reputation from being discovered. Note that he underestimates the true lost reputation from fraud-discovery, so he undersupplies fraud-hiding effort (that is, if he understood the true level of lost reputation, he would work harder to hide fraud). His fraud-hiding effort is negatively related to his effort-cost of hiding fraud.

Before considering the period where the superego awakes, it is worth considering one of our assumptions in more detail. We have assumed that, if fraud is discovered, the organisation
collapses, the manager loses his job, and the game ends. However, above, we have modelled
the business-as-usual case, where the game continues for the full term of the dormant
superego, with the manager committing the same maximum fraud, and fraud-hiding efforts as
in result 1, identically for each of the periods \( n \in [1, n_c) \).

Of course, as the game continues through this time interval, the probability of fraud-discovery
by outsiders, such as the auditor, increases. In our model, the probability of avoiding fraud
discovery by the time we arrive at period \( n \) is \((1 - q)^n\).

Our modelling approach is based on the firm continuing. One way is to consider a very low
probability of fraud-discovery. As an example, if we assumed that the probability of fraud-
discovery is \( q = 0.1 \), (10% chance of being discovered/90% chance of getting away with it
each period!) then the probability of avoiding fraud discovery by the time we arrive at period
5 is \(0.9^5 = 0.59\). Even to survive fraud-investigations to period 10 has quite a high
probability: \(0.9^{10} = 0.35\). Our model then focuses on the case where the firm avoids fraud
discovery for a sufficiently long period to make our model meaningful.

We now turn to considering the critical time period \( n_c \) where the superego awakes. We
consider that the superego awakes when the ‘small and inconsequential’ period-frauds mount
up to a large level of cumulative fraud that triggers the superego. Thus, we define a critical
level of cumulative fraud \( F_c \), where, if \( F \in [0, F_c) \), the manager’s superego is dormant. If
we reach period \( F_c \) without fraud being discovered (see discussion above), the superego
awakes.

In result 1 above, we demonstrated that, when the superego was asleep, the manager exerted
the same level of fraud each period, being the maximum physical amount per period \( \bar{f} \).
Therefore, the critical level of fraud \( F_c \), at which the superego is awakened, can be
translated into a critical time period \( N_c = \frac{F_c}{\bar{f}} \). To clarify analysis, we assume that \( \bar{f} \)
divides into \( F_c \) exactly, so that, at \( N_c \), cumulative fraud has reached the exact level of
critical fraud (this is not an essential assumption, but it makes the analysis neater and clearer).
Thus, when we reach period $n_c$, cumulative fraud is such that the superego awakens. We specify the unethical manager’s payoff, when the superego awakens, as follows:

$$\Pi = (1 - q)(F_c[1 - G]) + qF_c(1 - \gamma e G - (1 - \gamma e)(R + r)) - \beta e^2.$$  

(2)

We designed this payoff to capture the various conflicting economic and behavioural/psychological/emotional factors in the fraudulent manager’s mind when the superego awakens, and he realises the extent and level of his cumulative fraud. The reader is invited to compare payoff (2) with earlier payoff (1) when the superego was asleep: we observe parallels in these two payoffs.

When the superego was asleep, the manager only considers period fraud (thus $f_a$ in payoff (1)). Now that the superego is awake, he considers cumulative fraud $F_c$ in equation 2. As in equation (1), the unethical manager gains some positive utility from fraud-commission (Ariely (2010) discusses how criminals and fraudsters may gain some pleasure and excitement from ‘committing the perfect crime’, cheating the system and getting away with it!): but now, in equation (2), the positive utility comes from cumulative, not period fraud.

As in equation 1, the payoff in equation 2 captures both the case where fraud is not discovered (with exogenous probability $1 - q$), and the case where fraud is discovered (with exogenous probability $q$). The first term of equation (2) demonstrates that when the superego awakes, then, if fraud is not discovered, the manager enjoys the excitement of committing cumulative fraud ($F_c$). However, compared to equation (1) when the superego was asleep, the manager now feels a level of guilt, acting as a psychological ‘cost’ on utility: $(1 - G)$. Note that $G$ is a fraction between zero and 1, and represents the proportion of the utility from $F_c$ ‘lost’ due to painful feelings of guilt.

The second term in equation (2) represents the case where the fraud is discovered. In our model, the manager’s fraud-hiding effort $e$ reduces the amount of fraud to be discovered: effectively, the harder that he works at hiding fraud, the more fraud that he can put out-of-sight of external bodies, such as the auditor. For example, in the Enron case, much managerial

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effort was exerted in creating complex accounting methods and financial instruments, such as SPEs, to hide large levels of fraud from the external auditor.

