WHICH PROPERTIES OF GIFTS LEAD THEM

TO BE

CONSIDERED AS BRIBE ?

by

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Submitted to the Social Sciences Institute

in partial fulfillment of the requirements for the degree of

Master of Arts

Sabancı University

June 2009

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to my family

Acknowledgements

First, I am deeply grateful to my thesis supervisor, Mehmet Baç, for his helpful comments and suggestions throughout this work. We have been working on this thesis for one year and I had a chance to observe how an economist thinks and solves a problem. It was a very good learning experience for me to collaborate with him. I would also thank to my thesis jury members Eren İnci and Meltem Müftüler Baç for their helpful comments and questions about my thesis. Lastly, I thank to my friend, Özge Yağış who was eager to listen me and provided me with the environment in order to finish this work.

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Economics, M.A. Thesis, 2009

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Abstract

This article studies the properties of gifts that lead them to be considered as bribe when offered to public officials. The model first handles only three goods that are to be given as gift, then extends the case to N goods. We provide a two-stage analysis for both cases. At the first stage we deal with a situation in which an officer can only consume the gift offered to him and we find out that the officer's preferences will determine the bribery conditions. Second, we give the officer the opportunity of exchanging the gift for his most preferred good and reach the conclusion that besides his preferences liquidity will affect the corrupt dealings.

Keywords: bribery, gift-giving, optimal policy, liquidity, preferences

HEDİYELERİN HANGİ ÖZELLİKLERİ RÜŞVET YERİNE

GEÇMELERİNE SEBEP OLUR?

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Ekonomi, Yüksek Lisans Tezi, 2009

Tez Danışmanı : MEHMET BAÇ

Özet

Bu çalışma devlet dairelerinde çalışan memurlara getirilen hediyelerin hangi kapsamda rüşvete gireceğiyle ilgilidir. Kurduğumuz model ilk etapta hediye olarak verilebilen üç malı ele alıp sonra bunu N mala genellemektedir. Her iki durum için iki aşamalı bir analiz geliştiriyoruz. İlk aşamada memurun gelen hediyeyi sadece tüketebildiğini düşünüp mallar üzerindeki tercihlerinin rüşvete sebep olduğu sonucuna ulaşıyoruz. İkinci aşamada ise memura gelen hediyeyi satıp en sevdiği maldan alabilme opsiyonu tanıyoruz ve tercihlerinin yanısıra bu sefer hediyenin likiditesinin de rüşvete yol açabildiğini görüyoruz.

Anahtar Sözcükler : Rüşvet, hediyeleşme, tercih, likidite, en uygun politika.

Contents

1 Introduction

Corruption as a pervasive worldwide phenomenon is the misuse of public power for private gain[1]. It generally occurs in the principal-agent relationships in public sector where agents have discretionary power on the distribution of benefits. Issuing a permit or licence, giving permission to the passage of the custom goods or favoring relatives, friends are typical examples that the public officials use discretion while providing government goods or services. In order to collect bribes from private individuals, underpaid public officials with little incentives may impose delays on the demanded service. So, bribes sometimes, not only produce mutual benefits for the payer and the receiver but also create efficiency in the public sector. Mostly, it is the burdensome government rules and regulations that cause corrupt incentives to arise within an organization. A private individual may pay bribe to overcome this slow going process and improve efficiency. This seemingly positive effect of bribe taking however, does not supply a valid argument for tolerating some level of corruption. Besides the benefits for both sides that agree to participate in a bribery, a serious social harm is generated due to corruption. Income inequalities, low growth rates, distortions in industrial policies, the lack of trust on the functionality of the government and its institutions are the main adverse effects of corruption that are included in the social harm. This fact is the underlying reason why we assume in our model that the total surplus (total benefit of both sides minus the total cost) generated by a corrupt dealing is negative. Since the social harm as a cost exceeds the existing total net benefit, the increasing number of people engaged in a corrupt interaction will cause too much loss in the social welfare. Thus, taking corruption under control to an extent will appear as the government's or principal's objective in an organization. In controlling corruption, the government as a policy maker aims to improve the efficiency of the state and the overall welfare of the society. Full elimination of corruption in some contexts is neither possible nor economically sensible. The interesting part of our model about this mentioned point is that totally preventing corruption is possible but not worthwhile because the maximum social welfare is sacrificed to getting rid of it. Taking steps towards reducing the harm it generates is a better task to deal with.

Moreover, the secrecy of a corrupt dealing is a serious difficulty in detecting the actual level of corruption so, the predictions based on the uncovered part of the corruption level in an organization or country possibly does not reflect the truth. Since both parties in a bribery benefit and the dealing is illegal, it is unlikely that one of them will uncover the arrangement. That is why the secrecy issue also makes the goal of total elimination of corruption more difficult.

Gift giving behavior on the other hand, is a social interaction that invests in a relationship between the donor and the recipient. By means of a gift, a donor is interested

[1]Susan Rose-Ackerman, 1999, Corruption and Government.

in revealing the recipient's preferences[2]. Giving a gift carries the message of the donor to the recipient that "I recognize you and know what you like". Although a gift may be inefficient, i.e., it may create a deadweight loss, it is an important and effective way of expressing one's valuation of the opposite side in a relation. No one who wants to be known as valuing the partner's preferences will give cash gifts. Thus, a donor gets pleasure as the gift he gives matches with the recipient's preferences, that is to say he behaves altruistic.

While the sociological approach of gift giving behavior does not involve reciprocity, it may sometimes be intentionally offered to get a benefit. So, this is the point where a quid pro quo exists in gift giving. For example, giving a highly valuable and expensive gift such as gold, diamond even cash to a friend's daughter in her wedding and after a period of time requesting a permit for a construction of a high building in a forbidden zone from this friend who is also a public official issuing permits, is a case in which an implicit reciprocity appears. If such reciprocal obligations exist in gift giving interactions, even if the donor's actual demand is not immediate, then the intention behind the gift moves towards bribery. So, the similarity of gifts and bribes stems from the existence of a quid pro quo.

These two aspects of gift giving, either giving it to please the recipient or expecting a return from it are captured in our model by introducing two types of clients who interact with an officer and who have these intentions. The honest client in the model gives an officer a gift to appreciate his manner of supplying the service and to please him, whereas the dishonest client seeks a benefit by offering a gift. While gift giving to the officer in the government institutions in this sense is a case which at first look seems to be a social interaction between the officer and the client, it may in some cases turn out to be an interaction that leads to corruption. Thus, in our corruption model the bribery intention of gift-offering client is reflected.

This paper is mostly related to the literature on corruption. We contribute to the literature in the way that we link the gift-giving event with its social and economic aspects to the growing corruption literature. Focusing on a public official and client interaction in which a gift is offered to the officer instead of money bribes is the point which makes our work different. There is no chance for the officer and the client to bargain over the size of the bribe because this time the size of the bribe is determined by the value of the gift offered. So, if the client seeks a benefit behind the gift, he would choose among the goods regarded as appropriate in the society because this would lead the officer to accept the gift more easily. Identifying an appropriate gift is a part of gift-giving that is independent of one's intention. If a client as in our model is dishonest, i.e., if he has the intention of bribing the officer via a gift, he would like to offer one of the goods which is known to be suitable and liquid such as a brand watch.

Our framework differs from the existing literature in that we propose that the govern-

[2] Prendergast and Stole, (2000), The non-monetary nature of gifts.

ment's strategy in controlling corruption is to prohibit the goods which if prohibited will produce the maximum social welfare. In the formal literature the government's strategy appears as imposing a penalty both for the bribe giver and taker and reward schemes for the supervisor, if there is any, who is hired to monitor the agent's performance and report his wrong doings. However, in our context the government's decision on the fine levels for the briber and bribee does not guarantee a decrease in corruption because the client can offer another good which is not fined. Thus, the level of fines affects both the officer's and the client's decision on offering or accepting the prohibited good. If the fine level is sufficiently high, then the dishonest client may offer a gift from the nonprohibited goods and achieve his/her goal.

1.1 Literature Review

In this section we discuss the related literature on corruption and gifts in order to highlight the contribution of the present thesis. In our framework, goods as gifts and money as bribe are substitutable, and the degree of substitutability between any good and money is an inherent property of that good. While we know of no paper in which the issue of bribery and gifts is addressed, there are many separate theoretical studies of corruption and gifts. We discuss a selection from these papers below.

A review of this literature by *Pranab Bardhan (1997)* points out the adverse effects of corruption on development. In his paper he states that bribes on investment licences reduce the incentives to invest and cause profits to decline on production. Further, when public resources are abused for the corrupt officer's private gain growth rates will be negatively affected. He summarizes the arguments on factors that can produce both efficient and inefficient outcomes. If in a bribery, many firms compete in bidding process for a government contract, the firm with the highest bid in bribes is also the lowest cost firm which is awarded with the contract. So, efficiency is achieved in such a case. Further, due to pervasive and cumbersome regulations corruption may improve efficiency when one pays to speed the procedure. The worst effects of bribes in terms of inefficiency is observed in different agencies which supply complementary government goods or services and set their bribes independently. This procedure reduces total supply because of high level of bribes reducing inefficiency.

