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How can Corruption Affect Corporate Behaviour?

A Two-stage Game Theory Model Approach

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Abstract

This paper rationalizes the behaviour of decision makers within several countries where such behaviour is mainly non-existent or illegal. In particular, we study the Telecom Corruption Scandal in 2012 and build a two-stage game theory model specifically to that event in order to justify the decisions made by the agents involved. The first model examines the behaviour of a single decision maker engaging in corrupt activities. We study the optimal bribery amount the decision maker are willing to pay and found that for such optimal level there exists no equilibrium where a moral type finds it attractive to invoke corrupt behaviour. Next, we extend our model in which we include a second firm and study the impact of such inclusion. We found that the involvement of a second firm serves as a risk sharer and hence, under some certain assumptions we found that there exists a unique equilibrium in which both enterprises finds it optimal to bribe and engage in corrupt activities. Such equilibria might only exist between companies from countries with similar Corruption Perception Index (CPI), as when the scores deviate significantly from each other either in nature or through dynamic changes, we might instead arrive at corner solutions. We found the derived models applicable to the Telecom Scandal, but further rigorous analysis and discussions can be made to improve the model. Additionally, we describe factors that the model cannot explain which may influence the outcomes. In total, we provide evidence for the existence of corporate behaviour that are not fully in-line with classic economic models, and we rationalize such behaviour by defining and including new decision variables we find crucial to clarify such phenomenon.

Keywords **-** Telecom Scandal, Corruption, Game Theory, Corruption Perception Index, Optimal Bribe Amounts.

Acknowledgement

This thesis is written as part of our Master of Science in Economics and Business Administration at the Norwegian School of Economics (NHH) and serves as the last chapter of our time at NHH. The process of finding the right topic has been challenging, as there are a lot of interesting questions out there that we wanted to investigate further. From insightful discussions with each other during the fall semester, we found a shared interest of creating a new model that current economic models are not fully able to rationalize. We wanted to leverage on our diverse background from economic analysis and international business to write a thesis that involves both quantitative interpretations and business knowledge from an international perspective. Writing this thesis has been challenging at times, but also highly educational and fun. We have developed ourselves both academically and socially, and we found this process truly rewarding and valuable.

First of all, we would like to thank our supervisor, Chang-Koo Chi, for constructive feedbacks and challenging discussions throughout this process. Your support and guidance have truly been appreciated. We would also like to thank all the lecturers at NHH for providing valuable knowledge in several subjects, which served as a crucial element for the completion of this thesis. Lastly, we would like to thank fellow students at NHH for helpful discussions and making the years in Bergen as an unforgettable experience. Thank you!

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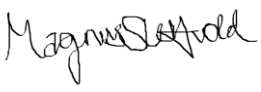

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1 Introduction

As long as the pressure to deliver results for firms exist, a continuing temptation will be present for such firms to engage in unethical activities in order to achieve the desired goals. Corrupt practices, which most definitely leads to negative consequences if detected, can on the other hand result in great profits and it is thus an option for organizations when deciding, for instance, new market entries. The rational decision for an investment, according to traditional economic theory, should be to invest in any opportunity given that it yields a positive net present value (NPV). Corruption, however, have negative impacts on several stakeholders within the society and tend to be mostly present in emerging markets, where the need for institutionalization is greater. Thus, a dilemma in the context of results and ethical right doing will be present in such decision processes.

Transparency International´s yearly corruption perception index (CPI) ranks Scandinavia as one of the least corrupt regions in the world. Companies engaging in bribery activities in order to obtain significant market positions is not a new story. However, unethical decisions for Nordic companies in the context of corruption forms the basis of our investigation that aims to discuss the rationale behind this phenomenon.

Competitive environments can pressure firms to engage in activities, which they otherwise would not participate in from a rational perspective, in order to maintain performance relative to their peers. We argue that such pressure provides another dimension to the debate on corruption and strengthens the incentive for our study. In addition, we currently lack a holistic study on how competition for companies influences decision making in corrupt environments. Our research question is thus heavily focused on the effects of corruption in a competitive landscape and the impacts it has on firms and their respective decisions. For instance, can it be that certain firms are more or less likely to engage in unethical investments due to changed dynamics in factors such as bribery amount or loss incurred (if detected)? Fundamentally, our research question can then be boiled down to one line;

How can corruption affect corporate behaviour?

In this study, we investigate the effects of corruption on corporate behaviour by developing a game theory-based model and links it to a well-known corruption scandal in the telecommunication market. The applied case has its roots starting in 2005 following several foreign direct investments for licenses to operate in the Uzbek market from three major telecom companies. The case is well applicable as support to our developed model as it is up to date and the firms involved are all competitors prior to their expansion into Uzbekistan. Moreover, the telecom scandal closed in 2017 following a lost verdict against the three engaged companies who were all obligated to pay a fee for their actions. We can thereby analyse the outcomes from the information and data.

We separate our model into two parts. The first part investigates a single firm and how it behaves in a corrupt market environment. In addition, we distinguish between a moral – and corrupt – type´s behaviour. We apply prospect theory – formerly developed by Kahneman and Tversky (1980) – into our model, which serves as a crucial element. We conclude that the firm´s expected value function is negative for the moral type, and hence the firm will never find it optimal to bribe a positive amount. Conversely, we find under some certain circumstances that the corrupt type will bribe a positive amount regardless of the probability of detection. The second part is an extension of the first model and includes competition by involving an additional firm. In the second model, we study the moral type further and find that the inclusion of another firm leads to a loss in the expected value function of a firm that does not bribe while the other offers a positive amount. On the other hand, if both firms bribe, we discover the existence of a bribery amount that can turn the expected value function positive. Hence, we conclude that both firms will offer a positive bribery amount in a simultaneous game.

2 The Telecom Scandal

In this chapter, we will first provide an overview of the Telecom Corruption Scandal, and then introduce the three companies involved. In addition, we will provide the relevant transactions and further the subsequent consequences related to them.

2.1 Case background

The telecom scandal case originally has its background following a number of transactions dispersed by three tech-giants, keen to expand their operations in the Scandinavian and Baltic/Eurasian markets, to the princess of Uzbekistan (on that time) - Gulnora Karimova. Subsequently, the disbursements allowed the companies involved to obtain the necessary rights for operations in Uzbekistan's telecom market. An investigation by Organized Crime and Corruption Reporting Project (OCCRP) revealed that Karimova received in total of over US $ 1 billion through several bribery payments during the period between 2005 - 2012 (Westerberg, 2018).

Although a nascent telecommunication sector did emerge in Uzbekistan during the 1990's, the market was severely under-serviced during the start of the new century. In 2007, mobile service penetration was allegedly below 10% in a country consisting of approximately 27 million residents (BMI, 2007). Needless to say, the demand for mobile services at that time was certainly unbridled and, hence, telecommunication firms around the world intuitively found the Uzbek telecommunication market to be an unusually promising option for further expansion. To underline the weight of the former statement, OCCRP remarked in 2015 that *"everyone wanted a piece of the Uzbek market, which eventually grew to 25 million subscribers by 2012"* (OCCRP, 2015).

By 2004, the Uzbek market situation occurred, to a greater extent, to be impenetrable as Karimova fundamentally had established a monopoly, through what seemed to be a racket, in Uzbekistan's telecommunication sector among others, which gradually formed her syndicate. In practice, any prospective investor who wished to gain market entry in Uzbekistan had to pay one of Karimova's proxy firms an entrance fee. Nevertheless, fee

proceedings for licenses to operate contradicted with Uzbek laws, foreign bribery legislation, and international laws.

Firms entering Uzbekistan's telecommunications sector in 2005-2007 were, prior to investments, aware of the high corruption risks posed, as the topic was addressed by several authoritative media investigations during the mid-2000s. Moreover, audits handling clients in Uzbekistan's telecommunications industry were under a duty to flag related accounts as high-risk and under such circumstances obligated to employ enhanced due-diligence procedures. As the licenses to operate later showed (and by no means were unexpected) to require additional payments to maintain a market presence, the telecom firms engaged in the deals turned out to be somewhat stuck in their positions. Karimova threatened with obstruction by several Uzbek governmental ministers if they did not agree to reimburse the illegal payments while at the same time incuring significant reputational – and financial – losses in the event of a revelation was a fact.

By the end of 2007, three international telecom brands had entered the Uzbek market (fully aware of the terms that prevailed), allegedly under the stewardship of Karimova. More specifically, the three firms involved were: TeliaCompany – a Swedish telecom company – VimpelCom – a Russian telecom company with the Norwegian tech-giant, Telenor, possessing approximately one third of total outstanding shared – and MTS – the largest telecom operator in Russia. Investigations led by OCCRP identified a total payment of US$ 456 million, US$ 115 million, and US$ 350 million from TeliaComapny, VimpelCom and MTS respectively (Roque, 2016). The prior transactions were a result of a money laundering process through a Gibraltar-based shell company and includes several countries such as the United States, Switzerland, Ireland, Belgium, Luxembourg, France, and Sweden. Furthermore, Karimova and her collaborators controlled all the money from the payment proceeds. The suspicious transactions were identified through a number of misleading bookkeeping techniques from the companies' financial statements, where Deloitte, as Telia´s auditors, recorded a substantial amount in their goodwill-account in Uzbekistan (Muddy Waters, 2015).

At the start of 2015, the equity research firm Muddy Waters made it public that they were shorting TeliaCompany (bets on a value-decrease of the company), which was based on a number of suspicious bookkeeping from their financial statements (see appendix A1 and A2) (Muddy Waters, 2015). In addition, the scandal triggered several criminal investigations led by governmental authorities (Sweden, Norway, United States, Netherlands and Switzerland) against the three companies in question (Pollack & Allern, 2018).

A few months after Muddy Waters' revilement, the US Department of Justice (DOJ) confirmed the allegations and uncovered that the three firms involved had paid bribes to Uzbek officials to obtain mobile telecommunications business in Uzbekistan (VOA, 2015). As a result of heavy public and investor pressure, TeliaCompany announced that they were going to pull out all operations in central Asia. Furthermore, Norway's government demanded the resignation of Telenor chairman Svein Aaser. The settlement with DOJ required Telia, VimpelCom, and MTS to pay a total of $965 , $835 , and $850 – million respectively in fees to US, Swedish and Netherlands authorities (totaling approximately $2.66 billion) (Gray, 2019).

2.2 Firm backgrounds and motives

As the time of entering the telecom market in Uzbekistan was not a simultaneous move by the telecom companies, we will in this section provide an overview of the companies involved in the Telecom Corruption Scandal, and the timeline of when they entered the Uzbek telecom market (see appendix B for timeline visualization).

2.2.1 MTS

MTS (Mobile Tele Systems) is a Russian telecommunication corporation that was established in 1993 and is listed on the New York Stock Exchange. The company is not directly operating in the same market regions as TeliaCompany although an expansion into the Eurasian region occurred during the same timeframe as the aforementioned firms. The company had 108 million subscribers in 2012, accounting for 1.5% of the total world's

population and is considered to be the largest mobile operator in Russia and Eastern Europe (MTS, 2013). The core business of MTS is the provision of mobile-communication services.

2.2.1.1 MTS' expansion into Uzbekistan

MTS entered the Uzbek market in 2005 through an acquisition of the largest telecom company in Uzbekistan at that time – Uzdunrobita (which was fully controlled by Karimova). The company paid in total US$ 121 million in order to obtain 74% of the shares in Uzdunrobita (MTS, 2004).

2.2.2 Telenor Group and VimpelCom

VimpelCom was founded in 1992 and was introduced on the New York stock exchange in 1996. The company is incorporated in Bermuda and the headquarter is located in Amsterdam, Netherlands. Telenor, a Norwegian based telecommunication enterprise, first invested in VimpelCom in 1998 and held an economic stake of approx. 36% in the end of 2012 and had a voting share of approx. 43%. The Norwegian state accordingly held 54% of the total outstanding shares in Telenor and was thus the majority shareholder (Telenor Group, 2013). Prior to VimpelCom's expansion into the Uzbekistan telecom market in 2006, Telenor was considered to be one of Telia Company's main competitors. In addition, Telenor denied a merging offer from Telia prior to Telia's acquisition of Sonera.