In the second term of payoff 2, $R$ represents his true lost reputation when his fraud is discovered. We focus on the case where $R > \hat{R}$ (that is, the manager underestimated his lost reputation when considering small frauds in equation 1, but now realises the true extent $R$ of his lost reputation if the cumulative fraud is now discovered). Furthermore, in the second term, $r$ represents managerial regret from committing fraud after it is discovered. As noted earlier in the paper, this follows the behavioural research into regret theory (Bell 1982; Loomes and Sugden 1982) which suggests that people only feel regret when the loss becomes ‘real’. Also, as noted previously, the manager only feels guilt $G$ if fraud is not discovered.

In our model, the manager has no control over the probability $q$ of fraud-discovery (for example, the manager cannot ‘make’ the auditor discover fraud: if the auditor lacks independence, and wishes to ‘turn a blind eye’, or exert low effort into finding fraud, the manager cannot make the auditor discover fraud). Thus, when considering his expected payoff, he faces two possible guilt-situations: in the first case, he feels guilt when fraud is not discovered (the first term of equation 2): in the second case, he feels guilt when fraud is discovered, but he has hidden some away (eg: in SPEs): this is captured in the second term of equation 2.

The second term in payoff 2 captures an interesting trade-off for the unethical manager when the superego is awake. The manager feels guilt $G$ for the amount of fraud hidden away (being discovered and ‘coming clean’ is ‘good for the soul’). On the other hand, the manager suffers both from lost reputation and from regret due to the amount of fraud discovered. The manager thus faces an interesting trade-off and economic/psychological conflict in his mind when deciding on his fraud-hiding efforts: as he increases his fraud-hiding efforts, he gains in terms of reducing the negative effects of lost reputation and regret. However, he increases the utility-loss associated with guilt. These two opposing effects are interesting. Lost reputation and regret drives the manager to work harder to hide fraud, while guilt drives him to work

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7 We emphasise that, in our analysis, we do not consider the auditor as a player in the game. The probability of fraud-discovery $q$ is exogenously given, but may implicitly capture our discussion on the reasons why the probability of fraud-discovery is beyond the manager’s control, such as the psychological motivations of the auditor herself. Many papers exist, considering a game-theoretic approach in which a manager and an auditor are both players in the game. See Anastasopoulos and Anastasopoulos (2012) for a good example of such a game-theoretic approach, plus a good review of related literature.
less hard to hide fraud: his optimal fraud-hiding effort depends on which of these two effects dominate. Result 2 captures this trade-off in the manager’s fraud-decision.

We solve for the manager’s optimal fraud level and fraud-hiding efforts exactly as described when deriving result 1. We obtain proposition 1: (which incorporates lemma 1 to give the complete picture). Note that proposition 1b), that the manager reduces period fraud to zero, depends on certain parameter assumptions.

**Proposition 1:**

a) When \( N \in [0, N_c) \), the superego lies dormant. The manager only considers period-fraud. He commits the maximum ‘small’ fraud each period: \( f_n = \tilde{f} \), and exerts fraud-hiding efforts \( e^* = \frac{q\tilde{f}\tilde{\gamma}}{2\beta} \).

b) When \( N > N_c \), the superego is activated, and the manager experiences feelings of guilt and regret. Furthermore, he now turns his attention to cumulative fraud. The manager reduces his period- fraud to zero. Although he commits no more fraud, he exerts fraud-hiding efforts \( e^* = \max(\frac{qF_c\gamma[R + r - G]}{2\beta}, 0) \) (in order to hide the existing cumulative fraud). When his guilt is low compared to lost reputation and regret: \( G < R + r \), the manager exerts some fraud hiding efforts. When his guilt is high compared to lost reputation and regret: \( G \geq R + r \), he reduces his fraud-hiding efforts to zero.

We summarise these results in diagrams 1 and 2.
In diagram 1, the thinner lines represent per period fraud. The thick black lines represent cumulative fraud. In summary, the manager uses a cost-benefit calculation (as in Ariely’s
discussion). Up to time $n_c = \frac{F_c}{f}$, he views the frauds as small, his guilt is low, and therefore, he commits fraud. After time $n_c = \frac{F_c}{f}$, fraud becomes large enough that his superego kicks in, activating guilt, such that he stops fraud.

Diagram 2 captures an interesting effect: although the manager stops committing fraud, his fraud-hiding efforts are determined by his relative feelings of guilt and regret, together with his lost reputation. If guilt dominates, then he reduces his fraud-hiding efforts to zero. If lost reputation/regret dominates, he increases his fraud-hiding efforts (as he now considers cumulative, rather than period fraud). This can be considered as a kind of fraud-entrapment. In the early periods, he perceived the fraud as minor, and so committed it without guilt, and exerted low fraud-hiding efforts. In the latter periods, he views the cumulative fraud as large, and is now entrapped into hiding it.