Schleifer and Vishny (1993) take up this idea in their study of the industrial organization of corruption and illustrate the inefficiency caused by corruption. First, they introduce two types of corrupt activities. In the activity they name 'corruption without theft' a public official sells a licence for government by taking bribe over the price of the good and he turns over the price to the government taking the bribe for himself. In the 'corruption with theft' case however, the official does not turn anything to the government and hides the sale. This type of corrupt activities are common in custom duties. Then, they provide a model that compares the bribe levels and inefficiency in independent monopolists which consist of public agencies providing complementary goods and in joint monopolist that supply the same goods. They reach the conclusion that in the former case, each agency takes the others' sale as given and sets their own bribes so as to maximize their revenues. The bribe per unit sale is higher and the supply of the goods is lower so, an inefficient case is generated. In the latter case however, the joint monopolist sets the bribe to maximize the total revenue, which they show results in a lower bribe per unit sale and higher supply of goods. Thus, a relatively more efficient case and higher aggregate level of bribes are achieved. They further provide an extension to their model in which each complementary good is supplied by many public agencies and stress on the point that competition pulls the bribe level down to zero by creating the most efficient case. Their industrial organization model suggests that generating competition between the public officials in the process of obtaining government goods will eliminate the corruption without theft. In the case of corruption with theft however, competition may cause more theft from the government while it reduces the bribes.

Similarly, *Susan Rose-Ackerman (1975)* studies the relationship between the market structure and the corrupt interactions in the process of obtaining a government contract and provides a three-stage analysis that includes varying market conditions. In her model she handles a situation in which many firms are assumed to compete for a government procurement contract. She then drops the competition assumption to consider the case of bilateral monopoly where a bargaining process determines the bribe level. In the former case, there are many sellers competing for a public contract. The existence of a private market eliminates bribes totally but if there is no private market, using sealed bids to determine the contractor can also solve the bribery problem. She determines the factors that lead to corruption and the ways to reduce it by effective penalty schemes. An interesting point is that the level of bribe depends on the properties of the penalty functions. So, the model suggests certain penalty schemes that are effective to reduce the bribes in the indicated market conditions. But when the penalties are ineffective then the identity of the successful corrupt firm is the most efficient one, i.e., the firm which minimizes its costs. In the latter case in which only a single buyer and a seller bargain over the size of the bribe, the firms which find waiting costly are more likely to pay the bribe.

The formal literature on corruption has been also developed on hierarchial aspect. *Mehmet Bac (1996)* provides an extension to the corruption in different hierarchial structures by studying the relation between monitoring and corruption. The approach in his article differs in that the incentives, wages and rewards, that aim to minimize the cost of corruption are taken as given so as to better understand the role of hierarchial structures in leading to corrupt dealings. The assumption of an exogenous incentive scheme includes same wages for all agents and same rewards for all supervisors in order to simplify the analysis and help the above mentioned goal. He considers the possibility of internal corruption that is defined as the transfer of subordinate's benefit from external corruption to the upper levels. In addition, external corruption is simply the case that we already know as a bribe taking official from a client outside an organization. In his framework two types of monitoring technologies are introduced namely, public monitoring (supervisor simultaneously monitors a group of subordinates) and private monitoring (supervisor monitors a particular subordinate). Under both monitoring technologies a trade-off between external and internal corruption in flat and steep hierarchial structures is observed. In the model, a flat hierarchy refers to minimal one rank extension that consists of a supervisor at the top and a group of subordinates who are monitored at the bottom. A steep hierarchy however, is referred as maximal one rank extension in which each supervisor's monitoring effort is only for one subordinate. He reaches the conclusions that under public monitoring external corruption is less in a flat hierarchy than in a steep one but much more internal corruption is likely to arise within a flat hierarchy than in a steep one. As for the case of private monitoring, the situation is a little different. Since the monitoring cost increases significantly as monitoring effort increases, supervisor's monitoring effort is low so, all subordinates are corrupt in a flat hierarchy. The type of monitoring technology does not matter for a steep hierarchy however. Thus, due to the convexity assumption of the cost function higher corruption is expected in a flat hierarchy.

Mookherjee and Png (1995) provided a model that focuses on the compensation of a corruptible inspector delegated with the task of monitoring pollution from a factory. Their model displays similarity to the principal-supervisor-agent paradigm in the way that the legislature who layouts the enforcement for the prohibited actions takes the place of principal. The inspector however, is charged with monitoring pollution in order to enforce the regulations. So, his expected task is analogous to the supervisor who is hired to enhance an organization's functionality. The factory finally, like the agent, can offer bribes to the upper levels to cover its wrongdoings. In their set up the regulator's optimal policy consists of three instruments; the penalty for bribe giver and taker and the reward for the inspector's report of pollution level. Social harm caused by corruption in the model appears as external harm caused by the factory's pollution. The inspector incurs an unobservable effort to monitor the factory so, he has discretion over reporting the level of waste discharged by the factory. The bribe between the inspector and the factory is determined by their simultaneous choice of monitoring effort and pollution respectively. In contrast to the usual extensive form of non-cooperative game models, bribe is the outcome of the Nash bargaining solution where the surplus is equally split between the parties. Whenever the inspector observes any level of pollution, he reports it as zero. This result stems solely from the assumption that the rate of leak that is defined as the probability that the factory's actual pollution level will leak to the regulator is constant. The effects of the compensation policy on the agreed bribe level is observed. An increase in the reward rate and penalty for the inspector raises the level of bribe because the cost of not reporting the pollution rises so, he demands a higher bribe. They show that one way to eliminate corruption is to sufficiently increase the reward or the penalty of the inspector such that the inspector's demand exceeds the factory's limit to pay for the bribe. Another way to reduce the bribe is shown as to increase the penalty on the factory and reduce the penalty for the inspector. This recommendation contrasts with the usual method of penalizing bribe givers less severely than the bribe takers. While the regulator's objective is to avoid corrupt incentives by adjusting either rewards or penalties, he can unintentionally contribute to the harm produced by pollution. In this sense, their model suggests an important result: given a compensation policy, the regulator can construct another policy that generates less pollution without increasing monitoring effort. Thus, due to this alternative corruption will be eradicated and bribery will be leaved as an inefficient way of private gain for the inspector.

In a similar framework, *Bowles and Garoupa (1997)* extend *Becker*'s standard economic model of crime in which a police officer and a criminal can collude for their interests. They apply a solution developed in a related work by *Cadot* to derive the optimal policy to compensate the corruptible police officer. In their model officers differ in their susceptibility to involve in bribery and they engage in crime by taking bribe to cover the criminal activity in return. The probability of successful bribe is endogenous. If bribe is detected, both parties are subject to fines. Following the approach of *Cadot* (1987), they apply the bargaining solution where parties can have different bargaining powers. First, an individual decides to commit a crime or not. If he acts as a criminal and is detected by a police officer, bargaining process over the bribe starts. If the process is successful the officer's illegal activity also can be detected. They make two important assumptions in their model. The first is that only the collusion between police officer and the criminal is considered, possible collusion among officers is ignored. The second is that officers detected while taking the bribe will not have to repay the money but will have to encounter a cost for involving in corruption which corresponds to future income that a convicted corrupt officer will not receive. The bribe increases with the fine imposed on the criminal because he will agree to pay more to avoid a larger fine. Similarly, the bribe increases with the fine imposed on the police officer because the cost of taking bribe increases. This result implies that higher fine may deter crime but contributes to corruption. The attitudes towards corruption determine the officer's decision on whether being corrupt or not. Optimal policy of the police department is to control not only corruption within the organization but also the crime rate. In this sense, the fines imposed both on the criminal and the police officer and the probability of detection affect deterrence and the rate of corruptible police officers.

Besides the formal studies on corruption, gift-giving has been studied by several economists. The question of "Why do individuals give gifts?" has not only been the concern of anthropology but also has recently been addressed by *Camerer* (1988), *Carmichael* *and Mac Leod* (1997). *Prendergast and Stole (2000)* rather address the form in which the gift should be given in social relationships within a signaling game model. They are interested in the question of "Why non-monetary gifts prevail over the efficient monetary transfers despite the possibility of generating deadweight loss?" They come closer to our analysis in that they provide an understanding of the gift-giving phenomenon. In our model this corresponds to the honest client's gift-giving behavior. In their set up, they consider a donor and a recipient where the donor receives a signal that carries information about the recipient's preferences. They, however, assume only two goods that are to be given as gift which is a restriction because when there are many goods, the donor will be able to send a more precise message in which he can order the goods. Receiving the signal from the recipient, the donor chooses either giving cash gift or purchasing a non-monetary gift. At the beginning of the game, nature chooses which of the gift the recipient prefers. The donor observes the signal and decides on the form of the gift and the recipient forms an expectation about the donor's ability to understand his preferences. They assume that the purchased gift is only consumed due to the high costs of the refunds of the gift. In our analysis we extend this assumption by giving the officer the opportunity of selling the gift in order to highlight the impact of liquidity in causing corruption. Both agents in their model derive utility from the value of consumption, the welfare of the other agent and the knowledge that other party understands his/her preferences. So, both agents are altruistic towards each other and the level of altruism and their concern about being known to understand the recipient's preferences are key determinants of the form of the gift they decide. Marginal rate of substitution of these two sources of utility will determine the perfect Bayesian equilibrium outcomes. Finally, they reach the conclusions that if the donor is interested in the recipient's welfare rather than to be known to understand his preferences, he chooses cash as gift. If the donor, however, values revealing the recipient's preferences more than his welfare, he purchases a non-monetary gift.

The thesis is organized is as follows. The next section presents the model in which we address the question of "When gifts offered to public officials are considered as bribe?" In Section 3 we begin our analysis by considering only three goods -money and two non monetary goods - that has specific liquidity values and two types of clients -honest and dishonest- that buy gifts to the officer with different intentions. We first assume that the officer can only consume the gift offered. After characterizing the behaviors of the clients on which good to offer, we determine the corresponding expected payoffs and the expected social welfare. We find out the case and the optimal policy in which the maximum social welfare is achieved when the government prohibits any of the good(s).