2.2.2.1 Telenor and VimpelCom's expansion into Uzbekistan

VimpelCom was in a negotiation process from 2005 with Karimova, but they officially entered the market in the beginning of 2006, when they bought a local firm in Uzbekistan - Buztel, for US$ 60 million. In February 2006, VimpelCom bought another local company – Unitel – for a total amount of US$ 200 million, and a couple of months later Buztel and Unitel were merged under the name of Unitel (Telenor Group, 2007). Later investigation papers from 2012 and 2014 published by *Dagens Næringsliv* and *Klassekampen* showed realized money transactions between VimpelCom and Takilant (the same company

TeliaCompany had been involved with). Last, the investigation showed that the board of VimpelCom, including its Telenor representatives, had approved the aforementioned money transactions to Takilant.

2.2.3 Telia Company

TeliaCompany (previously TeliaSonera) was, following a merger in 2002 between the previous Swedish Telia and Finnish Sonera, the dominant player in the Swedish and Finnish telecommunication market. The merger was formalized by Telia acquiring Sonera, which at the time was struggling financially (Telia Company, 2020). In addition, the Swedish and Finnish government retained approximately 48% and 19% of the total ownership respectively in Telia Company. The governmental ownership stakes have since 2002 gradually decreased although Sweden possessed 37.2%, Finland 11.7% and Norway 1.1% of outstanding shares in 2012 (Telia Company, 2013). Telia Company's headquarter is located in Stockholm and the enterprise is listed on Nasdaq stock exchange in Stockholm and Helsinki. In 2012, Telia Company had approximately 28.000 employees worldwide. Moreover, Telia Company is operating in 4 different segments within the telecommunication market: mobile, broadband, fixed voice and TV. Although, broadband, fixed voice and TV is limited to the Nordic and Baltic markets, mobile services are offered in all of the countries in which Telia Company is operating, including Uzbekistan.

2.2.3.1 Telia Company's expansion into Uzbekistan

TeliaCompany entered Uzbekistan in 2007 with no prior acquisitions. The company controlled 43% of the Uzbek mobile market and was the second biggest player in the country during 2012, running under the organisation name "Ucell" (Telia Company, 2013). In recent years, TeliaCompany have reduced their influence in the Eurasian market. Nevertheless, TeliaCompany aggressively expanded into Eurasia during 2005 - 2012 and operated in 18 countries in 2012. In a majority of the countries in which TeliaCompany operated, they possessed more than 40% market share.

Suspicions regarding the movement were first raised in 2008 by the Swedish newspaper *Svenska Dagbladet*. According to the paper, Takilant (the same company TeliaComany was

negotiating with) was flagged to have a potential connection with the Uzbekistan's president Islam Karimov and his family. However, Lars Nyborg (the CEO of TeliaComany at that time) defended the deal and reassured that the company was strictly following its ethical policies in Uzbekistan. However, *Uppdrag Granskning* could in addition to questionable transactions show that the dictatorships in Eurasia where TeliaCompany operated were expected to receive personal information about the telecom-customers in order for TeliaCompany to obtain the licences. Several journalists questioning the dictatorships were thus hunted by authorities due to the allowance of telecom voice- and text- interceptions. Notably, there were no more investigations into the acquisition and the Swedish government, which previously mentioned is the largest shareholder in Telia Company, approved the deal without further due diligence.

3 Corruption

In this chapter, we will first define the concept of corruption followed by a clarification of grand corruption which is linked to the case. Next, we will investigate the corrupt landscape in Uzbekistan and lastly describe how one is able to measure the level of corruption within a country.

3.1 Defining corruption

Corruption is a widespread concept and is hence followed by numerous definitions. For instance, the World Bank defines corruption as "the abuse of public office for private gain" (World Bank, 2013). An alternative definition has been developed by several EU institutions and is less ambiguine when applied to Karimova and the Uzbek state, i.e., "The abuse of power for private gain". The latter definition covers both the private and the public sector, and encompasses glitches such as nepotistic appointments, conflict of interest, and cronyism (PwC & Ecorys, 2013). The explanation for occurrence of corrupt behaviour is primarily self-enrichment of elites, but also maintenance of political control through hierarchical systems of ally-client networks. Consequently, the distribution of resources may be inflicted by rival groups and can thus lead to political instability. To the greater extent, such decision-making is conducted behind closed doors and frequently results in laws and policies that contradicts with formal regulations and the rule of law.

Corruption can take place in various contexts within a society. By separating different levels within a society one can distinguish clearer categories for the locus of different types of corruption. There are three (3) main categories according to Andvig and Fjeldstad among others: Private corruption, Bureaucratic corruption, and Grand corruption (Andvig et al., 2001). We are going to further clarify grand corruption as it is related to the telecommunication scandal in question.

3.1.1 Grand corruption

Grand corruption, in contrast to bureaucratic corruption, is practices that take place within the higher levels of the state hierarchy. Contrariwise, and to further emphasize the former statement, bureaucratic corruption is e.g. bribes linked to lower level of seniority in the given state (such as police officials, property regulation or treasury department). Max Weber extricated the two concepts from politics and administration, where he equalizes grand corruption as political corruption (Rubenstein et al., 2010). In sum, the notable take is that grand, or political, corruption is carried out at the top of the state hierarchy. Actions where those persons take use of their power to yield large inducements from non-state actors or embezzle money from the state treasury (Andvig et al., 2001). In addition, political corruption can be policies that are made to advantage those making them.

Grand corruption is essentially practices taking place within the higher levels of the state hierarchy. This form for corruption often crosses borders and involves public and private sector actors in schemes throughout various jurisdictions (Dell, 2019). Weber extricates the two concepts from politics and administration, where he equalizes grand corruption as political corruption (Weber, 2006). Grand corruption includes actions where individuals make use of their power to yield large inducements from non-state actors or embezzle money from the state treasury (Andvig et al., 2001). In addition, grand corruption usually turns out to be policies made to advantage those making them. Powerful players engaged in grand corruption schemes frequently thwart enforcement against them by meddling with the justice system. Investigations against such powerful players are normally expensive and convoluted and grand corruption hence tends to have lower solvency ratio than private – and bureaucratic – corruption (Dell, 2019).

3.2 Corruption in Uzbekistan

Gulnara Karimova allegedly exploited her father's (former president Islam Karimov) position of power to live an ostentatious, luxurious life. The broad supporting cast of proxy banks, foreign advisers, and confidentiality jurisdictions have thus not exposed her activities in the same way they normally ought to do in a well-functioning institutionalized society. Neither has the general structures of national violence nor systemic institutionalized market scams, which directly underwrite grand corruption in Uzbekistan. Doing business in Uzbekistan often involves problems directly faced when entering the market. There are in particular two key areas in which the Uzbek officials have unrestricted power: (1) promulgation of special government resolutions, and (2) the impervious nature of systems for awarding licenses in a number of business segments. The former restriction (1) requires joint ventures and other major investment decisions to approve details of a contract and/or investment agreement. The latter restriction (2) increases the possibility of corrupt practices as the licenses for the given business segments (mainly within energy, retail sales, telecommunication and tourism) are raised by official agencies that themselves have interest in the sectors, both on a commercial and political level (U.S. Department of State, 2015). Consequently, the licensing system currently in place in Uzbekistan makes it rigid for new entrants to enter the market as it is both extensive, but also multifaceted and opaque. Additionally, as the licensing scheme is fundamentally discretionary, any type of license that have been distributed can correspondingly be indented at any time.

Once established in the Uzbek market, organizations are usually faced with additional demands to maintain a market presence. For instance, licenses that have been distributed to actors in the market could have to be renewed. Other requirements could be currency exchange to force imports or repatriation of profits or completing customs procedures (U.S. Department of State, 2013). The statement indeed supports delinquent actions made by officials and underlines how unstable the situation in fact is for international firms to maintain businesses in Uzbekistan.

Tax regulations is another form of weapon for foreign and domestic firms operating in the Uzbek market. According to Gulnara Karimova, which even herself was confronted with the authorities stated in 2013 that; *"when there is no wrongdoing in Uzbekistan, the*

prosecutor's office usually finds "miracle" tax violations, and this is reason enough to close a company and put an owner in prison." (Barış, 2013). The tax system itself encourages corrupt behavior, as full compliance with authorities (i.e. the tax regime) can be problematic to accomplish.

Judging by past encounters in Uzbekistan, firms who does not meet the requested payments or "fees" are generally met with intimidations to their business processes. Businesses in such positions may be imposed by fines or tax liabilities until the company is enforced into bankruptcy or is simply not able to operate due to indented licenses, making it unbearable to continue ongoing business operations. Domestic firms have also reported problems with inspections and currency conversions (yet the World Bank have reported enhancements in the Uzbek business environment) (World Bank, 2020)

3.3 The measurement of corruption level within a country

Some cultures find it unethical to participate in briberies, while other cultures rather practically see it as a necessary mean in order to do business. Transparency International (TI) have ranked 180 nations by their perceived levels of public sector corruption, using a scale from 0 to 100, where 0 is highly corrupt and 100 is highly clean (see appendix C1) (Transparency International, 2020). The score is based on 16 different surveys and assessments by either businesspeople opinion surveys or performance assessments from a group of analysts (CPI 2010: Long methodological brief, p. 2). In order for a country to get a score on what TI calls the Corruption Perception Index (CPI), it has to be evaluated by at least 3 out of the total of 10 different institutions (see appendix C2 for the entire list) involved in the non-governmental organization (NGO) (Transparency International, 2010)

With relevance to the case in question, The Government in Sweden and Norway, which obtains a major shareholder stake in Telia Company and Telenor respectively, are scored among the "cleanest" nations according to Transparency International's Corruption Perception Index (CPI). In 2019, Sweden scored 85 and is ranked as the 4th best and Norway scored 84 and is hence ranked as the 7th best. On the contrary, Russia and Uzbekistan scored 28 and 25 which places them at rank 137 and 153 correspondingly (Transparency International, 2020).

4 The Model

In this section, we are going to investigate the relationship between incentives for corruption and the potential profit or loss connected with these activities. The method for this particular study is by first looking at if one player could encourage corrupt behaviour conversely to multiple players.

We identify several factors that affects a firm's decision-making when bribery mechanisms are involved. These factors include A) - the CPI Score (see section 3.3), B) - the amount of stake controlled by the government, and C) - the financial implications of transactions that involves bribery. Specifically, we find no equilibrium where there is only one moral type that bribes in order to get contracts for their business expansion into another country. The rationale behind this is that we do not find the risk-award attractive when there is only one enterprise, as the potential gain do not compensate for the losses that occurs when caught.

4.1 Governmental Stake

First, we assume that the government stake in a company should affect the way strategic decisions are made. It would indeed not be in the interest for a government who is acting against corrupt conduct to support actions of the same kind in markets outside of where it operates. Internal due diligence to spot – and stop – such decisions would in addition be more likely in a country which (based on the previous assumption) is scoring high on Transparency International's CPI. The risk of getting caught would also be higher if internal controls are working as intended, given that the government acts to eliminate such behaviour. Developed countries, in most cases, possess anti-corruption schemes to investigate suspicious actions for all companies within the country. Nevertheless, we assume that if the government is already actively involved in decision making through for instance the board of directors, raised red flags leading to further investigations are more likely to appear.

4.2 Financial implications of bribery

Tangible short term costs, including fees and compensation, should affect the players in question in the same way independently on if the bribery was executed solely or in the context of other peers, given that anti-corruption law stictions in the business' country of origin functions properly. However, the losses would weaken the player´s financial position in comparison to his competitors. We assume that the initiative for corrupt behaviour should thus be lower, given that investors are risk averse and a weakened market position would not correspond with maximizing the shareholders' value. The assumption likewise applies for long term costs such as lowered bond rating which could result in an increased cost of raising new capital relative to its peers. Moreover, intangible factors including reputation could affect future potential customers to choose the player's competitors and thus hurt the future inflow of revenues. The consequences of getting caught for a single firm involved in corrupt practices is hence considerably higher compared to a situation where several parties are sharing the risk.

4.3 Key parameters and variables

We denote the following variables as:

- $x \in [0, \bar{x}]$: A space of bribery offers, where $\bar{x}$ indicates a maximum possible offer based on a given budget.