3. A dyadic model of fraud-infection

Thus far, we have considered an individual manager, acting in isolation. We now extend the model to consider the possibility that unethical practice (such as fraud) may spread throughout an organisation, as unethical actors ‘infect’ ethical actors. In this work, we have been inspired by Kulik et al’s (2008) conceptual model of the spread of unethical behaviour. Following the second part of Kulik et al’s model, we focus on a dyadic relationship between two types of manager: an ethical (non-fraudulent) and unethical (fraudulent) manager. We note a difference between the two managerial types that has interesting policy and ethical considerations. The unethical manager acts exactly as in model 1, as described in results 1 and 2. That is, he performs a cost-benefit analysis, with the superego asleep for the first $n_c$ periods (purely economic cost-benefit analysis), after which the superego awakes (economic and behavioural cost-benefit analysis). In performing these calculations, the unethical manager considers the probability of fraud-discovery. In contrast, the ethical manager does not perform such a cost-benefit analysis, and does not consider the probability of being caught. In our model, the ethical manager acts according to his character (is it in his character to commit fraud?), but may also be affected by the organisational culture.

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8 Note that, in this version of the model, we no longer consider fraud-hiding efforts, as in the first model. In this version, there is only one decision in each period for both types of manager (ethical and unethical): whether to commit fraud or not. Our focus in this section is on the factors driving the spread of unethical/fraudulent behaviour from the unethical to the ethical manager. Of course, there may be fraud-hiding efforts at the top of the organisation (as was the case in Enron, for example). We leave this senior-level fraud-hiding effort unmodelled.
We model this as follows. The unethical manager still faces the payoff as in (1), and acts as in the first model, as described in results 1 and 2. The ethical manager, on the other hand, is a different ‘beast’ and has the following payoff:

\[ \Pi_E = U - gf_n + \psi \]  

(3)

where \( U \) represents the ethical manager’s ‘base utility’ from working in the organisation, and \( gf_n \) represents his guilt (parameter \( g \)) from committing period fraud \( f_n \). Due to the multiplicative nature of this element of his payoff, \( g \) can be thought of as ‘guilt per unit of fraud’. Thus, the higher is \( g \), and/or the higher is \( f_n \), the higher the total guilt felt by the ethical manager. We assume that \( g \) is strictly positive for the ethical manager; thus, in the absence of the final parameter \( \psi \) of equation (3), payoff \( \Pi_E \) is strictly decreasing in guilt. That is, an ethical manager would optimally choose zero fraud to maximise his payoff.

It is the final parameter of equation (3), \( \psi \), that brings the interest to our dyadic model. We term \( \psi \) the unethical infection parameter, and it provides the link from the unethical manager’s to the ethical manager’s behaviour, as follows.

We model unethical infection as:

\[ \psi = \theta \Delta (n - 1) \quad \text{if} \quad f_n(E) = f_n(U) \]

\[ \psi = 0 \quad \text{if} \quad f_n(E) < f_n(U). \]  

(4)

The first part of equation (4) states that the ethical manager only gains utility \( \psi \) if he ‘matches’ the unethical manager’s level of fraud: \( f_n(E) = f_n(U) \). If he commits any level of fraud lower than the unethical manager, \( f_n(E) < f_n(U) \), then the ethical manager gains zero utility from unethical infection: \( \psi = 0 \).

\( \theta \) is the unethical infection rate: that is, the extent to which unethicality spreads across an organisation from unethical to ethical members. \( \Delta \) is the ‘organisational reward’ for being unethical. Thus, for example, in Enron, we would expect both parameters to be large: much research demonstrates that Enron was organised such that both the infection rate, and the rewards for being unethical, were large in Enron. Breaking down the total level of unethical
infection to these two factors (infection rate, and organisational rewards for unethical behaviour) may be interesting for empirical analysis of fraud across organisations, as we suggest that both elements play a role in the spread of fraud. The factor \( n - 1 \) is in the equation to represent the growing pressure on the ethical manager to commit fraud as time goes on.

In our dyadic model, the actions of the unethical manager remain as in model 1 (that is, he is isolated from the behaviour of the ethical manager). Thus, the unethical manager continues to commit maximum fraud in the period when the superego remains asleep: \( N \in [1, N_c] \). Thus, given that the unethical manager commits maximum fraud per period, then (4) demonstrates that the ethical manager only achieves \( \psi = \theta \Delta (n - 1) \) if he mimics the unethical manager by committing maximum fraud in the period. If he commits any amount of fraud lower than the maximum per-period level, he will commit less fraud than the unethical manager, and his unethical reward, from (4) will be \( \psi = 0 \). Formally, incorporating (4) into (3), the ethical manager’s payoff, when he commits less-than-maximum per-period fraud (given that the unethical manager is committing maximum fraud in each period) is:

\[
\Pi_E = U - gf_n. \tag{5}
\]

On the other hand, if the ethical manager mimics the unethical manager by committing maximum per-period fraud, the ethical manager’s payoff is:

\[
\Pi_E = U - gf_n + \theta \Delta (n - 1). \tag{6}
\]

Considering (5) and (6), the ethical manager’s payoff is decreasing in fraud in (5) (that is, for any level of fraud up to, but just less than, the maximum level). If the ethical manager commits maximum fraud, then his payoff jumps up by the final term in (6).