We extend the analysis in Section 4 by rather assuming that the officer can sell the gift and repeat the procedure to derive the conditions that yields the government's optimal policy.

Section 5 generalizes the special case of three goods to N goods in order to draw an inference about the property of the gifts that lead to bribery. We again analyze this case in two stages by first considering the officer only consumes the gift and then he can sell the gift respectively.

Finally, Section 6 concludes the thesis by presenting a summary and discussion of the results.

2 Model

We classify the goods according to their liquidity values. We assume that there are three goods and all the goods have some liquidity value, which is denoted as "α" . One of the three goods is money. We place all the three goods with respect to their characteristic value, α_i, i = 0, 1, 2 in the interval [0,1] in such a way that the most liquid good, money, has liquidity α_0 and the least liquid good with characteristic of α_2 is closest to $'1'$. The last good has liquidity $'\alpha_1'$ such that $\alpha_1 \in (\alpha_0, \alpha_2)$. We measure units so that all three goods can be purchased at the price of \$1. The sale value of good α_i is $1 - \alpha_i$. Money, for example, has liquidity 0 and value \$1, whereas another good with $\alpha = 0.4$ has sale value \$0.6 .

Below we introduce the notation and then describe the model and the sequence of events. Some of the variables are further explained in the analysis.

F_o= fine for the officer detected accepting a prohibited gift,
F_c= fine for the client detected giving a prohibited gift,
$p(\alpha)$= probability of successful bribery, without being detected,
μ= probability of detection of bribe given that the client accepts a banned gift,
β= moral coefficient (type component) of the officer, measuring the personal discount applied on corrupt benefits,
π= probability that α_1 is the officer's most preferred good,
G= cumulative distribution of the officers with respect to their moral coefficient, β,
b= private benefit of the client from the bribe,
c= the officer's cost of supplying the demanded service in return for a bribe,
$U_s(\alpha_i, q)$= The utility of officer s from any good, α_i with i = 0, 1, 2 of quantity q,
h= social harm caused by corruption,
γ= probability that the client is of a honest type.

We consider an officer who may sell government property for personal gain. He will have to pay a fine F_o for accepting the prohibited gift(s) only if he is detected. The officer's moral coefficient $\beta \in [0, 1]$ influences the decision on taking the bribe. If $\beta = 1$, he will not hesitate to take the bribe if the fine is sufficiently small. If $\beta = 0$, he will never accept the bribe. The other component of the type of an officer is α_i, indicating his most preferred good. The pair (β, α_i) is the officer's privately known type.

The clients who apply to the officer in order to receive a government good or service, have two potential types; the honest client simply seeks to please the officer by giving a non-monetary gift. He never has any intention to bribe. The second is the dishonest type whose aim is to get a service to which he is not entitled by giving the officer a gift. If the bribe is detected, he has to pay a fine F_c, again only for the prohibited gift(s). While both types of agents buy a gift for the officer despite their different intentions, the officer's preferences over the goods are unknown by the client. All client types value money equally.

The objective of the government is to control corruption. To this end, it decides to prohibit some of the goods to be given as a gift. We handle the cases of government's prohibiting only one good, prohibiting any two goods and the case of not permitting any of them. We point out what consequences will arise from point view of both client types and the officer by deriving their expected payoffs and find out the corresponding social welfare values in each of these cases. After determining the case in which maximum social welfare is achieved, we determine the optimal fine levels which are the government's other instruments in controlling corruption .

The sequence of events in the model is as follows:

- The government determines F_o, F_c and which good(s) to prohibit.
- A client is matched with an officer. The officer learns the type of the client(honest/dishonest), the officer's β and α_i remain private knowledge.[3]
- The client decides on whether to offer a gift/bribe, and in the affirmative, on which good to offer as gift/bribe. The officer makes an acceptance/rejection decision.
- Detected bribe transactions are penalized; payoffs are realized.

At the first stage of our analysis, we assume only three goods one of which is money. The officer's preferences are defined over the remaining two non- monetary goods. Since money is the most valuable asset from which everyone derives maximum utility, we also need some additional non-monetary goods that may create deadweight loss or failure in successful bribe when they are offered as gift/bribe. If there were only the officer's most preferred good besides money, the dishonest client would have more chance for successful bribe even if money is prohibited because this most preferred good of the officer gives him the maximum utility as money does. But, in the case of assuming two non monetary goods

[3]This may not be a reasonable assumption in practice. If the officer is incompletely informed about the type of the client, the analysis become very complex; some of the issues that arise are tangential to the main points we raise in this paper

one of which is the good that gives the officer '0' utility, the dishonest client faces the risk of failure in his bribe offer. Analogously, if we assume only two goods including money and the non monetary good giving '0' utility, the dishonest type can only offer money as bribe for the allowing fine levels. The honest client, however, is hurt because he can only choose the good which gives the officer '0' utility.

3 Optimal policy when the gift must be consumed

3.1 The Government prohibits one good

In this section, we assume that the officer consumes whatever he gets as gift or bribe. Later we shall allow him to exchange the gift/bribe for another good. Clearly, if the government prohibits one of the three goods this will be money, because the officer's benefit from money is equivalent to the utility he gets from his most preferred good. With $1, he can buy the good which gives him the maximum utility. If one of non-monetary goods is prohibited, the dishonest type will give $1 as a cash gift and maximize the payoff from his corrupt behavior.

3.1.1 The Honest Client

To start with the honest type, he will choose the gift from the permitted goods. He behaves altruistically. His final utility from giving good α_i as gift consists of a fraction ϕ of officer's utility:

$$EU_{c_h} = \phi U_s(\alpha_i, 1) - 1$$

where i = 1,2 and $\phi \in$ (0,1). Here, $U_s(\alpha_i, 1)$ is the utility of officer s from consuming q=1 unit of his most preferred good, α_i. The subscript c_h denotes the honest client type. This client type gets the maximum utility when he buys the officer's most preferred good which he does not know. He knows, however, that with probability π the officer likes α_1 most, with probability (1- π) he likes α_2 most. We denote the officer's utility as:

$$U_{\alpha_j}(\alpha_i, 1) = \begin{cases} \overline{u}, & \text{if } i = j = 1, 2, \\ 0, & \text{if } i \neq j. \end{cases}$$

The subscript α_j denotes the officer's type whereas α_i denotes the gift's characteristic. If the gift and the officer's preferences match, then he gets $\overline{u}$, the maximum utility; otherwise he gets '0'.

Both clients choose a gift from the free goods by taking the distribution of α_i in to account. The expected payoffs and the SW values will become a function of π. We distinguish between the following cases:

If $\pi \geq \frac{1}{2}$, the probability that officer is of type α_1 is higher than that of type α_2. The honest client in this case gives α_1 as a gift. So, if the officer's type is α_1, he gets $\overline{u}$ utility otherwise, he gets '0' utility. So, an officer gets $\pi\overline{u}$ expected utility when α_1 is given as a gift. Analogously, for $\pi < \frac{1}{2}$, the honest client gives α_2 as a gift. An officer gets $\overline{u}$ utility with probability $(1 - \pi)$. His expected payoff under these conditions is given as:

$$EU_o = \begin{cases} \pi\overline{u}, & \text{if } \pi \geq \frac{1}{2}, \\ (1-\pi)\overline{u}, & \text{if } \pi > \frac{1}{2}. \end{cases}$$

Then, the honest client's expected utility from offering any non-monetary gift is

$$EU_{c_h} = \begin{cases} \pi\phi\overline{u} - 1, & \text{if } \pi \geq \frac{1}{2}, \\ (1-\pi)\phi\overline{u} - 1, & \text{if } \pi < \frac{1}{2}. \end{cases}$$

The officer gets $\overline{u}$ utility with probability π and gets '0' utility in the worst scenario so, he accepts everything from the honest type.

3.1.2 The Dishonest Client

Consider now the dishonest type. This type of client wants the officer to accept the bribe. He has two options: to give money or one of the permitted goods.

His expected utility from offering money is

$$EU_{c_d} = p(0).b - 1 - \mu F_c \tag{1}$$

where the subscript c_d denotes the dishonest client. Note that, he does not consider giving money if the expected utility in (1) is negative, that is, if

$$p(0).b - 1 - \mu F_c < 0.$$

Any government's policy instruments in controlling corruption, include imposing fines on both the bribe giver and the bribe taker. If the fine imposed on the client exceeds a certain value, the dishonest client will not offer money. Assuming $p(0) = 1$, that is, that bribery is surely successful, there is a critical fine level $\overline{F_c} = \frac{b-1}{\mu}$ such that for $F_c \geq \overline{F_c}$, the dishonest client gets negative expected payoff. So, it is sufficient for the government to set F_c a little higher than this critical value in order to eliminate money to be given as bribe.