- $\alpha > 0$: Representation of a contract´s profitability

- $\beta > 0$: The score of corruption measured by the Corruption Perception Index *(CPI)*

- $\pi(x; \alpha)$: Potential gain from new contracts, which is assumed to be increasing in $x \in [0, \bar{x}]$ and increasing in α. If the firm does not bribe, there will be no reward in terms of benefits, i.e, $\pi(0; \alpha) = 0$.

- $L(x; \beta)$: The loss function when the firm is detected, which is assumed to be increasing in the arguments of x and β. If the firm does not bribe, then there will not be any penalties, i.e., $L(0; \beta) = 0$.

Let $v(m)$ denote the value function for gain/loss (m) to the firm.

- $v(\pi(x; \alpha))$: Represents the perceived value from the net benefits.

- $v(\text{-}L(x; \beta))$: Represents the perceived value from the loss in the state of detection.

- Normalize $v(0) = 0$, $x = 0$ means that the firm does not bribe, which serves as our reference point.

- v is an increasing function.

4.4 A simple model with one player

Consider a firm that chooses a bribery amount ($x \geq 0$) in order to gain some certain benefits for its business. Nature will then decide the probability of detection, and the firms´ respective payoffs will be dependent on the state occurred, as shown in the decision tree below (figure 1).

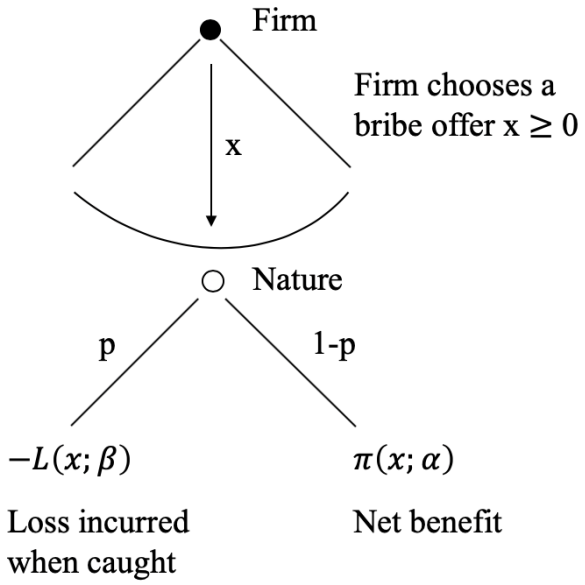

Figure 1: Decision tree

If the firm is detected, the payoff will be denoted as the loss function, $-L(x;\beta)$, and vice versa, the payoff becomes $\pi(x;\alpha)$ accordingly in a state with no detection. The value function ($v(m)$) captures the pleasure from the benefit of winning contracts, as well as the pain from the loss in a state of detection. We denote the likelihood of detection by the probability, p. Then the firm's expected value can be written as

$$v = p * v\big(-L(x;\beta)\big) + (1-p) * v\big(\pi(x;\alpha)\big) \quad (1)$$

The firm will then choose the bribery amount that maximizes the expected payoff. From the first order condition, we get:

$$F.O.C \ \frac{p}{1-p} = \frac{v'\big(\pi(x;\alpha)\big)\pi_x(x;\alpha)}{v'\big(-L(x;\beta)\big)L_x(x;\beta)} \quad (2)$$

We *"make"* a mild assumption on the primitives: for all x, we have that $v', \pi_x,$ and L_x are bounded functions. This implies that once the optimal bribery amount is identified, we can also identify the global maximum level of the value function, net benefit function and the loss function to the firm. Furthermore, the condition indicates that the firm cannot be better off by deviating from the derived bribery amount, i.e., the bribery amount is constructed such as the expected payoff is exactly tangent to the relationship between the probabilities. We apply the MRS (the slope of the indifference curve that provides the same expected payoff). Once the convex-shaped indifference curve becomes tangent to the probability line, the bribery amount maximizes the expected payoff, as the indifference curves in the right direction are always preferred (see figure 2 below).

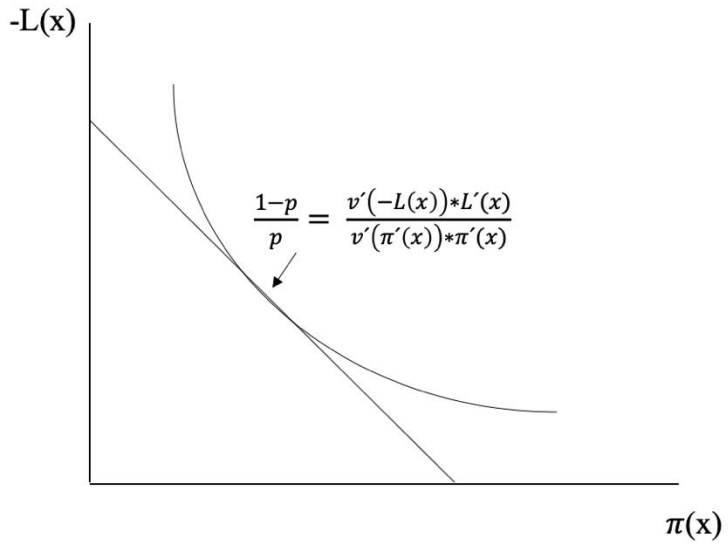

Figure 2: Indifference curve

We can now modify proposition (2) and get:

$$G(x;\alpha,\beta) \equiv MRS\ for\ the\ optimal\ x \quad (3)$$

Hence,

$$G(x;\alpha,\beta) = \frac{v'\big(\pi(x;\alpha)\big)\pi_x(x;\alpha)}{v'\big(-L(x;\beta)\big)L_x(x;\beta)} \quad (4)$$

We denote the following assumption,

$$v' > 0, \pi_x > 0, \text{ and } L_x > 0. \ (A1)$$

If (A1) holds, we must have that

$$G(x;\alpha,\beta) > 0 \text{ for all } x.$$

In the next two sections, we will be analysing the behaviour of two particular types, which we denote as the moral type and the corrupt type.

4.4.1 Moral Type

As previously mentioned, the value function v represents the firm´s pleasure from winning new contracts and the pain from detection. In this section, we analyse the value function of a moral type.

Definition 1. The firm is identified as a *moral* type iff. the value function v satisfies

$$\lim_{x\to 0^+} \frac{v'(\pi(x;\alpha))}{v'\big(-L(x;\beta)\big)} = 0.$$

Immediately observe that in order for this limit to hold, the marginal value for gains must be significantly lower than the marginal value for losses, i.e., $v'(\pi(x;\alpha)) \ll v'\big(-L(x;\beta)\big)$ in the neighbourhood of $x = 0$. This suggests that a moral type is loss averse at the reference point $x = 0$. From prospect theory (Kahneman & Tversky, 1979), the main findings are that the losses have a larger effect on the individual than the equivalent gain. For an illustration, consider figure 3.

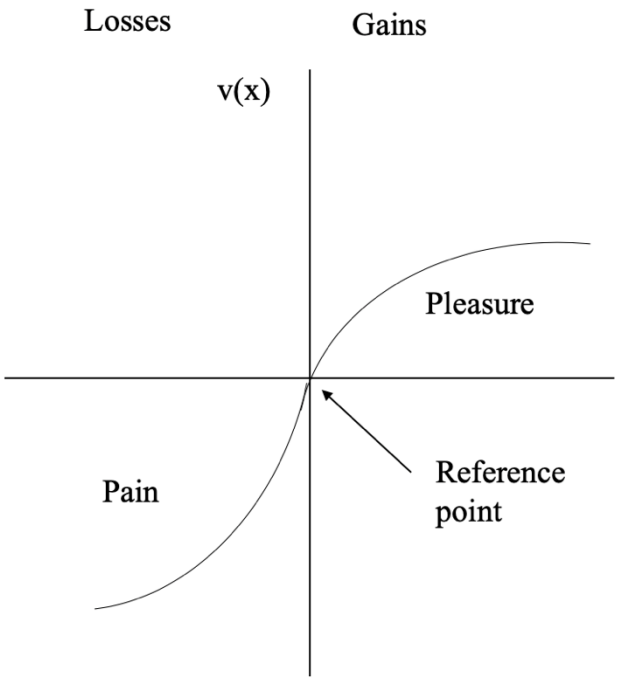

Figure 3: Loss aversion curve

The figure illustrates how much satisfaction we get from a certain outcome. We evaluate happiness from the reference point, with two possible domains: losses and gains. The function shows how much a given outcome with respect to the reference point is affecting the utility of an individual. To illustrate with an example; For $100 dollar gain you get hold of less pleasure than an equivalent loss from the reference point. The steepness of the curve illustrates exactly this point, i.e., losses hurts more than gains provide pleasure. The pleasure is concave in the gain's domain, and the concavity captures diminishing marginal utility. This translates into risk aversion, i.e., we are risk averse in the region of gains. The pain curve is convex, which translates into risk seeking. We do everything we can to avoid additional losses, or in other words, increasing marginal utility.

For the moral type, the MRS $G(x)$ has a limit value of 0 at $x = 0$ since

$$\lim_{x \to 0^+} G(x) = \frac{v'(\pi(x;\alpha))}{v'\big(-L(x;\beta)\big)} * \frac{\pi_x(x;\alpha)}{L_x(x;\beta)} = 0$$

From (A1), we know that $G(x)$ is bounded at $\bar{x}$ as shown in figure 4 below.

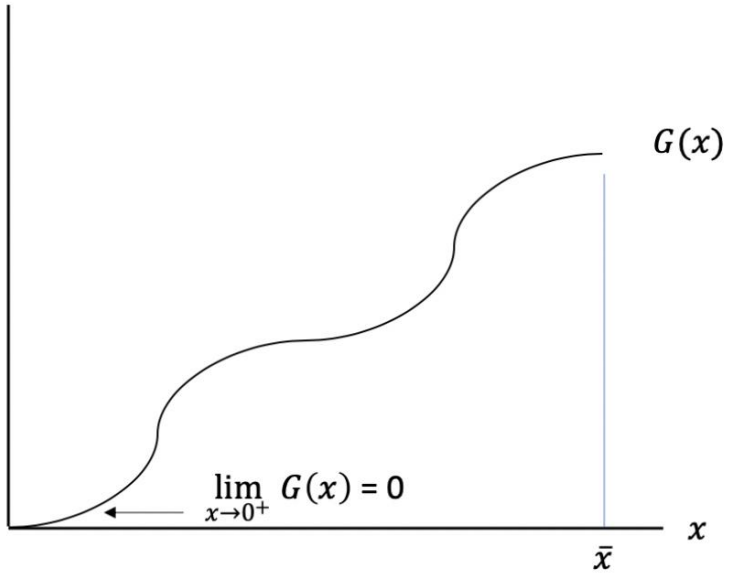

Figure 4: Limit value of the moral type

4.4.2 Application of the moral type

To illustrate the behaviour of the moral type, carefully consider the following example: We denote

$$\pi(x;\alpha) = \alpha^2 x \text{ and } -L(x;\beta) = \beta^r x.$$

The value function is given by the next piecewise function,

$$v(m) = \begin{cases} \sqrt{m} & for\ m \geq 0 \\ m^{\frac{1}{r}} & for\ m < 0 \end{cases}$$

Where $r > 2$ is an odd integer in order to define the value function when $m < 0$. Given these specifications, we have that

$$v\big(\pi(x;\alpha)\big) = \sqrt{\alpha^2 x}$$

and,

$$v\big(-L(x;\beta)\big) = \left((\beta^r x)^{\frac{1}{r}}\right).$$

From the first order conditions, we have that,

$$v'\big(\pi(x;\alpha)\big) = \frac{\alpha^2}{2\sqrt{\alpha^2 x}} = \frac{\alpha}{2\sqrt{x}}$$

and,

$$v'\big(-L(x;\beta)\big) = \frac{1}{r}\beta x^{\frac{1}{r}-1}.$$

Hence, we have that,

$$G(x) = \frac{\frac{\alpha}{2\sqrt{x}}}{\frac{1}{r}\beta x^{\frac{1}{r}-1}} = \frac{\alpha r}{2\beta} x^{0.5-\frac{1}{r}}$$

Observe that since $r > 2$, $G(x)$ will be increasing monotonal and $\lim_{x\to 0^+} G(x) = 0$.