Therefore, from (5) and (6), the ethical manager either commits zero fraud, or maximum fraud. Thus, (5), with zero fraud, becomes:

\[
\Pi_E = U \tag{5a}
\]

In order to decide on his optimal level of fraud (zero or maximum), he simply compares (5a) and (6), to observe which is larger. This reduces to the following result. The ethical manager commits maximum fraud in a period if \( \theta \Delta (n - 1) > gf_n \); otherwise, he commits zero fraud.
We note the following. In the first period \((n = 1)\), the ethical manager faces zero unethical infection: \(\psi = \theta \Delta (n - 1) = 0\). Thus, \((5a) > (6)\), and he commits zero fraud. Now, throughout the period when the superego is asleep, such that the unethical manager commits maximum per-period fraud, the ethical manager’s unethical infection pressure is growing with the passing periods, due to the inclusion of \(n - 1\) in the infection equation. The ethical manager switches from zero fraud to maximum fraud in the period where equation \((6)\) switches from being less than, to becoming greater than \((5a)\). Note that \((5a) = (6)\) when \(\theta \Delta (n - 1) = gf_n \Rightarrow (n - 1)' = \frac{gf_n}{\theta \Delta}. \quad (7)\)

Thus, \((n - 1)'\) represents the critical period whereby, for \(n - 1 < (n - 1)\)', the ethical manager commits zero fraud. When \(n - 1 \geq (n - 1)\)', the ethical manager switches dramatically from zero to maximum fraud. Payoff \((6)\) captures the following dilemma for the ethical manager: The second term demonstrates that he feels guilt at committing fraud (this is what defines him as an ethical manager, in contrast to the unethical manager, with dormant superego). However, he faces organisational pressure, from the infection rate, and from the organisational rewards from mimicking the unethical manager. This ethical dilemma is captured further in \((7)\): the more ethical he is (higher numerator in \((7)\), the later the critical period at which he switches from zero to maximum fraud to mimic the unethical manager. On the other hand, the higher the organisational unethical infection pressure (the denominator in \((7)\), the earlier the period at which he switches from zero to maximum fraud.

We note that, given the parameter values in \((7)\), and given the exogenous period \(N_C\) at which the unethical manager’s superego awakes, it is possible that the ethical manager is able to resist the unethical infection parameter for the entire period that the unethical manager’s superego is dormant (this is the case where \(n' > N_C\)). On the other hand, if \(n' \in [0, N_C)\), the ethical manager will be able to resist, and commit zero fraud for the period \(n \in [0, n')\), but will switch to maximum per-period fraud when \(n \in [n', N_C\}. \) In order to clarify this analysis, we work with the following numerical parameter values: \(U = 1,000; \quad g = 5; \quad f_n = 500; \) and the infection parameters are \(\theta = 0.5; \quad \Delta = 1000\). For the unethical manager, we consider the case where his superego awakes at the cumulative fraud level: \(F = 5,000\). Since the maximum per-period fraud is \(f_n = 500\), this implies that the critical period at which the
unethical manager’s superego awakens is: \( n_c = \frac{F}{f_n} = 10 \). Consider the ethical manager.

Given the parameter values above, we compare (5a) (zero fraud) and (6) (maximum fraud) to examine the ethical manager’s behaviour in each round.

**Ethical Manager’s Fraud decision as a function of time**

The following diagram summarises the ethical manager’s fraud decision period-by-period.

Diagram 3

The horizontal line is his payoff from committing zero fraud (5a). The upward sloping line is his payoff from committing maximum fraud (payoff 6). The diagram demonstrates that he switches from zero to maximum fraud at period 6. We can easily check that this is consistent with the critical period in (7):

\[
(n - 1)' = \frac{gf_n}{\theta \Delta} = \frac{5 \times 500}{0.5 \times 1000} = 5. \Rightarrow n' = 6.
\]

**3.1: The unethical manager’s superego awakes**

We assume the following. If the ethical manager is able to resist committing fraud for the entire period where the unethical manager’s superego is dormant (that is, \( n' > N_c \)) then, when the unethical manager’s superego awakes, and he behaves as in result 1, the ethical manager remains ethical (i.e., remains uninfected), and continues to ignore the behaviour of the unethical manager, continuing to commit zero fraud. On the other hand, if \( n' < N_c \), the ethical manager switches to maximum fraud during the period where the unethical manager’s superego is dormant. In this case, we assume that, once the unethical manager’s superego
awakes, the ethical manager has become so infected by the unethical manager, that, he, in effect, becomes an unethical manager, and acts as in result 1. Both managers (ethical and unethical) stop committing fraud, but may or may not exert fraud-hiding efforts for the cumulative fraud, depending on whether $G < R + \hat{R}$ or $G > R + \hat{R}$.