On the other hand, the officer accepts money if the condition below holds:

$$EU_o = \beta U_s(\alpha_s, 1) - \mu F_o - c \geq 0.$$

Recall that α_s is the officer's most preferred good, which yields him the maximum utility, $U_s(\alpha_s, 1) = \overline{u}$. The cost 'c' is assumed to be positive that is, the dishonest client will give some effort in order to supply the demanded service for the dishonest client. Thus, for a successful bribe transfer both of the conditions below must hold:

$$\begin{array}{cc} \text{Feasible bribe} & p(0).b - 1 - \mu F_c \geq 0 \\ \text{conditions :} & \beta\overline{u} - \mu F_o - c \geq 0. \end{array}$$

Given the fine F_o, the officers who accept the bribe are those with $\beta \geq \frac{\mu F_o + c}{\overline{u}}$. Since $\beta \leq 1$, the second condition will hold only if $\mu F_o + c \leq \overline{u}$. The officers with $\beta < \frac{\mu F_o + c}{\overline{u}}$ reject the bribe. There will be no corrupt officers accepting money if $\mu F_o + c > \overline{u}$. There is a critical F_o, denoted as $\overline{F_o}$, and is given by $\frac{(\overline{u} - c)}{\mu}$ such that it is sufficient for government to set a fine a little bit higher than $\overline{F_o}$ in order to eliminate money bribes.

Consider now the possibility that the dishonest client offers one of the free goods as gift/bribe. The dishonest type will buy the good which has the higher probability of being the officer's most preferred good. So, if $\pi \geq \frac{1}{2}$, the dishonest client offers α_1. He gets $p(\alpha_1)b - 1$ utility with probability π (when his choice and the officer's preferences match) and '0' with probability $(1 - \pi)$. For the case of $\pi < \frac{1}{2}$, he offers α_2 as bribe and gets $p(\alpha_2)b - 1$ with probability $(1 - \pi)$ only if the officer is of type α_2 otherwise he gets '0'. So, his expected utility from offering any free good α_i is

$$EU_{c_d} = \begin{cases} \pi p(\alpha_1)b - 1, & \text{if } \pi \geq \frac{1}{2}, \\ (1 - \pi)p(\alpha_2)b - 1, & \text{if } \pi < \frac{1}{2}. \end{cases}$$

The officer on the other hand, accepts the offer of good α_i if

$$EU_o = \beta U_s(\alpha_i, 1) - c \geq 0 \qquad where \quad i = 1, 2.$$

From the point view of the officer, if he is of type α_2, he rejects the bribe when α_1 is offered as bribe because the good he does not like gives him '0' utility and there is a cost c from accepting the bribe (Note that there is no fine for free goods). But if he is of type α_1 then his moral coefficient β, will determine his acceptance/rejection decision. We examine this issue below:

If $\beta < \frac{c}{\overline{u}}$, we have $p(\alpha_1) = 0$, because it is optimal to reject. Thus, he gets '0' utility.

If $\beta \geq \frac{c}{\overline{u}}$, the officer accepts α_1, so, $p(\alpha_1) = 1$ and he gets the utility $(\beta\overline{u} - c)$.

Again, when α_2 is offered as bribe, the officer rejects α_2, if his type is α_1, and gets '0' utility. If his type is α_2, he accepts the bribe and gets the utility $(\beta\overline{u} - c)$ only if $\beta \geq \frac{c}{\overline{u}}$.

The officers with $\beta < \frac{c}{\overline{u}}$ reject the bribe of α_2. We can express his expected utility as:

$$EU_o = \begin{cases} \pi p(\alpha_1)(\beta\overline{u} - c), & \text{if } \pi \geq \frac{1}{2}, \\ (1-\pi)p(\alpha_2)(\beta\overline{u} - c), & \text{if } \pi < \frac{1}{2}. \end{cases}$$

According to the distribution of β, the probability that any non-monetary will be accepted by an officer is explicitly given by

$$p(\alpha_i) = 1 - G(\beta_2), \quad i = 1, 2.$$

where β_2 is the critical value of β such that any officer accepts the non-monetary good α_i with i=1,2 as bribe if his $\beta \geq \beta_2$ and $\beta_2 = \frac{c}{\overline{u}}$.

The probability of successful bribe for money takes the form of

$$p(0) = 1 - G(\beta_1),$$

where β_1 denotes the critical value of the officer's β such that any officer with $\beta \geq \beta_1$ accepts money as bribe and it is given by $\beta_1 = \frac{\mu F_o + c}{\overline{u}}$.

Finally, the dishonest type makes a decision between the options of giving money or giving one of the free goods. If offering money is not profitable for him, i.e., when $F_c > \frac{b-1}{\mu}$ or $F_o > \frac{\overline{u}-c}{\mu}$ holds, he offers among the free goods. But, when money as bribe is profitable both for the dishonest client and for the officer, the option which gives higher expected payoff will be chosen by the dishonest type. Recall that the dishonest client's expected payoff from offering any good is

$$EU_{c_d} = \begin{cases} [1 - G(\beta_1)]b - \mu F_c - 1, & \text{if he offers money,} \\ \pi[1 - G(\beta_2)]b - 1, & \text{if he offers } \alpha_1, \\ (1-\pi)[1 - G(\beta_2)]b - 1, & \text{if he offers } \alpha_2. \end{cases}$$

The dishonest client's behavior on deciding which option to offer as bribe is characterized by the following proposition:

Proposition 1 *:*
Suppose that the government bans exchange of money bribes, leaving the two other goods free. Under the feasible bribe conditions stated above,

when $\pi \geq \frac{1}{2}$, the dishonest client offers α_1, if and only if

$$\mu F_c > b\Big[1 - G(\beta_1) - \pi(1 - G(\beta_2))\Big]. \tag{2}$$

When $\pi < \frac{1}{2}$, the dishonest client offers α_2, if and only if

$$\mu F_c > b\Big[1 - G(\beta_1) - (1-\pi)(1 - G(\beta_2))\Big]. \tag{3}$$

Note that when the fine is in the interval [0,$\overline{F_c}$], it is profitable for client to offer money. Moreover, there exist a fine $F_c^* \in$ [0,$\overline{F_c}$] for a given value of π such that the dishonest client chooses money as bribe for any $F_c \in$ [0,F_c^*] and he chooses a free good α_i, with i = 1 or 2, for any $F_c \in$ (F_c^*, $\overline{F_c}$]. When the dishonest client's free good option is α_1, the expression of this critical fine is $F_c^* = \frac{b[1-G(\beta_1)-\pi(1-G(\beta_2))]}{\mu}$ and it takes the form of $\frac{b[1-G(\beta_1)-(1-\pi)(1-G(\beta_2))]}{\mu}$ when he decides between money and the good α_2.

In this formula, F_c^* is the minimum fine above which the client will not offer money as bribe. This critical F_c^* is a function of π. When $\pi = 1$, that is to say when the dishonest client certainly knows that officer is of type α_1, we set $F_c^* = 0$ because the dishonest type offers α_1 for all values of F_c. Similarly, for $\pi = 0$, $F_c^* = 0$. This time the dishonest client offers α_2 and there exists no region in the interval [0,$\overline{F_c}$] such that it is optimal for the dishonest client to offer money.

Up to now in our analysis, the expected utility of both types of clients from offering any non-monetary goods is a function of π, that is of the likelihood that the good they offer as bribe/gift matches with the officer's preferences.

3.1.3 Social Welfare

After characterizing the dishonest type's behavior when the government's strategy is to prohibit only one good, we first consider the expected social welfare generated by one to one matchings of an officer and potential client types. We then form the expected social welfare according to π.

If $\pi \geq \frac{1}{2}$;

The honest type chooses α_1 among the permitted goods as a gift, which yields the expected utilities of $EU_{c_h} = \pi\phi\overline{u} - 1$ and $EU_o = \pi\overline{u}$. So, the total surplus when the client is honest:

$$TS = \pi\overline{u}(\phi + 1) - 1. \tag{4}$$

The dishonest type's decision is to offer α_1 when eqn (2) holds. Therefore the expected utilities of the officer and the dishonest client are respectively, $EU_{c_d} = \pi[1 - G(\beta_2)]b - 1$ and $EU_o = \pi[1 - G(\beta_2)](\beta\overline{u} - c)$, which yield a total surplus of

$$TS = \pi(1 - G(\beta_2))(b + \beta\overline{u} - c) - 1.$$

With probability γ the officer interacts with an honest type, and with probability $(1 - \gamma)$ with a dishonest type. So, the expected social welfare when (2) holds is

$$SW = \gamma[\pi\overline{u}(\phi + 1) - 1] + (1 - \gamma)[\pi(1 - G(\beta_2))(b + \beta\overline{u} - c - h) - 1]. \tag{5}$$

We assume that per a corrupt interaction of a dishonest client and an officer, a constant social harm 'h' is produced such that $h > (b+\beta\overline{u}-c)$ for $\beta = 1$ and all admissible values of b and c. The harm caused by corruption exceeds the total net benefit that the parties gain by participating in bribery. So, for any corrupt dealing there exist a constant and a negative net benefit term, $(b+\beta\overline{u}-c-h)$ that decreases the expected social welfare. Note that as the coefficient of this negative term, i.e., the number of corrupt officers increase, SW value decreases. This assumption also implies that if γ decreases so the social welfare does.

Consider now the case where (2) does not hold, that is, the dishonest client offers money (implying $\mu F_c \leq b[1 - G(c_1) - \pi(1 - G(\beta_2))]$). Then expected payoffs are respectively given as:

$$EU_{c_d} = [1 - G(\beta_1)](b - \mu F_c) - 1 \text{ and } EU_o = [1 - G(\beta_1)](\beta\overline{u} - \mu F_o - c),$$

so, the total surplus from the match of a dishonest client with the officer when money is offered is

$$TS = (1 - G(\beta_1))(b + \beta\overline{u} - c) - 1.$$

In calculating the expected social welfare, we take the government in to account because it gets the fines F_o and F_c if the bribe is detected. So, fines cancel out and do not appear in the welfare function. In that case the expected social welfare is (analogue of (5))

$$SW = \gamma[\pi\overline{u}(\phi + 1) - 1] + (1 - \gamma)[(1 - G(\beta_1))(b + \beta\overline{u} - c - h) - 1]. \quad (6)$$

We continue to determine the expected social welfare functions by considering the case for $\pi < \frac{1}{2}$.