For this type, we can state our first result as follows:

Proposition 1. Suppose (A1) holds and the firm is a moral type. Then for each α and β, there exists an inspection scheme $p \in (0,1)$ which completely curbs the firm´s bribe payment and corruption.

Proof: Since we know that $G(x)$ is bounded for all x, there exists a $\bar{p}$ such that for all $p > \bar{p}$, we have

$\frac{p}{1-p} > G(x)$ for all x.

This implies from that no bribery offer $x \in [0, \bar{x}]$ satisfies the first-order condition (2), and for such p, the derivative of the expected value function is strictly negative. Hence, the firm would not find it optimal to bribe for any x, see the figure 5 for illustration.

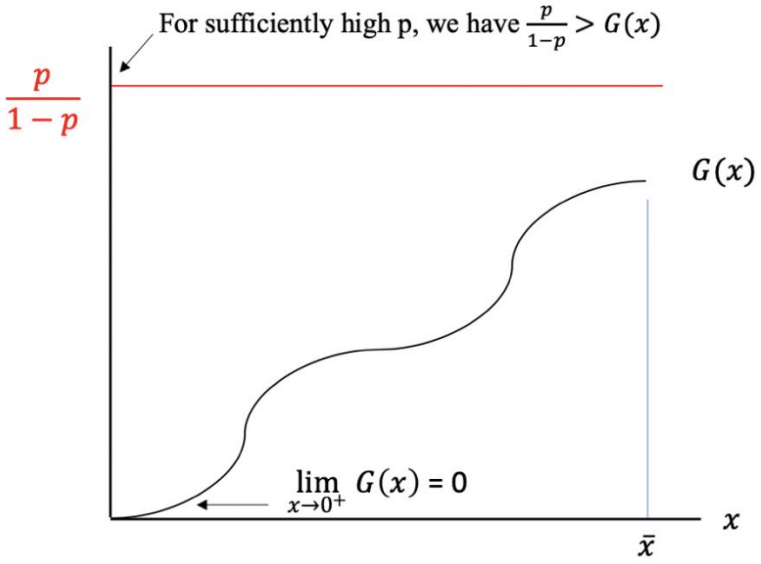

Figure 5: F.O.C. not satisfied for the moral type

For $\frac{p}{1-p} > G(x)$ for all x implies that the derivate of the expected value is negative, i.e.

$$-p * v'\big(-L(x;\beta)\big)L_x + (1-p) * v'\big(\pi(x;\alpha)\big)\pi_x < 0$$

Which means that the expected value function is monotone decreasing, as shown in figure 6 below.

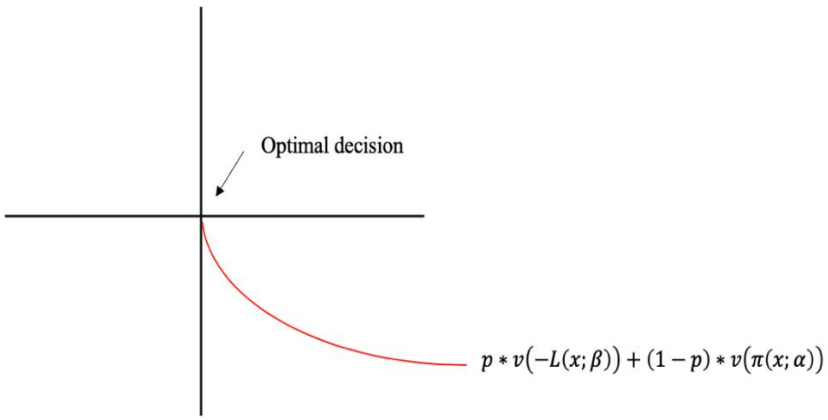

Figure 6: Expected value function for the moral type

The derived results can be used to illustrate Proposition 1. Let $r = 3$ and $\alpha = 2\beta$. In addition, we normalize the firm´s budget for bribery to $\bar{x} = 1$. Then $G(x)$ now becomes

$$G(x) = \frac{\alpha r}{2\beta} x^{0.5-\frac{1}{r}} = \frac{2\beta * 3}{2\beta} x^{\frac{3}{6}-\frac{2}{6}} = 3(1)^{\frac{1}{6}} = 3$$

Hence for all $\frac{p}{1-p} > 3$, the firm will never bribe, which implies that $p > 0.75$.

4.4.2.1 Loss aversion

We shall also examine the relationship between p and r. Let r represent the degree of an individual's loss-aversion (Kahneman and Tversky, (1979)). To illustrate, we set the parameters such that:

$$0 < \pi(\bar{x}; \alpha) < 1 \text{ and } -1 < -L(\bar{x}; \beta) < 0.$$

Then suppose that r increases. Then the value function becomes steeper for losses than for gains around the reference point, as shown in the figure below. Hence, as r increases, we have that $v(m) < -v(-m)$ for all $m \in [0,1]$, and $v'(m) < v'(m)$; in words, the value function for losses is steeper than the value function for gains, i.e, the firm becomes more loss-averse (see figure 7).

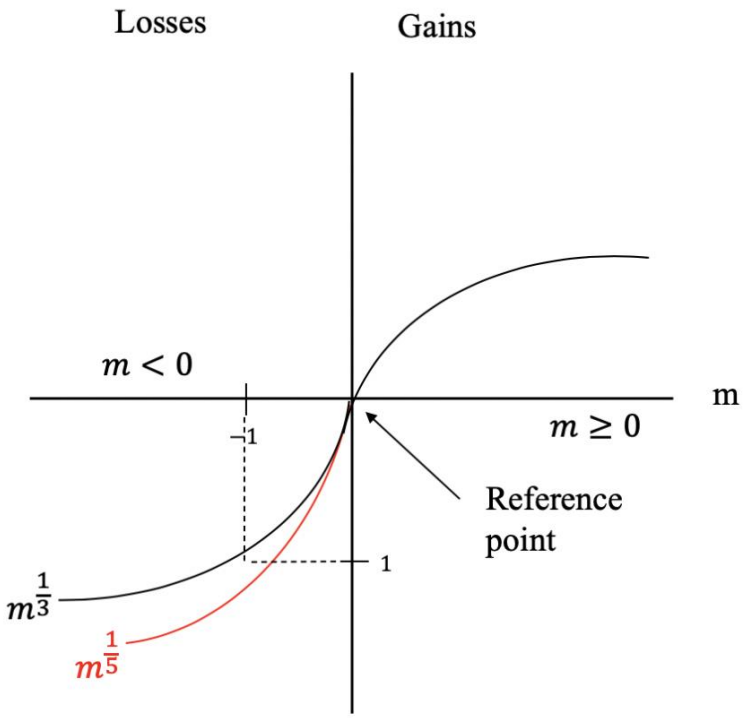

Figure 7: Change in loss aversion

From prospect theory (Kahneman and Tversky, (1979)), we know that the satisfaction from gains will be less than the pain from losses. Hence, because of the risk component of being detected is involved, one will never find it optimal to bribe unless the gains are sufficiently high, i.e, we demand a risk premium for engaging in bribery activities. If that is not the case, then we could find some risk-free alternatives that can potentially yield the same benefits. Intuitively, as the firm becomes more loss-averse, corruption can be eliminated with a more flexible investigation plan, unless α is incredibly high. In order to formalize this idea, we can illustrate with the same derived results from the previous example. If we set $\alpha = 2\beta$ and $\bar{x} = 0.01$, then we can eliminate corruption for $r = 3$ iff:

$$\frac{p}{1-p} > 3(0.01)^{\frac{1}{6}} \Leftrightarrow p > 0.58$$

If $r = 5$, then we must have that

$$\frac{p}{1-p} > 5(0.01)^{\frac{3}{10}} \Leftrightarrow p > 0.55.$$

Observe that when the player becomes more loss-averse, the upper-bound of the probability of detection the player can accept decreases as she becomes more sensitive in the loss domain, i.e, the value function becomes steeper.

4.4.3 Corrupt Type

The next type we are going to examine is the corrupt type.

Definition 2. The firm is a *corrupt* type if the value function satisfies

$$\lim_{x\to 0^+} \frac{v'(\pi(x;\alpha))}{v'\big(-L(x;\beta)\big)} = \infty.$$

Immediately observe from figure 8 that the corrupt type´s MRS $G(x)$ has an unbounded limit value at $x = 0$ because

$$\lim_{x\to 0^+} G(x) = \frac{v'(\pi(x;\alpha))}{v'\big(-L(x;\beta)\big)} * \frac{\pi_x(x;\alpha)}{L_x(x;\beta)} = \infty$$

Where (A1) guarantees that $G(\bar{x})$ is bounded as before.

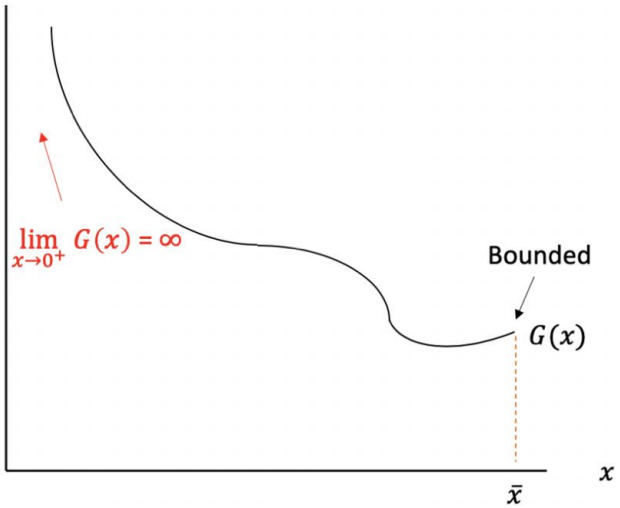

Figure 8: Limit value for the corrupt type

Application of the corrupt type

Let us denote the following benefit and loss functions:

$$\pi(x;\alpha) = \alpha^2 x$$

and,

$$\text{-}L(x;\beta) = \beta x$$

Next, the value function is given by the following piecewise function,

$$v(m) = \begin{cases} \sqrt{m} & for\ m \geq 0 \\ m & for\ m < 0 \end{cases}$$

Given these specifications, we have that:

$$v\big(\pi(x;\alpha)\big) = \sqrt{\alpha^2 x}$$

and,

$$v\big(-L(x;\beta)\big) = \beta x.$$

From the first-order conditions, we get,

$$v'\big(\pi(x;\alpha)\big) = \frac{\alpha^2}{2\sqrt{\alpha^2 x}} = \frac{\alpha}{2\sqrt{x}}$$

and,

$$v'\big(-L(x;\beta)\big) = \beta.$$

Hence,

$$G(x) = \frac{\frac{\alpha}{2\sqrt{x}}}{\beta} = \frac{\alpha}{2\beta\sqrt{x}}.$$

Observe that $G(x)$ is monotone decreasing and,

$$\lim_{x \to 0^+} G(x) = \infty.$$

Proposition 2. Suppose (A1) holds and the firm is a corrupt type. Then for each α and β, there exists no inspection scheme $p \in (0,1)$ which completely curbs the firm´s bribe payment and corruption, i.e., the corrupt type always makes a positive bribe offer.

Proof: Observe that the condition $\lim_{x \to 0^+} G(x) = \infty$ ensures that for all p, α and β, there exists an interval $[0, x^*)$ in the neighbourhood of $x = 0$ such that for every $x \in [0, x^*]$, we have

$$\frac{p}{1-p} > G(x).$$

Figure 9 below illustrates exactly this point. This implies that the expected value function has a positive derivative on that interval, which in turn implies that the firm would bribe at least $x^* > 0$ for all p.