This has interesting organisational implications. In the former case, where $n' > N_C$, there is only one level of cumulative fraud, committed by the unethical manager. In the latter case, $n' < N_C$, the ethical manager becomes infected (doubling the level of organisational fraud in the periods when he becomes infected), and equally as entrapped as the unethical manager when the superego awakes. In the case that $G < R + \hat{R}$, they both exert cumulative fraud-hiding efforts once the superego awakes.

In diagram 4, we consider the case where $N_C = 10$. Given our parameter values above, we obtained $n' = 6$. Thus, in diagram 3, we are considering the case where $n' < N_C$, such that the unethical manager commits maximum per-period fraud of $f_n = 500$ each period, and the ethical manager commits zero fraud up to $n = n' = 6$, but becomes infected at that period, and jumps to maximum fraud for the remaining 4 periods $n \in [n' = 7, N_C = 10]$. When the superego awakes at $N_C = 10$, both managers (ethical and unethical) stop committing fraud. Thus, in periods 1-6, the per-period fraud is 500 (committed only by the unethical manager). In periods 7-10, the per-period fraud is 1000 (committed by both managers). Thus, when the unethical manager’s superego awakes, the cumulative fraud level is $6\times500 + 4\times1000 = 7,000$. At this point, they both stop committing fraud. However, if $G < R + \hat{R}$, both managers become entrapped into exerting fraud-hiding efforts.

Diagram 4
<table>
<thead>
<tr>
<th>Fraud per period</th>
<th>Period</th>
<th>Unethical Manager</th>
<th>Ethical Manager</th>
<th>Total Fraud</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
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<td>500</td>
<td>0</td>
<td>500</td>
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<td>1000</td>
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<td>1000</td>
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<td>1500</td>
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<td>2500</td>
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<td>2500</td>
</tr>
<tr>
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<td>3000</td>
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<td>4000</td>
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<tr>
<td>500</td>
<td>10</td>
<td>5000</td>
<td>2000</td>
<td>7000</td>
</tr>
</tbody>
</table>

The unethical manager’s superego is asleep for the first 10 periods, and so the unethical manager commits the maximum amount of fraud per period ($f_n = 500$). The ethical manager commits zero fraud per-period until period $n' = 6$. At this point, the infection parameter dominates, and the ethical manager switches from zero to maximum period-fraud of 500, mimicking the unethical manager. Hence, the period fraud doubles from 500 to 1000 (unethicalsity has ‘swept across the dyad’): hence, the kink in the diagram at period 6. At period 10, the superego awakes, and both managers stop committing fraud at the cumulative level of 7000 (although, depending on the economic and behavioural parameters in their payoffs, they may continue to hide it: recall result 2). Although we have only considered a dyad, we could develop this work to consider a network of managers across the organisation. What our dyadic analysis has demonstrated is that unethicality may gradually spread across managers over time, and that total fraud may then ‘snowball’, increasing at an ever-greater rate.

### 4. Real World Unethical Infection: The Enron Case

In this section, we follow up our theoretical analysis by considering the case of Enron. Enron provides an example where fraud and unsustainable business practices appear to have been endemic and where a promotion system was in place which effectively nurtured unethical behaviour. As noted by Kulik et al (2008), Enron nurtured an organizational culture in which unethical managers were rewarded for performance even if this involved committing a fraud, and where ethical managers were incentivised to copy this behaviour.
Although the extent and scale of the *ex post* investigation of the collapse of Enron has been unprecedented, the most accessible studies are still those emanating from the internal enquiry set up by Enron shortly after the commencement of the SEC investigation (the Powers report: Powers et al., 2002) and the monumental enquiries of the bankruptcy examiners (Batson, 2002, 2003a,b,c; Goldin, 2003).\(^9\) The Powers report focuses primarily on the scale of Enron’s off balance sheet activities, transactions between Enron and its unconsolidated Special Purpose Entities (SPEs), the use of transactions with these SPEs to seek to protect Enron’s reported profitability in the two years immediately ahead of its collapse, and the opportunity for improper personal benefit afforded to certain of Enron’s senior executives from such transactions.