We know that the honest type chooses α_2 as a gift, which yields

$$TS = (1 - \pi)\overline{u}(\phi + 1) - 1. \quad (7)$$

If eqn (3) holds, the dishonest type's decision is to offer α_2 among his two bribery strategies. Then we get the following total surplus from the match of a dishonest client and the officer:

$$TS = (1 - \pi)(1 - G(\beta_2))(b + \beta\overline{u} - c) - 1.$$

With each choice of both client types, the generated expected social welfare will be the weighted average of these two surpluses:

$$SW = \gamma[(1-\pi)\overline{u}(\phi+1)-1] + (1-\gamma)[(1-\pi)(1-G(\beta_2))(b+\beta\overline{u}-c-h)-1]. \quad (8)$$

Finally, if eqn (3) does not hold, the dishonest type's choice is offering money and the honest client's choice however, is still the same. Then equation (8) will take the form of

$$SW = \gamma[(1-\pi)\overline{u}(\phi+1)-1] + (1-\gamma)[(1-G(\beta_1))(b+\beta\overline{u}-c-h)-1]. \quad (9)$$

We observe that there exist four welfare functions when we distinguish between the two cases according to π. In each cases, the honest client's choice over the goods is fixed but the dishonest client's bribery strategy can vary with the fine F_c, and π values as indicated by Proposition1. The choices of the potential client types and the officer with the corresponding expected social welfare functions are summarized by the proposition below.

Proposition 2 *:*

Suppose that $\pi \geq \frac{1}{2}$,

- *The honest type offers* α_1 *and if eqn (2) holds, the dishonest type also offers* α_1 *. So, these choices produce the SW function given by eqn (5).*

- *But if eqn (2) does not hold, the dishonest client offers money whereas the honest client's choice is the same. Then the SW function is given by eqn (6).*

  For the case $\pi < \frac{1}{2}$,

- *The honest type offers* α_2 *and if eqn (3) holds the dishonest type also offers* α_2*. In this case the generated SW function is given by eqn (8).*

- *If however, eqn (3) does not hold, only the dishonest client's choice switches to money and the SW is given by eqn (9).*

3.2 The Government prohibits money plus one good

Besides money, the government this time prohibits α_1 or α_2. We study both cases and determine the social welfare in each. In accordance with the government's objective, the good which among the two generates a lower social welfare if free, will be prohibited.

First, suppose that the government prohibits α_1, so, α_2 is the only free good. If the client is honest, he will have to offer good α_2 as a gift, yielding a total surplus in (7). If the client is dishonest, he chooses his best action which is offering either money or α_2. If (3) holds, he offers α_2 and the social welfare of a possible honest/dishonest client-officer matching is given by (8). Otherwise the dishonest type chooses money, yielding the social welfare function given by (9).

Now, suppose that the government prohibits α_2. The honest type will offer good α_1 and the total surplus will be as in (4). On the other hand, the dishonest client offers α_1

only if eqn (2) holds, which yields the social welfare function given by (5). Otherwise, he chooses money as bribery strategy, and the social welfare is given by (6).

Depending upon the assumption that the dishonest client's choice is either money or the free non-monetary good, we have two different SW functions in each case. In order to characterize the government's choice as to which good to prohibit besides money, we compare the generated SW functions according to the dishonest type's choice. For example, if the dishonest type chooses α_2 when α_1 is prohibited and he offers α_1 when α_2 is prohibited, we only compare the SW functions given by (5) and (7) to derive the conditions that produce the higher social welfare. The proposition below summarizes all the conditions and outcomes that indicate the optimal strategy for the prohibition of the additional good.

Proposition 3 *:*

- *Suppose (2) holds when α_2 is prohibited and (3) holds when α_1 is prohibited. So, we realize the SW functions given by (5) and (8) and observe that*
  for $\pi \geq \frac{1}{2}$, it is optimal to prohibit α_2 and
  for $\pi < \frac{1}{2}$, it is optimal to prohibit α_1 besides money.

- *If now (2) holds when α_2 is prohibited but (3) does not hold when α_1 is prohibited, we compare (5) and (9) to decide on which good to prohibit additionally and get these conditions:*
  for $\frac{1}{2} \leq \pi \leq \frac{p(0)}{p(\alpha_1)}$, prohibiting α_2 is optimal.
  for $\frac{p(0)}{p(\alpha_1)} \leq \pi < \frac{1}{2}$ however, prohibiting α_1 is the dominant strategy for the government.

- *Suppose (2) does not hold when α_2 is prohibited and (3) holds when α_1 is prohibited. By comparison of the SW functions in (6) and (8) we get the following conditions:*
  if $\frac{p(0)}{p(\alpha_1)} \leq (1-\pi) < \frac{1}{2}$, it is optimal to prohibit α_2 and
  if $\frac{1}{2} \leq (1-\pi) \leq \frac{p(0)}{p(\alpha_1)}$, it is optimal to prohibit α_1 .

- *This time if (2) does not hold when α_2 is prohibited and (3) also does not satisfy when α_1 is prohibited, the comparison of the SW functions given by (6) and (9) gives the conditions below such that*
  if $\pi \geq \frac{1}{2}$, α_2 is prohibited and
  if $\pi < \frac{1}{2}$, α_1 is prohibited.

Proposition 3 offers sufficient conditions in each of the four cases above. The necessary conditions are obtained by comparing the welfare functions directly.

Notice that, the optimal policy is to allow the good which is likely to be the officer's most preferred good under the conditions given by Proposition 3. The government faces a trade off in achieving the higher social welfare: while the dishonest type's corrupt intention to offer a non-monetary good becomes more possible, so does the honest type's benefit from having a larger chance to please the officer.

3.3 The Government prohibits all goods

If all goods are prohibited, the honest client can not offer anything and gets '0' utility, assuming that his income is normalized to 0. An officer who is matched with a honest client can not get anything either. However, the dishonest client's dominant strategy is obviously to offer money, since it will provide the officer certainly with the maximum utility. Under our assumption that the fine level for all the goods is the same, the dishonest client does not offer any of the non-monetary goods as bribe, due to the possibility that the gift may not match with the officer's preferences. The dishonest client's expected utility from offering money and any non-monetary good as bribe is, respectively,

$$EU_{c_d} = \begin{cases} [1 - G(\beta_1)]b - \mu F_c - 1, & \text{if he offers money,} \\ \pi[1 - G(\beta_1)]b - \mu F_c - 1, & \text{if he offers } \alpha_1. \end{cases}$$

If he offers α_2, the probability π will be replaced with $(1 - \pi)$ in the formula above. Clearly, offering money gives him higher expected payoff.

Finally, SW only consists of the dishonest client-officer matching that yields a negative total surplus of

$$SW = (1 - \gamma)[(1 - G(\beta_1))(\beta\overline{u} + b - c - h) - 1)].$$

3.4 The Government permits all goods, including money

When money is not fined, the dishonest client will certainly choose money as bribe and all officers with $\beta \geq \frac{c}{\overline{u}}$ will accept the bribe. Recall that when money is forbidden, corrupt officers are those with $\beta \geq \frac{\mu F_o + c}{\overline{u}}$. Thus, more officers become corrupt when money is allowed. The honest client on the other hand, chooses α_1 or α_2 because he values to match the officer's preferences by means of a non-monetary gift instead of directly giving cash. So, his choice is the same as in the case in which the government prohibits only one good. He will again make his decision between α_1 and α_2 according to the distribution of π as described previously in deriving the expected payoffs. While determining the social welfare, the honest client's choice will be critical.

If $\pi \geq \frac{1}{2}$, the honest type chooses α_1 and the social welfare is given by eqn (6).

If $\pi < \frac{1}{2}$, the honest type chooses α_2 and the social welfare is given by eqn (9).

3.5 The Government's optimal policy

We are now in a position to evaluate the optimal choice for the government. Prohibiting all the goods hurts the honest client and produces '0' total surplus from the honest client-officer matching. Given the same level of F_o, the SW function achieved in this case is less than (6) and (9), the functions obtained when only money is prohibited. So, it is dominated. In addition, permitting all the goods generates a higher level of corruption compared to the level achieved under the prohibition of one good because more officers become corrupt. Further, SW in this case will decrease due to the increased coefficient, $(1 - G(\frac{c}{\bar{u}}))$, of the negative net benefit term and be less than (6) and (9). So, we can rule out this option as well. Then the government's decision will be to prohibit either one or two goods that is either money or money plus one good. Recall that when one good is prohibited, it is certainly money and there exist four welfare functions given by Proposition 2.

Now consider that the government prohibits money plus one good;

In this case, the conditions and outcomes given in Proposition3 follow the social welfare functions given in Proposition2. For example; if $\frac{1}{2} \leq \pi \leq \frac{p(0)}{p(\alpha_1)}$ is satisfied, it is optimal to prohibit α_2 so, the honest type's choice is α_1 when two goods are prohibited. His choice will be again α_1 if only money is prohibited. The dishonest type's choice on the other hand for both cases is determined by Proposition 1. So, the choices of both clients are the same under the government's strategy of prohibiting one or two goods.