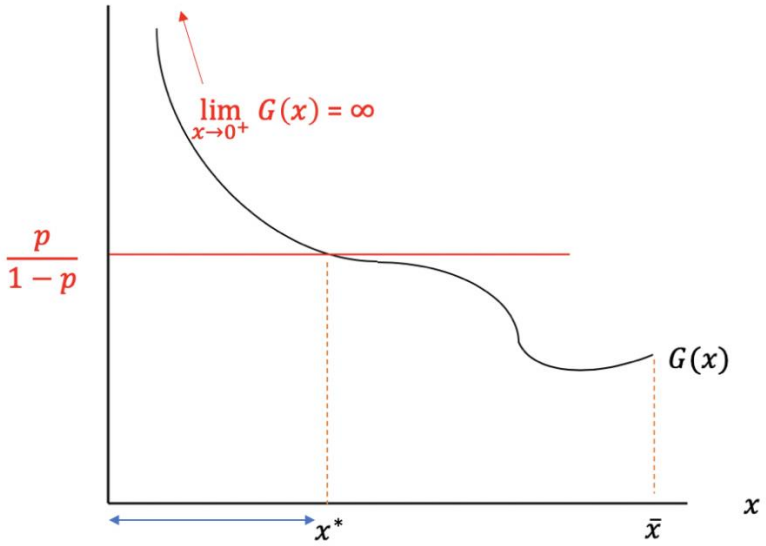

Figure 9: F.O.C. satisfied for the corrupt type

Within the interval of the blue line indicated on the figure, we have that

$$G(x) > \frac{p}{1-p}$$

and as indicated from figure 9, for such relationship there exist a unique level of a bribery amount that satisfies the first-order condition.

Proposition 3. Suppose that (A1) holds and the firm is a corrupt type. Furthermore, the firm´s MRS $G(x)$ is monotone decreasing in x. Then the firm´s optimal bribe scheme x^* is uniquely determined and the amount of bribe is a decreasing function of p (see proposition 2 for proof).

From the previous example, we have that MRS $G(x) = \frac{\alpha}{2\beta\sqrt{x}}$ is decreasing monotonal. Hence, the optimal bribe scheme x^* can be identified by the first-order condition (2):

$$G(x) = \frac{p}{1-p}$$

$$\frac{\alpha}{2\beta\sqrt{x}} = \frac{p}{1-p} \Rightarrow x^* = \left(\frac{\alpha(1-p)}{2p\beta}\right)^2.$$

Carefully observe that x^* is decreasing in the argument of p and β, which we denote as the *risk* components. A country with a low level of corruption (high β) is more likely to punish the player with a higher penalty fee than a country with relatively higher tolerance of corruption. The increase in the probability of detection is directly related to higher risk when engaging in bribery activities. The increase in either component will directly reduce the players´ incentive to bribe as the risk in terms of penalty and detection increases. On the other hand, x^* is increasing in α as the incentive of bribing a larger amount increases when a contract´s profitability increases.

4.5 A simple model with competition

In this section, we will discuss our model further and in particular investigate the outcomes of bribery with the existence of competition.

Now consider two firms that bribe simultaneously, i.e., each firm does not observe the other firm´s bribing strategy when making an offer. We apply the same loss function from the previous section, where the loss is dependent on the bribe amount and TI-score,

$$L_i(x_i; \beta_i).$$

Furthermore, the net gain function will now be dependent on the other player´s bribing strategy, i.e.,

$$\pi_i(x_i, x_j; \alpha).$$

We assume that a player´s net benefit function is increasing in x_i and decreasing in x_j due to the competition of receiving the most profitable contracts. In particular, we assume that $\pi_i(0, x_j; \alpha) < 0$ for $x_j > 0$, which implies that firm i suffers a loss it does not bribe but its competitor does. The loss can be interpreted as a weakened market position relative to the competitor when she gets more profitable contracts and outperforms player i on a relative basis in a state with no detection.

For further analysis, consider two loss averse firms, i.e., two moral types. We demonstrate the existence of an equilibrium in which the two firms bribe even with a presence of high CPI score.

Recall from the moral type in the previous section that when β is high, $G(x) = \frac{\alpha r}{2\beta} x^{0.5-\frac{1}{r}}$ shifts downwards and the moral type with a single firm never bribes, see figure 10 below.

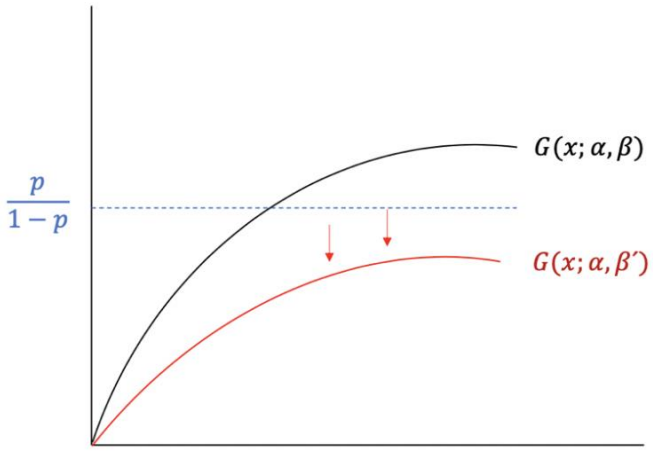

Figure 10: G(x) of the moral type

However, with the presence of competition, the expected value is no longer zero at $x_i = 0$ if $x_j > 0$. The reference point shifts to the left as shown in figure 11.

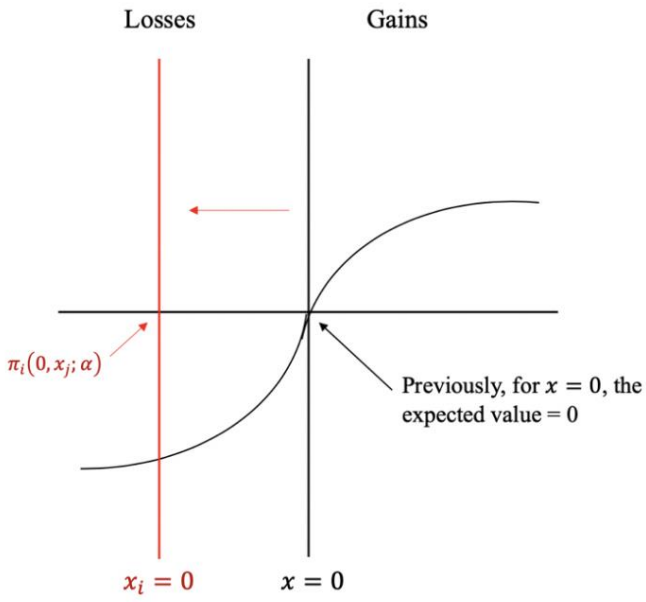

Figure 11: Shift in the reference point

Observe that after the shift the firm becomes risk-seeking in the loss domain for $x_i = 0$. In addition, the firm´s value function is also locally convex, in particular between the interval of $x_i = 0$ and $x = 0$. Within this interval, the firm will be significantly more risk tolerant in order to win the contracts with high profitability form its competitor.

4.5.1 Application of the two-player model

Consider the following gain and loss functions,

$$\pi_i(x_i, x_j, \alpha) = \alpha(x_i\, max\{x_j, 1\} - cx_j)$$

where $c > \overline{x_i}$, and $\overline{x_i}$ represents the maximum offer from firm i.
Next, we denote the following loss-function,

$$L(x_i, \beta) = \beta^3 x_i.$$

Furthermore, consider the following piecewise value-function,

$$v(m) = \begin{cases} m, & for\ m \geq 0 \\ m^{\frac{1}{3}}, & for\ m < 0 \end{cases}$$

Carefully observe that when $x_2 = 0$, firm 1´s expected value function becomes:

$$v = -p\beta x_1^{\frac{1}{3}} + (1-p)\alpha x_1 \quad (1)$$

From the first-order condition, we have that,

$$\frac{dv}{dx_1} = -\frac{1}{3}p\beta x_1^{-\frac{2}{3}} + (1-p)\alpha = 0.$$

Hence,

$$\frac{p}{1-p} = \frac{3\alpha}{\beta}x_1^{\frac{2}{3}} = G(x) \quad (2)$$

Observe that $G(x)$ is monotone increasing and $\lim_{x_1 \to 0^+} G(x) = 0$, as shown in figure 12 below. Furthermore, we assume that (A1) holds which implies that $G(x)$ is bounded.

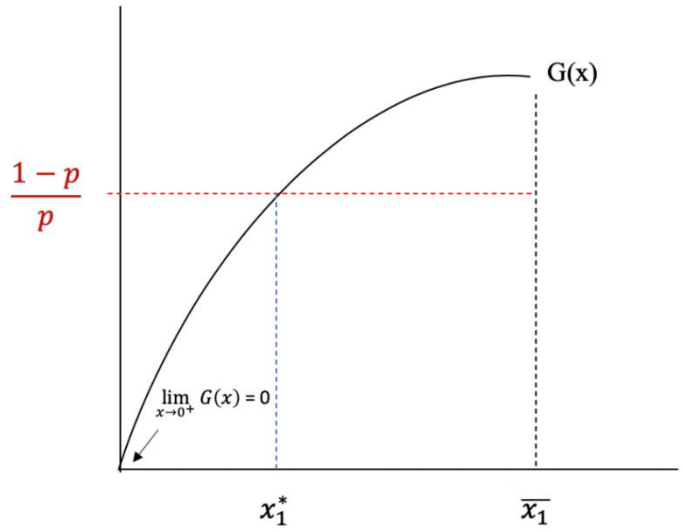

Figure 12: Illustration of G(x)

Recall from (1) that the expected value function is negative if

$$p\beta x_1^{\frac{1}{3}} > (1-p)\alpha x_1.$$

Hence, if this holds for the maximum level $\overline{x_\iota}$, firm 1 will never bribe, i.e

$$p\beta \overline{x_\iota}^{\frac{1}{3}} > (1-p)\alpha \overline{x_\iota}.$$

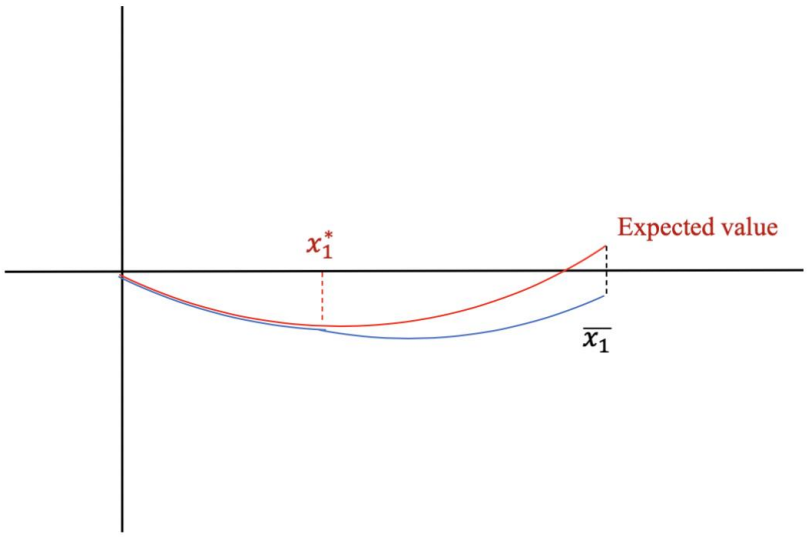

Figure 13: Expected value function and optimal bribary amount

Observe from figure 13 that the expected-value function is decreasing on $x \in (0, x_1^*)$ and increasing on $x \in (x_1^*, \overline{x_1})$. Hence, if the value at $\overline{x_1}$ is positive, the firm will offer $\overline{x_1}$ as indicated on the red curve. On the other hand, if the value is negative, the firm does not make any offer as we can see from the blue line, and we will have that,

$$\frac{p}{1-p} > \frac{3\alpha}{\beta} x_1^{\frac{2}{3}}.$$

Hence, the optimal decision for firm 1 is to not make an offer, i.e., $x_1^* = 0$.

Now suppose that $x_2 > 0$, then the first-order condition becomes

$$\frac{3\alpha \, max\{x_2, 1\}}{\beta} x_1^{\frac{2}{3}} = \frac{p}{1-p} \quad (3)$$

If $0 \leq x_2 \leq 1$, then the condition will be the same as before and firm 1´s behaviour is set such that she never bribes if:

$$\frac{p}{1-p} > \frac{3\alpha}{\beta} x_1^{\frac{2}{3}}.$$

However, if $x_2 > 1$, then the value function will be steeper compared to when $0 \leq x_2 \leq 1$, see figure 14 below.