The bankruptcy examiners’ reports gives a wider perspective on the extent and manner of the manipulation of Enron’s financial reporting in terms of income, cash flows and the balance sheet picture. The great majority of these manipulations were, individually, designed to comply with US GAAP and the details of the transactions giving rise to the manipulations were known to the auditors. However the bankruptcy examiner’s (Batson) view was that, in a great many cases, the compliance with US GAAP was illusory and that overall the combined effect was a massive distortion of the financial statements. Details of this distortion which, in the opinion of the bankruptcy examiner, led to overstatement of profit by 96%, of operating cash flows by 105% and an understatement of liabilities by 116% in the final set of fully audited financial statements, those for the year end 31 December 2000 (Batson, 2003a). On the face of it, Enron’s corporate governance structure was a model of good practice. Enron’s Audit and Compliance Committee, chaired by Robert Jaedicke Emeritus Professor of Accounting and former Dean of the Graduate School of Business at Stanford, and including Wendy Gramm, a former chair of the US Commodity Futures Trading Commission, and Lord Wakeham both a qualified accountant and a previous UK energy minister, was a distinguished one. The external audit was carried out by Arthur Andersen, one of the then Big Five auditors. There was an active risk and compliance function internal to the firm. Enron had produced a Code of Ethics, a document of 64 pages signed by Kenneth Lay (Enron CEO and Chairman), outlining the company’s firm commitment to conducting business affairs in accordance with all applicable law and in the highest moral and honest manner, with the last known edition produced in July 2000 (now an exhibit in the Smithsonian's National Museum of American History). The only potential reservation would be that the internal audit function was outsourced to Andersen, the external auditors, a practice which is prohibited in the United States since implementation of the Sarbanes Oxley Act of 2002, and

\(^9\) There is also an extensive academic literature reviewing and interpreting aspects of the Enron saga – examples of which include Benston et al. (2003) and Benston (2006).
in the European Union since implementation of the 2014 Regulation regarding statutory audit of public-interest entities.\textsuperscript{10} It is arguable whether anything could have prevented the collapse of Enron subsequent to the revelations of financial irregularities. However, more effective corporate governance, effective internal controls, an effective risk management system, and committed risk and audit committees, might have been able to check management excesses in terms of remuneration and auditing practices and could possibly have reduced the scale of the loss, significantly affected where the losses fell by ensuring more appropriate financial reporting practices and the prevention of schemes whereby net cash outflows were incurred for the purpose of financial reporting manipulation, and might have prevented the collapse of the company by catching the problems before they became fatal.

In addition to the unquestionably poor financial reporting, the sub-standard auditing provided by Arthur Andersen, and the failures of effectively all of the standard corporate governance mechanisms right up to the company’s demise, we question how an organization’s behaviour, and with this we make reference to what one must assume to be a majority of key personnel, including the members of the Board who are the basis for the ‘tone at the top’, came to wholeheartedly embrace a myriad of inopportune, in many instances unethical, and regularly unlawful, business practices, which on the whole and in their final impact would seem to have resulted in its unexpectedly sudden and inglorious demise. Here, the case contributes to an understanding of the antecedents to and the spread of unethical behaviour, its spread across the organization, and its development into the de-facto norm.

Kulik et al. (2008) note the corrosive effects on ethical behaviour of forced competition systems in organizations. Enron’s stacking system implemented a strict system of intra-organizational competition amongst employees, and refers to a forced-ranking system which forced out low performers every six months. Alas, forced ranking systems may not only be ineffective and inefficient (Pfeffer and Sutton, 2006), but may foster the spread of unethical behaviour between individuals after the behaviour has emerged but before unethical behaviour had become normalised. Kulik et al. (2008) argue that such systems may result in organization-wide corruption as an unintended consequence, an interpretation that had earlier

\textsuperscript{10} The ability to purchase both external and internal audit from the same firm has been a source of controversy for some time and the SEC had brought into force rules (probably unworkable) limiting the extent to which clients could purchase internal audit from their external auditor. Post Sarbanes-Oxley there is now a complete prohibition of joint purchase. The 2014 EU Regulation (Regulation (EU) No 537/2014) prohibits a number of Non Audit Services that can be provided by the external auditor, see: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2014.158.01.0077.01.ENG.
been suggested by Pfeffer and Sutton (2006), quoting McKinsey consultants Michaels et al. (2001):

“A couple of years ago, one of us gave a speech at a renowned (but declining) high-technology firm that used a forced-ranking system. They called it a stacking system. Managers were required to rank 20 percent of employees as A players, 70 percent as Bs, and 10 percent as Cs. Just as The War for Talent advises, they gave the lion’s share of rewards to As, modest rewards to Bs, and fired the Cs. But in an anonymous poll, the firm’s top 100 or so executives were asked which company practices made it difficult to turn knowledge into action. The stacking system was voted as the worst culprit. This is not just one company’s experience. A survey of more than 200 human resource professionals…found that…more than half of the companies [surveyed] used forced ranking (p. 107).”