After finding out the case(s) in which the maximum SW is achieved, the government then determines the optimal level of fines F_o and F_c that it imposes as the optimal policy. F_o determines the number of corrupt officers or equivalently the corruption level and affects social welfare function negatively. F_c on the other hand, determines the dishonest client's bribery choice that is either money or free good. Recall that the choice of the dishonest client is money among the prohibited goods.

It is useful to consider the special case of $F_o = 0$ and $F_c = 0$. Now the government prohibits one or two goods but impose no fines. The dishonest client certainly chooses money and the corrupt officers are those with $\beta \geq \frac{c}{\bar{u}}$. Considering the probability of successful bribe for money, where $p(0) = (1 - G(\frac{\mu F_o + c}{\bar{u}}))$ and we observe that when $F_o = 0$ the probability that any officer will accept the bribe is higher relative to the case in which F_o is positive. For this reason social welfare decreases and it cannot attain its maximum. So, we conclude that the zero fine case is not optimal.

In finding out the optimal fine levels, we first analyze the two regions that is divided by F_c^*. The dishonest client 's bribery strategy will be determined by the position of the given F_c relative to F_{c^*}.

First, consider the case when $F_c \in [0,F_c^*]$ for a given π. The dishonest type's bribery offer is money. In order to obtain maximum social welfare, we need to minimize the loss, generated by the corrupt interaction, i.e., increase F_o as much as possible such that corruption level is minimized. The optimal F_o that maximizes the SW function is $\overline{F_o}$. So, the social welfare generated by these conditions is given as:

$$SW = \gamma[\pi\overline{u}(\phi + 1) - 1] + (1 - \gamma)[(1 - G(\beta_1))(b + \beta\overline{u} - c - h) - 1]$$

such that $\beta_1 = \frac{\mu\overline{F_o}+c}{\overline{u}}$. Here, we randomly take $\pi \geq \frac{1}{2}$ to specify both the honest client's choice and the SW function.

Now, if the government imposes F_c in the range $F_c \in (F_c^*, \overline{F_c}]$, the dishonest client will offer the free, non-monetary good. We can instead think of the region $F_c \in (F_c^*, \infty)$ since the dishonest type's offer will be the same even if $F_c > \overline{F_c}$. In this case there is no need to find the optimal F_o level because there is no fine for the free goods. The fine will not in fact, be imposed so, SW is independent of F_o and is given as:

$$SW = \gamma[\pi\overline{u}(\phi + 1) - 1] + (1 - \gamma)[\pi(1 - G(\beta_2))(b + \beta\overline{u} - c - h) - 1].$$

such that $\beta_2 = \frac{c}{\overline{u}}$. We again assume the same condition ($\pi \geq \frac{1}{2}$) to make a comparison of the social welfare functions produced in the two regions, (0, F_c*] and (F_c*, ∞). The proposition below states the conditions that we seek for the government's optimal policy.

Proposition 4 *:*
If $\pi \geq \frac{(1-G(\frac{\mu\overline{F_o}+c}{\overline{u}}))}{(1-G(\frac{c}{\overline{u}}))}$, the government's optimal policy is to impose F_c in [0,F_c^*] and $F_o = \overline{F_o}$. Otherwise, any $F_c \in (F_c^*, \overline{F_c}]$ is the only fine level of the optimal government policy.

Note that if we take $\pi < \frac{1}{2}$ for the specification the honest client's choice, we replace π with $(1 - \pi)$ in the proposition above.

4 Optimal policy when the gift can be exchanged for the most preferred good

In the preceding analysis, we assumed that the officer consumes whatever he gets as bribe or gift. Depending upon this assumption, the derived expected payoffs of the potential client types and the officer with the corresponding SW functions specific to all cases lead us to the main conclusions we obtained on the government's optimal policy. Our results also apply if we assume that the officer can sell the good which he does not like instead of being restricted to consume it. This time, giving him the opportunity that he can buy his most preferred good buy selling the good that gives him '0' utility, will make difference only in the expected payoffs and SW outcomes in each case. Maximizing SW as in the previous analysis will be again the key point in determining the government's optimal policy. The government will either impose the policy of prohibiting only one good or two goods due to the same reasons as explained in the previous section. We will analyze both cases by characterizing clients' and officer's behavior together with the generated expected payoffs and SW functions.

4.1 The Government prohibits one good

Among the three goods, again money will be the prohibited because the dishonest client's benefit from money is maximum. Each client type's choice on non-monetary goods is determined by the value of π. Hence, the SW outcomes are also categorized according to π. The analysis starts with the honest client.

4.1.1 The Honest Client

If $\pi \geq \frac{1}{2}$, the honest client chooses α_1 as a gift. With probability π officer gets $\overline{u}$ utility and with probability $(1-\pi)$ he gets $(1-\alpha_1)\overline{u}$ utility by selling the gift and buying (1-α_1) unit of α_2, his most preferred good. As for the case of $\pi < \frac{1}{2}$ the honest client gives α_2 and the officer this time analogously, gets $\overline{u}$ utility with probability $(1-\pi)$. Otherwise he gets $(1-\alpha_2)\overline{u}$ utility with probability π. So, the expected utility of the officer and the altruistic honest client is given respectively as:

$$EU_o = \begin{cases} \pi\overline{u} + (1-\pi)\overline{u}(1-\alpha_1), & \text{if } \pi \geq \frac{1}{2}, \\ (1-\pi)\overline{u} + \pi\overline{u}(1-\alpha_2), & \text{if } \pi < \frac{1}{2}. \end{cases} \tag{10}$$

$$EU_{c_h} = \begin{cases} \pi\phi\overline{u} + (1-\pi)\phi\overline{u}(1-\alpha_1) - 1, & \text{if } \pi \geq \frac{1}{2}, \\ (1-\pi)\phi\overline{u} + \pi\phi\overline{u}(1-\alpha_2) - 1, & \text{if } \pi < \frac{1}{2}. \end{cases} \tag{11}$$

4.1.2 The Dishonest Client

The dishonest client on the other hand, considers either offering money or one of the free goods. His expected payoff from offering money and the related feasible bribe conditions are the same as in the previous analysis so, we will be interested in the client's free good choice. Considering the possibility of offering a non-monetary free gift, the officer will accept the bribe if

$$EU_o = \beta U_s(\alpha_i, 1) - c \geq 0$$

where i = 1, 2. The dishonest client offers α_1 for $\pi \geq \frac{1}{2}$. If the officer is of type α_1, he accepts the bribe whenever $\beta\overline{u} - c \geq 0$. Any officer of type α_1 will accept the bribe if his moral coefficient $\beta \geq \frac{c}{\overline{u}}$ otherwise, the ones with $\beta < \frac{c}{\overline{u}}$ will reject it although the gift matches with their preferences. So, the probability of successful bribe with any officer of type α_1 when the gift of α_1 is offered to him is denoted as:

$$p_{\alpha_1}(\alpha_1) = (1 - G(\frac{c}{\overline{u}}))$$

where the first subscript denotes the officer's type and the second one denotes the offered gift's characteristic.

But if the officer is of type α_2, he sells the gift of characteristic α_1 and buys (1- α_1) unit from his favorite good α_2. He accepts the bribe if $\beta\overline{u}(1 - \alpha_1) - c \geq 0$ holds and gets $\beta\overline{u}(1 - \alpha_1) - c$ utility in this situation. So, probability that any officer of type α_2 will accept the gift α_1 is

$$p_{\alpha_2}(\alpha_1) = (1 - G(\frac{c}{(1 - \alpha_1)\overline{u}})).$$

Note that as the gift offered has higher liquidity, i.e., low α_i value, the probability of successful bribe is also higher because even if the gift does not match with the officer's preferences, he can exchange it for his favorite good by deriving a utility close to the maximum value, $\overline{u}$. If the gift matches with the officer's preferences, the dishonest type has the highest chance for successful bribe.

Now, the dishonest client's expected payoff from offering α_1 is

$$EU_{c_d} = \pi p_{\alpha_1}(\alpha_1)b + (1 - \pi)p_{\alpha_2}(\alpha_1)b - 1. \tag{12}$$

Then, the expected utility of the officer is

$$EU_o = \pi p_{\alpha_1}(\alpha_1)(\beta\overline{u} - c) + (1 - \pi)p_{\alpha_2}(\alpha_1)(\beta\overline{u}(1 - \alpha_1) - c). \tag{13}$$

As for the case of $\pi < \frac{1}{2}$, the dishonest type offers α_2. If the officer is of type α_2, he will accept it whenever $\beta\overline{u} - c \geq 0$. The probability of successful bribe in this case is given as:

$$p_{\alpha_2}(\alpha_2) = (1 - G(\frac{c}{\overline{u}})).$$

If the officer is of type α_1, he will accept the bribe when $\beta\overline{u}(1 - \alpha_2) - c \geq 0$ holds so, the probability that bribe is successful when the gift of characteristic α_2 is offered is

$$p_{\alpha_1}(\alpha_2) = (1 - G(\frac{c}{(1 - \alpha_2)\overline{u}})).$$

The expected utility of the dishonest client from offering the gift of α_2 is

$$EU_{c_d} = (1 - \pi)p_{\alpha_2}(\alpha_2)b + \pi p_{\alpha_1}(\alpha_2)b - 1. \tag{14}$$

Considering the expected utility that the officer gets, it is given as:

$$EU_o = (1 - \pi)p_{\alpha_2}(\alpha_2)(\beta\overline{u} - c) + \pi p_{\alpha_1}(\alpha_2)(\beta\overline{u}(1 - \alpha_2) - c). \tag{15}$$

Recall that the dishonest client's expected payoff from offering money is given as:

$$EU_{c_d} = p(0)b - \mu F_c - 1$$

where $p(0) = (1 - G(\frac{\mu F_o + c}{\overline{u}}))$.