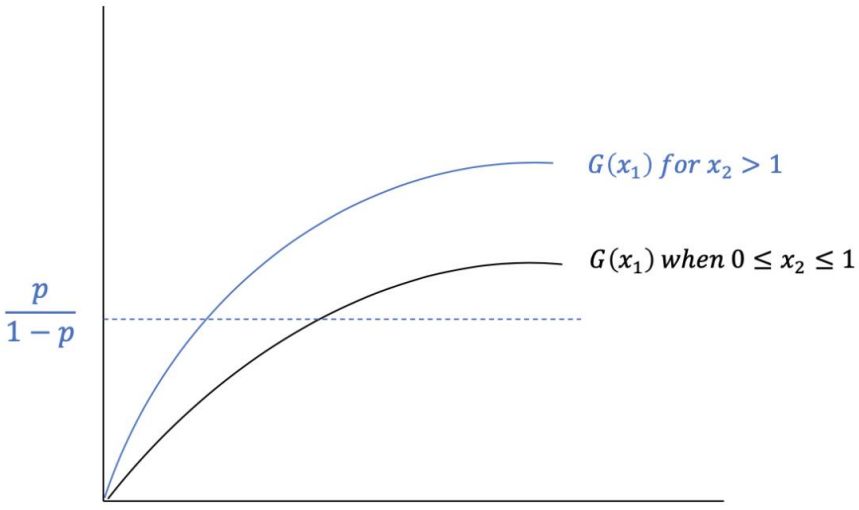

Figure 14: Shift in G(x)

Recall from (3), for $x_2 > 0$ we have that:

$$G(x_1) = \frac{3\alpha x_2}{\beta} x_1^{\frac{2}{3}}.$$

Observe that $G(x_1)$ shifts upwards as x_2 increases or β (the TI-score) decreases. Hence, ff the upward shift in the value function is sufficiently high, then firm 1´s expected value at $\overline{x_1}$ can turn positive, i.e.,

$$v = -p\beta \overline{x_1}^{\frac{1}{3}} + (1-p)\,\alpha(\overline{x_1} x_2 - c x_2) > 0.$$

4.6 A unique equilibrium of bribe with multiple players

In our previous investigation, we found that there exists no equilibrium where a single player uses bribing instruments in order to get contracts to expand their business. However, when we have a situation of multiple players (that at the same time are also competitors), there exist a unique equilibrium where bribing instruments are optimal in a simultaneous game.

First of all, we assume that investors are risk averse, and maximize their investments w.r.t. lowest possible risk (Sharpe, 1994). When the competitors serve as substitutes of each other, investors will choose to invest in the company that provides the greatest payoffs, given similar risk profiles. In the sense of TeliaCompany and Telenor, we argue that both the size and the risk profiles of the two firms are similar. Hence, if one player enters a contract with potential gain of profit, then the other firm will move accordingly in order to maintain the competitiveness towards the investors in terms of payoff.

Secondly, we argue that if there exist a sufficient level of risk sharing between the competitors, then bribing can lead to an equilibrium compared to a situation with only one enterprise. The intuition follows the same path as everyone belong to the same boat. If one company gets caught, then the same goes for the other firm. Hence, on a relative basis, the loss of getting caught is reduced when comparing it with the competitors. Consequently, the players are being more tolerant when they know that the other players receive the same penalty, hence finding it attractive to bribe when there are other players involved.

Most importantly, the implications of how competition can drive inefficient outcomes lies on the core of our analysis. The firms are feeling a pressure when the other is making a threatening and risky move, hence forcing an outcome that is not efficient for both companies, but it occurred as a consequence of being reluctant to lose to the other firm, as well as being more tolerant to a loss when the businesses are sharing the same risk of being detected.

5 Extended Analysis

In this chapter, we will provide a comprehensive analysis on how the decision makers are affected by their respective corruption index scores. We will apply the results from our model and study the effects of corruption on the optimal bribery amount to the players – or firms – involved. In addition, we will provide a dynamic analysis on how changes in the corruption index scores affect the players decision.

5.1 Corruption index analysis

From our previous analysis, we observed that the players bribery amount are strategic complements, but one interesting analysis to conduct is how the players would react in situations where the corruption score of the countries in question are high or low, compared to the competitor. From our general equilibrium, our intersection between player 1 and player 2 would look like a normal situation arising from the notion of strategic complements as visualized in figure 15.

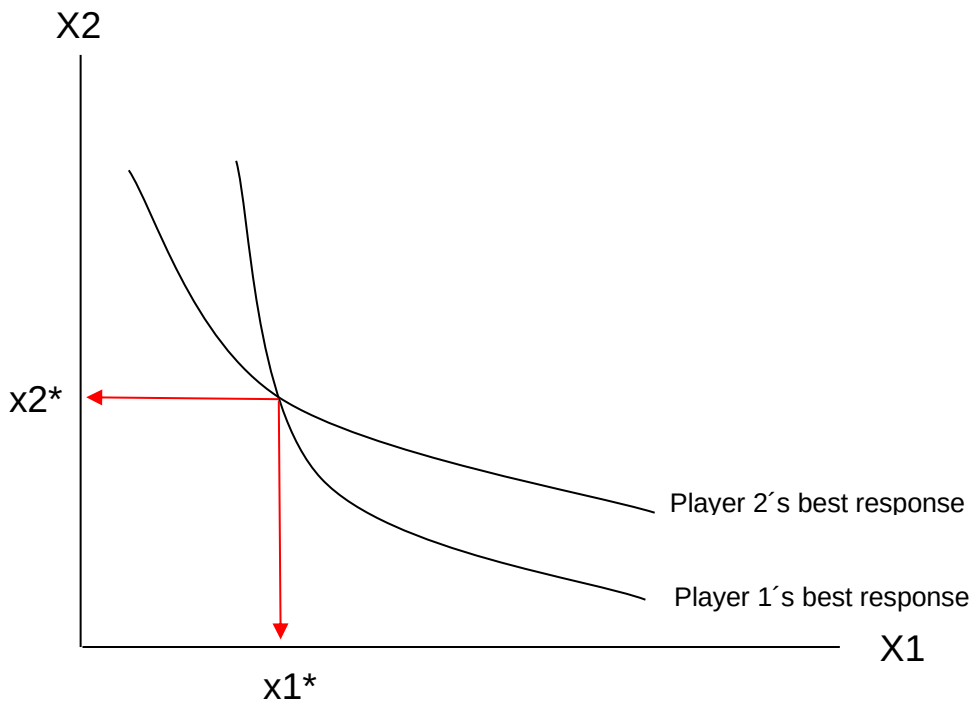

Figure 15: Best response function between player 1 and player 2

In general, we will have the following relationship between the bribery amount and the corruption index score (as illustrated in figure 16), and we will carefully demonstrate it by distinguishing between two cases, specifically where $\beta_1 = \beta_2 = \beta$ and $\beta_1 \gg \beta_2$.

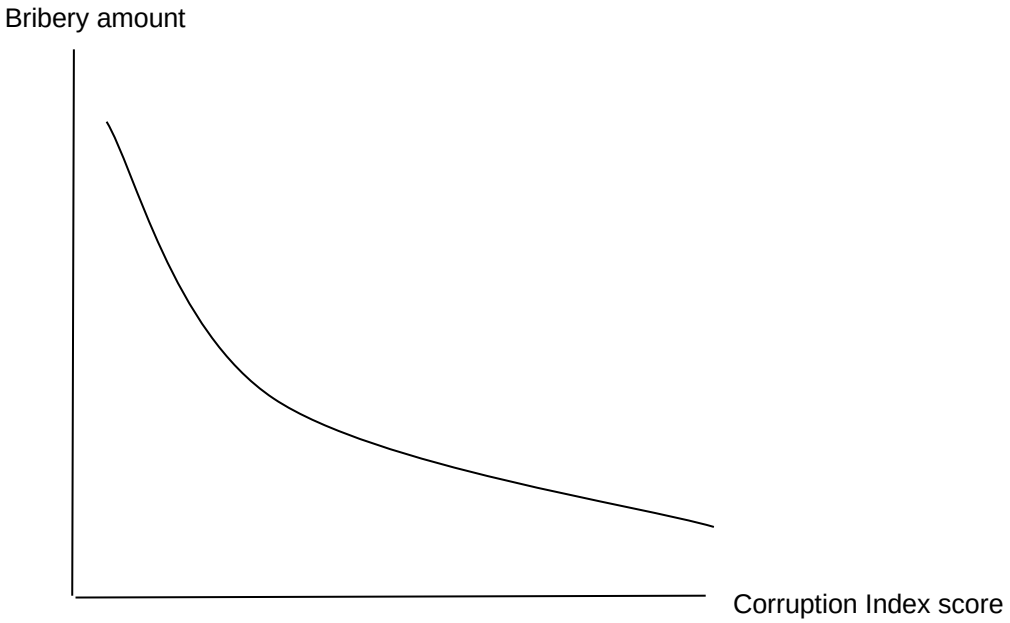

Figure 16: Relationship between bribery amount and CPI

5.1.1 Corruption analysis with similar index scores

In a case where the corruption score is similar, i.e., $\beta_1 = \beta_2 = \beta$, then the amount of bribe from our model is also the same due to the perfect symmetry of the two players. The rationale behind this is that the players face the same political conditions regarding corruption. In the case of detection, their penalty will be very similar in nature. Hence, their optimal amount of bribe should be similar after taking the detection probability into account. Another perspective of this situation is the existence of risk sharing. If we assume that the players are perfect substitutes by consumers, and in addition to that listed on the same stock exchange, then one action from a player leading to either positive or negative consequences can have a significant impact on the other player. Hence, if one player bribed a huge amount in order to secure some contracts to expand her business, then the best response to a new player will be to bribe a similar amount. In a case of detection, their punishment will be similar, and as emphasized before, their penalty cost will not be interpreted as a huge loss when a similar amount of penalty was also received by the other player. The economic loss

incurred will have a similar impact on the players profit and loss statements, and as analysts and investors care about relative performance, the loss will not be seen as influential to the players if they incurred it simultaneously. Furthermore, the reputation loss will not be as substantial when the competitor was engaged in a similar corrupt behaviour. Again, on a relative basis, the consumers will not view the one player being more corrupt than the other when the actions made were in fact similar. By realizing these valuable pieces of information, the players can be more aggressive in their bidding process in order to increase the chance of getting the contracts they want to expand their business.

5.1.2 Corruption analysis with different index scores

If we now assume a situation where the players are from a different place in the world, and their corruption index score also differs significantly, i.e., when $\beta_1 \gg \beta_2$. In this case, as derived directly from the optimal bribery amount, player 1 will bribe a lower amount than player 2. Countries with a low corruption index score have a larger flow of corruptive activities, and even the government itself can be corrupt. Hence, in that case, there is little incentive for player 1 to bribe a high amount, as the punishment of getting detected is significantly lower in terms of both economic and reputation for player 2. Recall that the cost incurred when detected is increasing in the bribery amount, which is evident from the telecom scandal case. Then, the likelihood of player 1 getting the contracts to expand her business is lower than player 2, as player 2 is rationally believed to bribe a higher amount. Observe that the risk involved is crucial for the aggressiveness of the bribery amount. As player 1 knows that once detected from her country of origin with high corruption index score, the penalty cost will be substantial and will in turn also hurt her reputation in the public, and even result in a significant fall on player 1´s stock price. Conversely, player 2 will not face the same amount of risk as player 1, as the nature of the country in question have a greater degree of tolerance towards corruption activities, as well as the general behavior is already leaning towards corruption and hence most likely not damage the reputation on a relative basis. In this situation, player 1 might not find it attractive to engage in the bidding process to start with, as the conditions set by the nature is working negatively against countries with high corruption index scores, and the level of risk sharing now becomes non-existent. The equilibrium in this case can hence have a possibility to be a corner solution, where player 1 bribe nothing and everything is gained by player 2.

5.2 Dynamic changes

We shall also carefully consider a situation involving dynamic changes, i.e., when two players in general had the same corruption index score, but as a result of an unexpected event, one player´s country in origin could experience a higher or lower corruption index score than the other player. If we now consider a situation where player 1 gets a significantly higher corruption score than player 2 as a result of some unexpected shock, i.e. $\beta_{12} \gg \beta_{22} = \beta_2$. Then, ceteris paribus, this will result in a shift in player 1´s best response function, as shown in figure 17.