Losers in a stacking system are under pressure to adopt the behaviours of the winners at the dyadic (person to person) level in order to thrive and survive in organisations. This can then lead to the spread of unethical behaviour if the winners at least sometimes succeed by making unethical decisions and the losers adapt to the behaviour of the winners (Kulik et al., 2008). With regard to the effects on behaviour, established behaviour patterns (including what may originally be seen as corrupt, fraudulent, unethical or unacceptable behaviour) may subsequently be interpreted as the acceptable norm, without necessarily being interpreted as ‘improper’.

Enron’s stacking system likely induced behaviour which in hindsight is clearly inappropriate, unethical, even fraudulent, but at the time may largely be viewed as acceptable behaviour necessary to survive and succeed in a competitive environment. Hence, competitive, aggressive, unethical behaviour may become acceptable, indeed highly valued, leading to highly selective assessments of own behaviour, regardless of and in contrast to Enron’s professed core values, summarized in Enron’s four values of respect, integrity, communication, excellence (‘R.I.C.E.’) and its Code of Ethics, values which in reality were routinely violated and undermined. A stacking system, and the rewards from perceived dominant behaviours and outcomes this enabled and encouraged, may well reinforce biases in judgement and decision making processes noted elsewhere, such as a susceptibility of individuals to drift from accepted or prescribed behavioural norms (Maccoby 2000); the tendency to acquiesce to or uncritically accept assertions (Prentice 2000a, 2000b; Langevoort
Committing small transgressions to start with, and 'blanking' them in the mind as "too small to worry about", “acceptable”, “a necessary means to survival”, or deviating from acceptable behaviour only by an amount seen as noise, immaterial, or within a range of acceptable variances, the individual effectively sets a new anchor for acceptable behaviour, potentially placing him or herself on a slippery slope towards outright fraud.\textsuperscript{11} Where this is rewarded in a forced-ranking system which measures success by crude numeric/financial performance indicators which underestimate risk and make no allowance for the likelihood of success of the proposed venture, this can become self-reinforcing. Hence, an unintended consequence of Enron’s stacking system may have been that the behaviour of the winner of one round of the competition is quickly adopted by the loser, who either develops the characteristics and skills necessary to win in the next round or faces removal from the organization.

Recent research into biological mechanisms underlying the development of fraudulent behaviour supports this interpretation on how small transgressions may gradually lead to larger ones, and how small deviations from a moral code (or standard, rule, law, regulation), may, over time, escalate into material deviations with potentially devastating consequences (Garret et al., 2016). Effectively, the brain may become ‘immune’ to the effects of deception, akin to an anchor creeping ever further away from the ideal spot, with the individual over time committing ever bigger frauds, a phenomenon possibly supported by, and potentially pre-disposed toward, over-optimism (Schrand and Zechman, 2011), a character trait typically favoured within organizations.

Hence, in the absence of a realisation within the organization of the need for a strong and fixed moral guide (an anchor which stays firmly affixed), or moderating factors which pull the individual and group back towards the moral beacon if their anchors have ‘slipped’, competitive internal interactions can lead to the spread of unethical behaviour from bad apples to good apples and can eventually become so ingrained that the remaining good apples have either been completely side-lined (observing the bad apples success and promotions) or

\textsuperscript{11} Anchoring and adjustment is a psychological heuristic made popular by the seminal work of Tversky and Kahneman (1974), that influences the way people intuitively use an initial piece of information to make subsequent judgments. According to this heuristic, people start with an implicitly suggested reference point (the “anchor”) and make subsequent adjustments to it to reach their judgement. Where an unethical manager’s behaviour is seen as the norm, this may form an anchor or reference point against which own behaviour may be judged. Further deviations from the anchor might be seen as insignificant, and thus acceptable, setting off a process which may lead to significant deviations from the originally accepted norm.
have left the organization. As the remaining good apples may not be seen as successful by the forced ranking system, they may forcibly be weeded out until only those willing to play the political game within the organization remain, an outcome not unlike Akerlof’s ‘Market for Lemons’ (1970), where bad drives out the good, and only the lemons (unethical individuals) remain. A race to the bottom may thus result in organizations with potentially disastrous results.

Whereas governance at board level should have picked up on the detrimental effects of its internal tournament system, and should have introduced moderating factors and circuit breakers, to induce a counterculture with high ethical standards or ethical leadership (or both, see Trevino et al., 2000), to overcome the corrosive side-effects of the stacking system, the tone at Enron’s top was hardly focused on providing such moderation, and instead, fostered an environment where unethical behaviour became the celebrated norm. To some extent, Enron’s stacking system not only de-emphasised ethical controls but strongly conditioned towards unethical behaviour. In this respect, the described pressures on performance echoes Milgram’s (1963) experiment on obedience to authority where honest, ethical, and good intentioned individuals were prepared to perform acts conflicting with their (original) personal conscience, even if this meant causing serious injury and distress (in Milgram’s experiment), or to expose the company to unsustainable liabilities and risks (Enron).