Considering the expected payoffs of the dishonest client from offering the non-monetary goods α_1 and α_2 (12 and 14) with the payoff he derives from offering money, we can characterize the dishonest type's bribery choice when government prohibits only money as follows:

Proposition 5 *:*
Suppose that the government prohibits money bribes, leaving the other two goods free. Under the feasible bribe conditions stated previously,

when $\pi \geq \frac{1}{2}$, *dishonest type offers* α_1 *if and only if,*

$$\mu F_c > b\Big[\Big(1 - G(\frac{\mu F_o + c}{\overline{u}})\Big) - \pi\Big(1 - G(\frac{c}{\overline{u}})\Big) - (1-\pi)\Big(1 - G(\frac{c}{(1-\alpha_1)\overline{u}})\Big)\Big]. \quad (16)$$

When $\pi < \frac{1}{2}$, *the dishonest type offers* α_2 *if and only if,*

$$\mu F_c > b\Big[\Big(1 - G(\frac{\mu F_o + c}{\overline{u}})\Big) - (1-\pi)\Big(1 - G(\frac{c}{\overline{u}})\Big) - \pi\Big(1 - G(\frac{c}{(1-\alpha_2)\overline{u}})\Big)\Big]. \quad (17)$$

According to the inequalities given by the proposition, it can be inferred that as the liquidity of any non-monetary good α_i is higher, then F_c^* is smaller such that for a large portion of F_c in the interval [0,$\overline{F_c}$] the dishonest type prefers α_i to money. He offers money only for sufficiently low values of F_c or $\pi/(1-\pi)$. In addition to high liquidity, if this non-monetary good is also more likely to be the officer's most preferred good, then F_c^* further gets smaller.

Notice that, up to now in the analysis of the behaviors of the clients and the officer, liquidity value has an important role in the expected payoffs. Considering all agents' expected payoff from offering and receiving any non - monetary gift, they benefit more as the gift has higher liquidity. Further, the dishonest client has a higher chance for a successful bribe because the number of officers accepting the bribe increases as the good offered is more liquid. The corrupt officers who accept the free good are those with $\beta \geq \frac{c}{(1-\alpha_i)\overline{u}}$, i = 1, 2. So, as α_i is closer to '0', the probability that any officer will accept the bribe increases.

After characterizing the dishonest type's behavior, now we will determine the social welfare produced from a one-to-one matching of an officer and any type of client.

4.1.3 Social Welfare

When the honest client offers α_1, the total surplus arising from a honest client-officer matching is the sum of (10) and (11).

$$TS = \overline{u}(\phi + 1)(\pi + (1 - \pi)(1 - \alpha_1)) - 1.$$

The dishonest client's choice is to offer α_1 when eqn (16) holds. So, the total surplus of the dishonest client-officer matching is produced by eqns (12) and (13).

$$TS = \pi p_{\alpha_1}(\alpha_1)(\beta\overline{u} + b - c) + (1 - \pi)p_{\alpha_2}(\alpha_1)(\beta\overline{u}(1 - \alpha_1) + b - c) - 1.$$

It is worth to note that the total surplus of the dishonest client-officer matching is again negative because if $h > (\beta\overline{u} + b - c)$ then $h > (\beta\overline{u}(1 - \alpha_1) + b - c)$ also satisfies. The expected social welfare with the indicated choices of both clients is then:

$$SW = \gamma\Big[\overline{u}(\phi + 1)(\pi + (1 - \pi)(1 - \alpha_1)) - 1\Big] +$$

$$(1-\gamma)\Big[\pi p_{\alpha_1}(\alpha_1)(\beta\overline{u} + b - c - h) + (1 - \pi)p_{\alpha_2}(\alpha_1)(\beta\overline{u}(1 - \alpha_1) + b - c - h) - 1\Big]. \quad (18)$$

The dishonest type's choice is money if eqn (16) does not hold and the honest client's choice of gift is the same. So, the expected social welfare takes the form of

$$SW = \gamma\Big[\overline{u}(\phi + 1)(\pi + (1 - \pi)(1 - \alpha_1)) - 1\Big] + (1 - \gamma)\Big[p(0)(\beta\overline{u} + b - c - h) - 1\Big]. \quad (19)$$

When the honest type offers α_2, the total surplus of this matching is generated by (10) and (11) and is given as:

$$TS = \overline{u}(\phi + 1)((1 - \pi) + \pi(1 - \alpha_2)) - 1.$$

This time the dishonest type offers α_2 if eqn (17) holds. After determining the total surplus of the dishonest client - officer matching, the expected social welfare follows as:

$$TS = (1 - \pi)p_{\alpha_2}(\alpha_2)(\beta\overline{u} + b - c) + \pi p_{\alpha_1}(\alpha_2)(\beta\overline{u}(1 - \alpha_2) + b - c) - 1.$$

$$SW = \gamma\Big[\overline{u}(\phi + 1)((1 - \pi) + \pi(1 - \alpha_2)) - 1\Big] +$$

$$(1-\gamma)\Big[(1 - \pi)p_{\alpha_2}(\alpha_2)(\beta\overline{u} + b - c - h) + \pi p_{\alpha_1}(\alpha_2)(\beta\overline{u}(1 - \alpha_2) + b - c - h) - 1\Big]. \quad (20)$$

The dishonest type offers money if (17) does not hold. Finally, social welfare is derived as:

$$SW = \gamma\Big[\overline{u}(\phi+1)((1-\pi)+\pi(1-\alpha_2))-1\Big]+(1-\gamma)\Big[p(0)(\beta\overline{u}+b-c-h)-1\Big]. \quad (21)$$

4.2 The Government prohibits money plus one good

Now, the government's task is to decide on the additional good in order which to prohibit besides money. It has two options as before: either prohibiting α_1 or α_2.

First, suppose that government prohibits α_1:

The honest client chooses α_2 as usual and the dishonest client offers α_2 when (17) holds so, SW is given by (20), otherwise dishonest type offers money and SW is (21).

This time consider that α_2 is prohibited:

The honest client gives α_1 and the dishonest client also offers α_1 if (16) holds so, SW is given by (18) otherwise, the dishonest client's choice is money and SW is (19).

The comparison of the SW functions derived in each case will give the outcome. We again make case by case analysis due to the two bribery options of the dishonest client. The analysis of the conditions is as follows:

Proposition 6 *:*

- *Suppose that (16) holds when the government prohibits α_2 and (17) holds when it prohibits α_1. We realize the welfare functions given by (18) and (20). So, the conditions that reveal the higher welfare are given as:*
  for $\frac{\pi}{1-\pi} \geq \frac{\alpha_1}{\alpha_2}$ and $\frac{p_{\alpha_1}(\alpha_2)}{p_{\alpha_2}(\alpha_1)} \leq \frac{\Delta u_1}{\Delta u_2}$, it is optimal to prohibit α_2 otherwise,
  for $\frac{\pi}{1-\pi} < \frac{\alpha_1}{\alpha_2}$ and $\frac{p_{\alpha_1}(\alpha_2)}{p_{\alpha_2}(\alpha_1)} > \frac{\Delta u_1}{\Delta u_2}$, it is optimal to prohibit α_1.

- *If now (16) holds when α_2 is prohibited but (17) does not hold when α_1 is prohibited, we compare the functions in (18) and (21) and get the following:*
  for $\frac{\pi}{1-\pi} \leq \frac{\alpha_1}{\alpha_2}$ and $\frac{p(0)}{p(\alpha_1)} \leq \pi$, it is optimal to prohibit α_1.

- *Suppose (16) does not hold when α_2 is prohibited and (17) holds when α_1 is prohibited. By comparison of the SW functions in (19) and (20) we get the conditions below:*
  for $\frac{\pi}{1-\pi} \geq \frac{\alpha_1}{\alpha_2}$ and $\frac{p(0)}{p(\alpha_1)} \leq (1-\pi)$, it is optimal to prohibit α_1.

- *Finally, if (16) does not hold when α_2 is prohibited and (17) does not hold when α_1 is prohibited, comparison of (19) and (21) gives us these conditions such that*
  for $\frac{\pi}{1-\pi} \geq \frac{\alpha_1}{\alpha_2}$, it is optimal to prohibit α_2.
  for $\frac{\pi}{1-\pi} \leq \frac{\alpha_1}{\alpha_2}$, it is optimal to prohibit α_1.

We denote

$$\Delta u_1 = (\beta\overline{u}(1-\alpha_1) + b - c - h) \quad \text{and}$$

$$\Delta u_2 = (\beta\overline{u}(1-\alpha_2) + b - c - h).$$

The comparison of SW functions provide us with two sufficient conditions. If these two conditions hold, the government prohibits one of α_i with i=1,2 besides money. For the first case for example, the expression $\frac{\pi}{1-\pi} \geq \frac{\alpha_1}{\alpha_2}$ implies that $\pi > \frac{1}{2}$ can satisfy this inequality. The good α_1, with higher probability and liquidity is free. Note that the total surplus of the honest type-officer matching increases as the good offered has such properties. ($\alpha_i \to 0$, $\pi/1-\pi \to 1$). So, the honest client and the officer benefits more when the first condition satisfies. The second condition $\frac{p_{\alpha_1}(\alpha_2)}{p_{\alpha_2}(\alpha_1)} \leq \frac{\Delta u_1}{\Delta u_2}$ implies that the loss in the surplus of the dishonest client-officer due to the corrupt interaction is less when α_1 is free so, a higher social welfare is achieved.