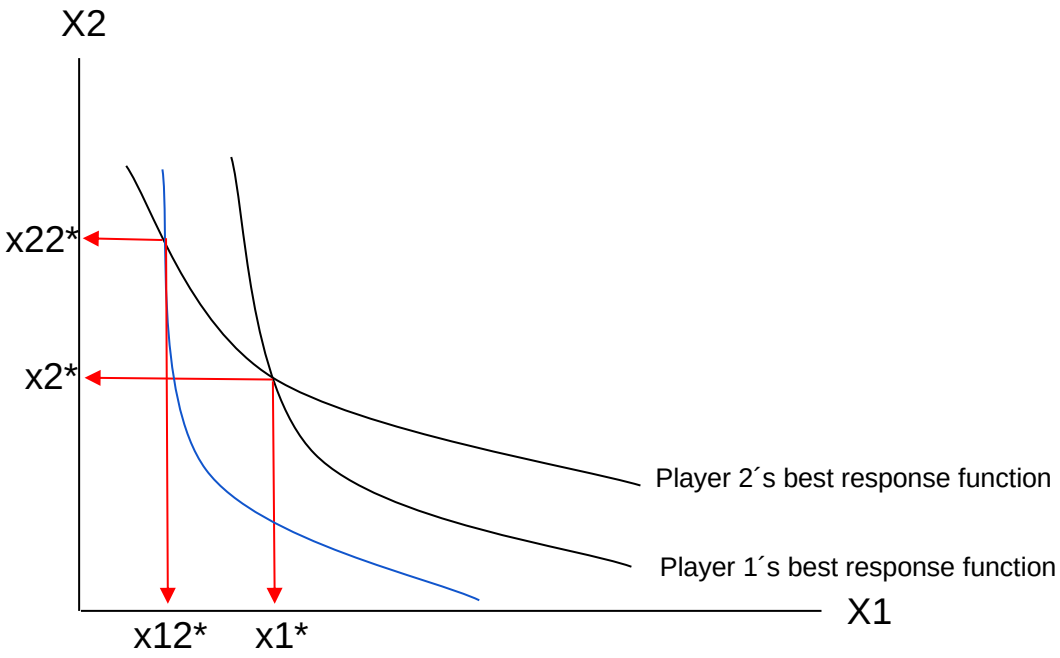

Figure 17: Shift in player 1's best response function

Observe that after the shift of player 1´s best response function, the new equilibria occurs at; $X_{12}^* < X_1^*$ and $X_{22}^* > X_2^*$. The dynamic change in the environment of player 1 resulted in a decrease in her optimal bribery amount, whereas player 2 increased the bribery amount as a result of being strategic complements. The intuition follows that player 2 rationally believe player 1 will lower her bribery amount as a result of achieving a greater corruption index score in player 1's country of origin. Player 2 can then be relatively more aggressive in the bidding process of not only taking the contracts that was originally on the pipeline of player 2, but also seeing the opportunity to outbid player 1 and win other contracts that originally

interested player 1. This strategy will in turn increase the presence and market share for player 2. Dynamic changes will thus have a similar effect as a situation where $\beta_1 \neq \beta_2$, and if the corruption score differs significantly as a result of this dynamic change, we can also see the possibility of arriving at a corner solution.

6 External explanations for corruption

The model we have developed is, as previously explained, mainly touching upon factors based on the rationale behind economic scenarios, where expected costs and profit combined with the probability of getting caught and corruption scores should account for the decision making. However, we believe that it is fundamental to get a deeper understanding for why such practices could be executed. Hence, we will in this chapter briefly elucidate additional aspects that can explain why, or why not, organizations or individuals may choose to engage in corrupt practices.

6.1 Norms and perceived opportunity

Not only economic motives have been found to be related to corruption-proneness, but also that the perceived costs and/or profits was outweighed by personal norms, social norms, and the perceived opportunity to comply. He also concludes that *"in recent years, economic explanations of corruption have been the most cited and probably also the most influential for policy formulations"* (Andvig et al., 2001). As corrupt practices are usually seen as criminal behaviour, it would also be normative to conclude that such actions should not be pursued no matter what the potential yields are.

Several studies have been made to predict the interaction between norms and incentives in rule breaking behaviour. However, no theories have any clear conclusions within the topic and even though no theory at present supports such hypothesizes (i.e. linkage effects between anticipated incentives, personal norms, social norms and perceived opportunities), it is still not any evidence that rule out those mechanisms. For instance, Wikström suggests that the more of any of the three previously mentioned motives on corruption, the larger chance there is for any such individual might engage in corrupt practices. (Wikström et al., 2011).

Norms have in addition been identified as an important factor within behavioural economics and the effect it has on decision-making. Individuals who engage in unethical behaviour does not solely do it based on profit/loss calculations, but also on the social norms concerning unethicality (Gino et al., 2009). Likewise, social norms have a prevalent

influence on engagement in corruption and the central effect it has on decisions at an individual level (Köbis et al., 2015).

6.1.1 Ethical climate

Some recent studies within the topic of corruption proposes that there is a relationship between the perceived ethical climate in both public and private organizations and corruption (Gorsira et al., 2018). According to their article, the effects of ethical degree and egoistical climate has an impact on the organization's employees. The "more" ethical and the "less" egoistic climate perceived, the less prone the firm's employees are to conduct behaviour linked to bribery and corruption. Moreover, the study suggests that the ethical climate itself is linked to corruption via personal and social norms with regards to the topic. Remarkably, public officials and business employees working within an organization that are more egoistic, also tends to be more prone to corruption, as self-interest is overall the main contributor within those organization what decides right behaviour (Gorsira et al., 2018).

6.2 Cognitive psychology of corruption

Cognitive psychology can help us to understand individual decision-making processes. Thus, it should not be disregarded when trying to understand motives for corruption. Although the current research on basic cognitive psychology shows a strong bi-directional relationship between cognition and behaviour, there is currently not much scientific evidence that shows clear linkages for corruption. The following sections should therefore be treated with a pinch of salt.

6.2.1 Risk tolerance

First, corruption could potentially be classified as risky behaviour, especially if the probability of getting caught is high. Søreide found in his study that risk acceptance can increase enterprises' tendencies to offer inducements, such as when acting corruptly could potentially increase a firm's chance of operating in a given market (Søreide, 2009). However, there are researchers that challenge the former claim and suggests that attitudes do not explain any correlation between risk and corrupt behaviour. For instance, Berninghaus advocates that the motivation instead is driven by the subjective estimation (beliefs) of the probability of being detected (Berninghaus et al, 2013).

6.2.2 Power

Power is one of the most central factors in the earlier stages of research within corruption. The parameter is involved in the commonly known formula for corruption developed by Klitgaard (see appendix D). In the context of Klitgaard's view on corruption, power is defined as *"certain individuals holding accountable degrees of power or authority over decision-making processes, creating lucrative windows of opportunity for unethical behaviour"* (Klitgaard, 1988) . Subsequently, given that Klitgaard's supposition holds, there exists no corruption without power. Undeniably, there are several ways one can define power and further research on the topic suggests that power can be separated into two different segments – either "personalized" or "socialized" power (Wang & Sun, 2016). According to Wang and Sun, personalized power is regarded as power that is used to pursue self-centred goals for the benefit of oneself. On the contrary, socialized power means that the individual believes that power should be used to pursue other-focused goals. People that are characterized with a personalized power view have an increased chance to act for self-interest and in addition have a higher tolerance towards corruption, in particular corrupt behaviour of highly ranked individuals (Wang & Sun, 2016). Power, although not specified as personalized or socialized, can in addition result in overconfidence, greater risk acceptance, and a focus on reward, all of them indirectly linked to increased possibility in engagement in corrupt practices (Yap, 2013).

6.2.3 Behavioural Biases

Behavioural biases can serve as a caveat to how classic economic models find it rational to justify decision making in several circumstances, in which corrupt activities can be one of them. Self-serving bias proposes that decision-makers *"process information in ways that support pre-existing views and advance their self-interests"* (Prentice, 2007). For example, an individual proposing for corrupt practices as the optimal decision in a certain situation may respond differently depending on the outcomes. If he gets away with the bribe, he tells himself that it was the right thing to do and takes credit for his actions. Contrary, if he is caught, he blames other for the situation he has put his surroundings.

Some scholars claim that it is the situation itself, and thus not the individual, that is to blame for unethical behaviour including corruption. Confirmation bias in combination with the halo effect could influence individuals, despite being considered honest persons, to participate in corrupt actions (Darley, 2005). Past practices within an organization can form standards by which their employee's magistrate forthcoming actions. As time goes on, organizations can develop a form of ethical sliding and hence influence situations where time is short. This phenomenon can be hard for organizations - in particular larger organizations - to stop as people tend to prefer the status quo (Reckers & Samuelson, 2016)

6.2.4 Rationalization

Individuals, by nature, rationalize future and past performance in order to make judgements for themselves and other individuals. The same reasoning can be applied for corruption and the concept is by researchers called neutralization theory (Benson, 2015). The idea behind this concept is that rationalization is one of the components which entails in normalized corruption (Ashford & Anand, 2003). The attempt to break social norms against unethical conduct unfolds for rationalization for corrupt behaviour. The reason for this is that rationalization can be working as a human element to dodge judgement for ethical breaches (could be translated into self-defence) which in the long run can lead to ethical fading (Reckers & Samuelson, 2016).

6.3 Transparency

Transparency have shown to greatly affect the degree of corruption existing within a country at the grand, private, and bureaucratic levels based on three major findings. First, information regarding governmental actions enables citizens to monitor government officials and enforces electoral accountability. Djankov discovered that public disclosure is connected to lower perceived corruption and an enhanced government (Djankov et al., 2010). Second, transparency provides residents with information on what they are entitled to and can thus reduce corruption (Djankov et al., 2010). Last, citizens can through transparency be allowed to signal interest in a specific outcome which in turn can reduce the level of corruption within a country (Peisakhin & Pinto, 2010).

6.4 Technology and communication

Technological innovations can create tools that make information flows more transparent and easier to get access to (given that the policymakers are not supporting corrupt behaviour themselves). Certain improvements enhance communication streams which is certainly bad for individuals involved in corrupt behaviour. The reason is that for a majority of corrupt practices, the corrupt agent needs to dodge mechanisms set up by the official government to prevent such actions. For example, recent developments in AI and big data have made it possible for governments to foster accountability as they have access to scan through a larger number of suspicious transactions (Santiso, 2019).

6.5 Corruption across cultural borders

As the case telecom scandal in question involves actors that are operating on unlike borders, the cultural differences could potentially have an impact on initiatives for conducting corrupt behaviour by the players. Needless to say, different countries have different norms and it could hence be challenging for parties whom interact with each other across borders to fully understand codes of conduct, and further what is considered to be legitimate and illegitimate behaviour (Lachman et al., 1994). One particular action could be legitimate in one country but illegitimate in another. Accordingly, it can be delicate for multinational organizations to know which country's rules one should follow. Although one would expect those firms to obey the country which legislates the tougher laws, this is not always the case. It is yet another reason for companies whose are operating on the edge to blame non-normative decisions, provided getting caught, on legislations that are exterior to the domestic scope. However, it is hard to find a neutral understanding of corruption from a broad cultural perspective, since the term is based on acts that, from a normative perspective, are considered illegitimate.

7 Concluding remarks and discussion

In this section, we are going to provide concluding remarks on our results, discuss the validity of our model assumptions as well as some thoughts for further studies.

7.1 Concluding remarks

The foundation of this thesis is set out to understand corruption behaviour in which current economic models are not able to fully rationalize. We have been using the telecom scandal as a real-world application for such behaviour occurrence, and in order to provide new valuable insights we developed an extension of models within game-theory that involves several corruption variables. We first examined whether there exists a unique equilibrium in which a single player performs corrupt behaviour, and then compared it to another scenario where two players engaged in corrupt activities simultaneously.

The first model examines the behaviour of a single player. We define her value function as a weighted payoff that is dependent on the probability of detection. The dependent variables are the loss incurred when detected and the profit obtained. The loss incurred is positively correlated with the total bribery amount and the corruption index score within the countries of origin, and the profit obtained is positively correlated with the total bribery amount. For the moral type, we found that there does not exist a space of $x \in [0, \bar{x}]$ that satisfies the first-order condition, and for such bribe amount the value function is negative. Hence, there exist no equilibrium in which a moral type finds it optimal to bribe a positive amount. However, for the corrupt type there exist a space of $x \in [0, x^*]$ in which the first-order condition is satisfied, and for a such level the player will bribe at least $x^* > 0$ for all p.