Just as groups may escalate commitment to a lost cause where groupthink takes hold (Janis, 1972; Weick, 1983); Staw, 1996 individuals can be subject to gradual escalation of self-serving dishonesty (Weick, 1964; Garrett et al., 2016). This can potentially have devastating outcomes when a forced ranking system with great rewards for the winners not only leads to frequent sporadic emergence of unethical behaviour, but results in widespread diffusion of such patterns permeating the organization (Kulik et al., 2008). Committed ethical leadership would likely have been able to put an end to such a diffusion of unethical practice. Enron, alas, was one example where a corrupt top reinforced unethical grassroots behaviour, with all remaining elements of the governance paradigm busy playing the three wise monkeys.

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12 In “The Market for Lemons: Quality Uncertainty and the Market Mechanism” Akerlof (1970) describes the demise of markets as a result of asymmetric information. Where an organization embraces a forced-ranking system, this can lead to situations where ethical behaviour is driven out by unethical behaviour patterns, as it does not pay to be ethical, and as ethical individuals are forced out since they simply may do not be competitive in an unethical environment.

13 Presumably, Enron star employees at least originally had some of these characteristics if the ethics education at the top MBA programmes from which Enron typically recruited is worth the fees charged.
5. Conclusion

We have developed a model of managerial fraud. At the individual level, the manager commits small frauds over a number of time-periods: the frauds are so small that the manager’s superego remains asleep, and the manager does not consider the frauds as consequential. At a critical time period, the superego awakes, and the manager becomes aware that he has committed a large cumulative level of fraud over time. Now, he stops fraud, but may react in one of two ways: he either ‘owns up’ to his fraud, as owning up is ‘good for the soul’, or he exerts increasing efforts into hiding the fraud, due to feelings of regret, combined with the sunk cost effect (relating to the fraud already committed). We then extended our model to consider the dyadic (organisational) level, whereby a corporate culture of unethicality may result in an unethical manager ‘infecting’ the ethical manager, such that the ethical manager is ‘corrupted’, mimicking the unethical manager’s behaviour. We concluded our analysis with an examination of the case of Enron.

We suggest that our model has the following managerial and organisational implications:

a). In designing monitoring and auditing systems to check for managerial misbehaviour and fraud, it is important to note that managers may not be aware of their fraudulent behaviour, especially in the early days of fraud, and when this fraud is 'small'. This is the period when the manager’s superego may be asleep.

b). when the manager's superego is asleep, traditional deterrence threats, such as in-depth auditing, monitoring, and punishments (such as fines, firing from the job, and potential prison sentences) may be wholly ineffective, as managers will not be aware that they are committing any offence (nor might the traditional gatekeepers notice this). Van Winden and Ash (2012) emphasise the importance of educating managers into ethical behaviour.

c). When the superego awakes, the manager may then be weighing up the economic and behavioural/psychological/emotional benefits of owning up to fraud versus hiding it (similar to Van Winden and Ash's (2012) competing forces model). Excess threat may be counterproductive, and lead to more fraud-hiding!

d). Finally, design of the organisational systems and structures, and the method of motivating, rewarding and compensating employees may have a crucial effect on the spread of unethical and fraudulent behaviour across the organisation. For example, a tough culture that rewards 'performance' at all costs, and is tough on ‘mistakes’, may lead to unethical behaviour spreading across the organisation, infecting once-ethical employees. The organisational culture at Enron, together with its 'stacking system', is a prime example of a structure to be avoided.
Our model provides a basis for future research. It would be interesting to further develop the model to consider the effect of other psychological and behavioural biases and emotions, such as overconfidence, anger, and shame. In our model, we have focussed on the managerial dyad. The model would be strengthened by considering a complete and complex organisational network. Furthermore, we could include an auditor as an additional player in the game. As noted in section 1.1, it would be interesting and informative to cast our game-theoretic model of fraud commission, escalation, and spread across organizations into an agent-based modelling approach (ABM), drawing on the approach developed by Davis and Pesch (2013). By combining our two approaches, we could gain a deeper understanding of the economic, behavioural and psychological factors driving fraud across organisations.

At the empirical level, we should extend our analysis beyond the Enron case to consider how our framework applies to other corporate frauds and scandals. Finally, we could employ experimental and neuro-economic techniques to test for the economic and psychological determinants of managerial fraud in a laboratory setting. Thus, it is hoped that this model will provide the first steps towards better understanding, and reducing, corporate fraud.
References