The second model is an extension of the first model, where we include a second player in order to examine whether the dynamics between multiple players can yield different results. The total profit is now dependent on the bribe amount of the other player in addition to her own bribe amount. The main results are that the reference point of the player that does not bribe shifts to the right when the other player makes a positive offer. Hence, by not making

an offer the player suffers a loss, and we find that player i does not bribe for $0 \leq x_j \leq 1$ if the first-order condition is not satisfied, i.e.,

$$\frac{p}{1-p} > \frac{3\alpha}{\beta} x_i^{\frac{2}{3}}.$$

However, for $x_j > 0$ we have that

$$G(x_i) = \frac{3\alpha x_j}{\beta} x_i^{\frac{2}{3}}.$$

If the increase in x_j is sufficiently high, then the upward shift in $G(x_i)$ can lead to a level of bribe amount derived from the first-order condition, x_i^*, that can turn the expected value function of player i positive. Hence, these results serve as a clear evidence of an existent unique equilibrium when multiple players are involved. The main effect of introducing a new player into the model is enhanced risk acceptance through a greater degree of risk sharing when the players serve as substitutes to each other in the market. The players will then prioritize their relative performance with its peers, and since the detection penalty will likely be within an equal range between the players, the risk acceptance will then be greater due to the similar loss incurred in a situation of detection.

We find the models to be consistent with the telecom scandal, as there were initially difficult to justify the reasoning behind the corrupt behaviour by Telia and Telenor when both companies belongs to countries with low tolerance for corruption. The irrationality was even stronger when both companies had a majority of their shares owned by their respective governments. From the developed models, we were able to rationalize such economic behaviour and we found it crucial that Telenor and Telia served as substitutes of each other in order to justify the behaviour under the telecom scandal - a race of achieving the highest market share and attract the greatest quantity of new potential investors.

Further analysis was additionally conducted in order to account for dynamic changes within a country. Specifically, we analysed the impact of a changed corruption index score on the optimal bribery amount. We first examined a situation where the corruption index score was similar, and then compared it to a situation where the score deviated significantly from each other. In the first scenario, ceteris paribus, we found that the optimal bribery amount was

identical as a result of the similarity in the market conditions within the countries of origin. When the score deviated, we found a solution where the player with higher corruption index score lowered her bribery amount as the other player has a greater degree of risk tolerance by nature. A similar result occurred when we had a situation of two players with initially similar corruption index score, but due to some non-accountable shocks, the scores deviated from each other. In this situation, the player experiencing the shock (which increased the corruption index score within its country of origin) lowered her bribery amount and lost market share to the other player as a result of lower risk tolerance relatively to the other player.

7.2 Discussion

Although the CPI takes various factors into account and seems to be a good estimate for corruption level within a country, it is a difficult task to estimate how much implications the external effects we listed in chapter 6 has on decision making for an individual/organization. Cognitive psychology is somewhat taken into consideration in our models (e.g. risk sharing towards potential penalties in the model with multiple players), however, we are mainly referring to the financial implications on our model. The additional factors by which we have not taken into consideration in our model will most likely influence decision-making. However, most of them are very hard to normalize and specific models would have to be built for specific scenarios in order to provide fair estimates. Consequently, we would like to argue that our game-theory model captures initiatives for corrupt practices on a broader level and can be applied for analyses in various contexts which contradicts with our research question.

One should be aware that the model is based on several assumptions that was initially made to simplify the technical derivations and put further emphasis on the intuition behind it. This will indeed serve as a shortcoming of the model, and one should validate the model by adjustments and data testing. Rigorous analysis can be conducted to improve the accuracy of the model, and the inclusion of variables that include behavioural aspects might also serve as an alternative approach for model-extension.

For further studies, the models conducted in this thesis should also be analysing sequential moves in addition to simultaneous ones, as Telenor and Telia entered Uzbekistan at different points in time. Furthermore, it would be interesting to test different degrees of risk tolerance, as for instance testing the model with risk averse or risk loving preferences. This thesis is mainly emphasizing on the decision made by the bribing players in order to obtain new potential contracts for business expansion. It would be insightful to include auction-theory in order to understand the bidding process made by the several players involved in the telecom scandal, as well as the response made by the player who granted these contracts. Lastly, an additional model should be conducted to study the behaviour of the authorities who receive the bribes and analyse whether or not the requirements of engaging in corrupt activities are consistent across countries with a significant tolerance for such behaviour.

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9 Appendencies

Appendix A1

Questionable and Potentially Corrupt Transactions and Payments covered by Muddy Waters Research

Country	Transaction	US$ Amount	SEK (at 8.11)	Red flags
Uzbekistan	Sale of shares to in TS Uzbek Holding allegedly to problematic party	$(50,000,000)	-405,500,000 kr	Possibly not a bona fide purchase and sale, but rather a means to transfer interest to problematic party who might be said to have no financial risk (purchase price offset by simultaneous purchase of 3G frequencies; business funded solely by TeliaSonera)
	Purchase of 3G Frequencies	$80,000,000	648,800,000 kr	Possibly entered into an agreement with problematic party for a 3G license which it did not at the time own, but then procured from the Uzbek government
	Purchase of number blocks	$9,200,000	74,612,000 kr	Purchase of government property possibly not from government, but from problematic party.
	Purchase of shares allegedly from problematic party	$220,000,000	1,784,200,000 kr	Possibly not a bona fide option, but rather purposely structured to transfer $220m to problematic party who might be said to have never taken financial risk.
	"Consulting" re 4G license, lease	$55,000,000	446,050,000 kr	Rather than buy licenses from problematic party, TeliaSonera likely structured it as a substance-less "consulting contract"
	2012 "customer expansion"	$5,000,000	40,550,000 kr	Internal problematic party documents suggest that TeliaSonera paid it $5m for "customer expansion" in advance of its shutting down competitor's business resulting in their customers flocking to TeliaSonera.

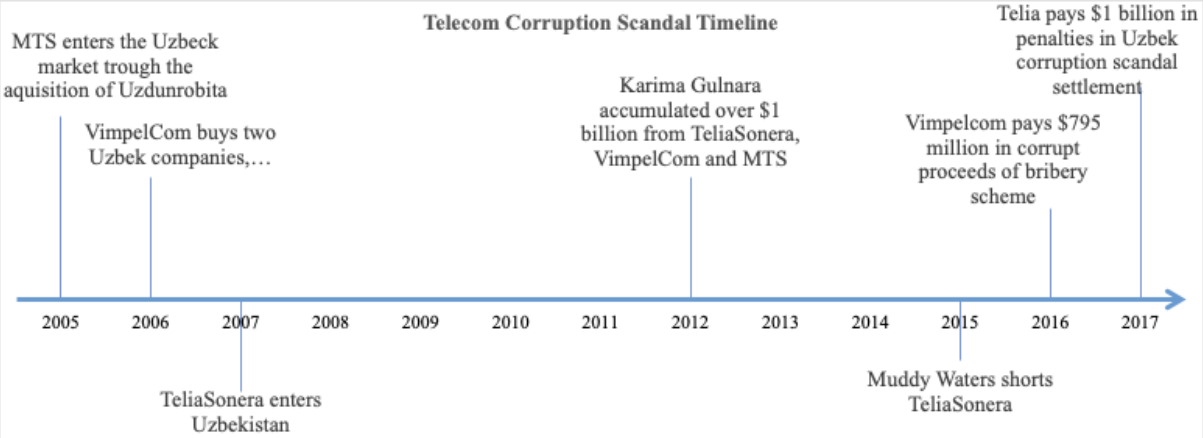
Appendix A2

TeliaSonera Eurasian Transactions:
Red Flag Matrix

Country	Transaction	Amount	Telia's counter party possibly problematic	Apparent over payment for assets or services	Purchase of state licensed resources (such as frequencies or numbering blocks) from private parties	Possible false commercial cover (e.g., "loan", "option", "consulting agreement", "dilution") that could misrepresent the nature of the transaction	Possible misappropriation of state owned assets or assets possibly misappropriated from private parties by Telia's counter party	Apparent lack of services or lack of financial contribution or risk taken by counterparty (carried interest or seemingly otherwise funded by TeliaSonera)	Omissions or misrepresentations in Telia's public disclosures	Possible undisclosed related-party transaction	Questions about whether counterparty is arms length from TeliaSonera	Transaction that resulted in Telia losing money to its counter party.
Uzbekistan	Sale of shares to in TS Uzbek Holding allegedly to problematic party; Purchase of 3G Frequencies	$30,000,000	X		X	X	X	X	X			
	Purchase of number blocks	$9,200,000	X	X	X		X	X	X			
	Purchase of shares allegedly from problematic party	$220,000,000	X	X		X		X	X			
	"Consulting" re 4G license, lease	$55,000,000	X	X		X		X				
	2012 "customer expansion"	$5,000,000	X			X	X	X	X			

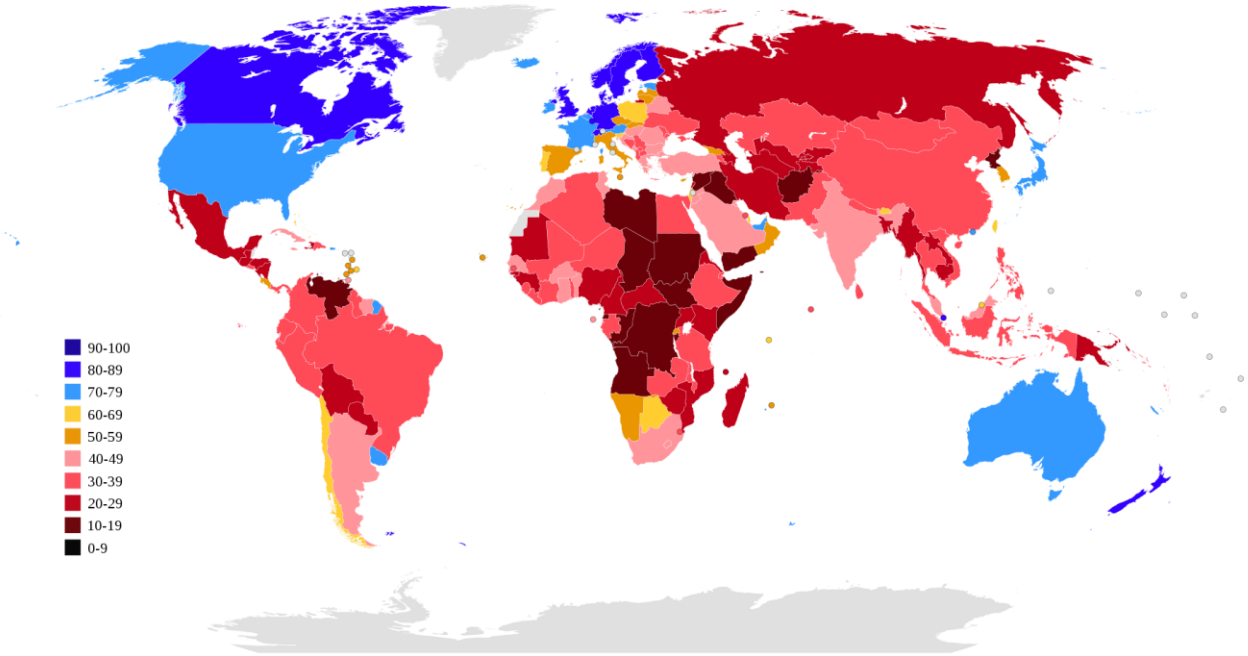
Appendix B

Telecom corruption scandal timeline:



Appendix C1

World Map for TI's CPI index (2018):



Appendix C2

List of institutions included in Transperency International:

- African Development Bank (based in Ivory Coast)
- Bertelsmann Foundation (based in Germany)
- Economist Intelligence Unit (based in UK)
- Freedom House (based in US)
- Global Insight (based in US)
- International Institute for Management Development (based in Switzerland)
- Political and Economic Risk Consultancy (based in Hong Kong)
- The PRS Group, Inc., (based in US)
- World Economic Forum
- World Bank

Appendix D

Klitgaard's formula for corruption:

$$C = M + D - A$$

Where *C* stands for Corruption, *M* stands for monopoly, *D* stands for discretion, and *A* stands for accountability.