In the following cases, the same argument applies. The first inequalities indicate that the honest type-officer surplus is higher by the suggested policy and the second condition is sufficient to generate less loss in the surplus of the dishonest client-officer. For the second and third cases only one sufficient condition for the optimal strategy is derived.

4.3 The Government's optimal policy

In this section we again find out that the social welfare functions are the same when one or two of the goods are prohibited. Considering the case in which all goods are prohibited, we observe that the social welfare produced consists of the negative total surplus of the dishonest client-officer matching because the honest type can not offer any gift. So, this case is the one in which the least welfare is achieved. Permitting all the goods however, increases the possibility of successful bribe because when there is no fine on money, more officers will tend to accept the bribe. So, this case increases the loss due to the corrupt interaction and decreases the social welfare when compared to the case in which money is fined. The remaining two cases; prohibiting only money and money plus one good again produces the same social welfare values assuming everything else staying at the same level. If the conditions for the prohibition of the second good hold, both clients' choice is equivalent under the same conditions.

In finding out the government's strategy for the optimal fine levels, we first determine the dishonest client's choice among the money and the non-monetary, free good. As before for a given π and the liquidity of the good offered, F_c^* is found. The position of given F_c relative to F_c^* will determine the dishonest client's bribery strategy.

If the government imposes F_c in [0, F_c^*];
The dishonest type offers money. Here, we again randomly take $\pi \geq \frac{1}{2}$ to specify the honest client's offer so, the social welfare. The dishonest client prefers money to α_1 in

this case the honest client, however, offers α_1 such that the SW outcome is

$$SW = \gamma\Big[\overline{u}(\phi+1)(\pi+(1-\pi)(1-\alpha_1))-1\Big]+(1-\gamma)\Big[(1-G(\frac{\mu F_o + c}{\overline{u}}))(\beta\overline{u}+b-c-h)-1\Big].$$

As in the previous analysis in order to maximize the SW, the government sets F_o to its highest value when the bribery strategy of the dishonest client is money. So, the loss $(\beta\overline{u} + b - c - h)$ will be minimized if $F_o = \overline{F_o}$.

With the fine levels $F_c \in [0, \overline{F_c}]$ and $F_o = \overline{F_o}$, we get

$$SW = \gamma\Big[\overline{u}(\phi+1)(\pi+(1-\pi)(1-\alpha_1))-1\Big]+(1-\gamma)\Big[(1-G(\frac{\mu\overline{F_o} + c}{\overline{u}}))(\beta\overline{u}+b-c-h)-1\Big].$$

Consider now if the government imposes F_c such that $F_c \in (F_c^*, \overline{F_c}]$.
The dishonest type offers a free, non-monetary good. Again assuming that $\pi \geq \frac{1}{2}$, the dishonest type offers α_1 as the honest type does. So, we get

$$SW = \gamma\Big[\overline{u}(\phi + 1)(\pi + (1 - \pi)(1 - \alpha_1)) - 1\Big]+$$

$$(1 - \gamma)\Big[\pi p_{\alpha_1}(\alpha_1)(\beta\overline{u} + b - c - h) + (1 - \pi)p_{\alpha_2}(\alpha_1)(\beta\overline{u}(1 - \alpha_1) + b - c - h) - 1\Big].$$

Now, the optimal policy of the government follows with the similar conditions which were previously found.

Proposition 7 *:*
If $\pi \geq \frac{(1-G(\frac{\mu\overline{F_o}+c}{\overline{u}}))}{(1-G(\frac{c}{\overline{u}}))}$ *holds, the social welfare is higher. Hence, the optimal government policy is to impose* $F_c \in [0, F_c^*]$*,* $F_o = \overline{F_o}$ *and prohibit either only money or money plus one good.*

Since we assumed $\pi \geq \frac{1}{2}$ in order to determine the welfare functions, the condition is related with π. If we take $\pi < \frac{1}{2}$, then our condition in the proposition takes the form of $(1 - \pi) \geq \frac{(1-G(\frac{\mu\overline{F_o}+c}{\overline{u}}))}{(1-G(\frac{c}{\overline{u}}))}$. Note that this is a sufficient condition.

This time full characterization of conditions for the optimal policy as in the previous section is not possible. We can only derive the sufficient condition.

5 The Analysis for N goods

5.1 The gift can only be consumed

In this section we aim to apply the same scenario for N goods and see how the same properties (liquidity and incomplete information about the officer's preferences) of the goods interact to shape the government's decision about which goods to consider as bribe if offered to an officer. At the first stage, we maintain the assumption that the officer can consume whatever he gets as bribe/gift. We think of N goods each with a specific π_i value. We then generate a vector of the N goods for both client types ranking them in an order starting from the one which is most likely to be the most preferred, to the one that is least likely. That is good 1 is the good with the highest π, denoted π_1, and so on.

$$\mathbf{P} = \begin{pmatrix} \pi_1 \\ \pi_2 \\ \vdots \\ \pi_N \end{pmatrix}$$

So, there exist a relation between the probabilities of N goods such that

$$\pi_1 > \pi_2 > \cdots > \pi_N.$$

We denote the liquidity of the good i by α_i. So, any good with π_i has liquidity α_i, where $i = 1, 2, \cdots, N$. Note that there is no order in the liquidity values of the goods; these are labeled and ranked according to π values. We assume that $\pi_i's$ and $\alpha_i's$ are common knowledge. The officer's most preferred good provides him with the maximum utility $\overline{u}$ and he derives $U_s(\alpha_i, 1)$ utility that vary between [0,$\overline{u}$) from the remaining goods.

5.1.1 The Government prohibits one good

To start with the first general case, when only money is prohibited, both client types offer the good α_1. If α_1 is prohibited besides money, then the good with probability π_2 is offered. The profile we generate also indicates both clients' non-monetary good offering order when the goods with higher liquidity are prohibited. The honest client in this case offers α_1. The dishonest client on the other hand, offers either α_1 or money. In either case, with probability π_1 the honest client gets $\phi\overline{u}$ utility and with probability $(1 - \pi_1)$ he gets $\phi U_s(\alpha_1, 1)$. So, the expression of the total surplus of the honest client-officer matching is

$$TS = \pi_1\overline{u}(\phi + 1) + (1 - \pi_1)U_s(\alpha_1, 1)(\phi + 1).$$

The dishonest type will get benefit b if the officer is of type α_1 and has $\beta \geq \frac{c}{\overline{u}}$. But if the officer is of any type other than α_1, he accepts the bribe whenever $\beta U_s(\alpha_1, 1) - c \geq 0$. So, the expected payoffs of the dishonest client and of the officer are

$$EU_{c_d} = b\Big[\pi_1 p_{\alpha_1}(\alpha_1) + (1 - \pi_1)p_{\alpha_j}(\alpha_1)\Big] - 1,$$

$$EU_o = \pi_1 p_{\alpha_1}(\alpha_1)(\beta\overline{u} - c) + (1 - \pi_1)p_{\alpha_j}(\alpha_1)(\beta U_s(\alpha_1, 1) - c)$$

where $j \neq 1$. This time, the probability that any officer will accept the bribe, $p_{\alpha_j}(\alpha_i)$, is written as:

$$p_{\alpha_j}(\alpha_i) = \begin{cases} 1 - G(\frac{c}{\overline{u}}), & \text{if } i = j = 1, 2, \ldots, N, \\ 1 - G(\frac{c}{U_s(\alpha_i,1)}), & \text{if } i \neq j. \end{cases}$$

where the subscript α_j denotes the officer's type and α_i denotes the gift offered. The total surplus from the dishonest client-officer pair and the SW function when the dishonest type offers α_1 can be obtained as follows:

$$TS = \pi_1 p_{\alpha_1}(\alpha_1)(\beta\overline{u} + b - c - h) + (1 - \pi_1)p_{\alpha_j}(\alpha_1)(\beta U_s(\alpha_1, 1) + b - c - h) - 1.$$

$$SW = \gamma\Big[\pi_1\overline{u}(\phi + 1) + (1 - \pi_1)U_s(\alpha_1, 1)(\phi + 1)\Big] +$$
$$(1-\gamma)\Big[\pi_1 p_{\alpha_1}(\alpha_1)(\beta\overline{u}+b-c-h)+(1-\pi_1)p_{\alpha_j}(\alpha_1)(\beta U_s(\alpha_1, 1)+b-c-h)-1\Big]. \quad (22)$$

Now, consider the dishonest client's other alternative of offering money. He offers money if (1) is non-negative. Further, he still chooses money rather than good α_i if the condition below holds:

$$\mu F_c \leq b\Big[p(0) - \pi_i(1 - G(\frac{c}{\overline{u}})) - (1 - \pi_i)(1 - G(\frac{c}{U_s(\alpha_i, 1)}))\Big]. \quad (23)$$

In this case, $i = 1$. This equation characterizes the dishonest client's behavior. Hence, the SW achieved when (23) holds for i=1 takes the form of

$$SW = \gamma\Big[\pi_1\overline{u}(\phi+1)+(1-\pi_1)U_s(\alpha_1, 1)(\phi+1)\Big]+(1-\gamma)\Big[(p(0)(\beta\overline{u}+b-c-h)-1)\Big]. \quad (24)$$

These are the two relevant SW functions when the government prohibits only money.

5.1.2 The Government prohibits money plus one good

We deepen the analysis by considering the prohibition of the additional good. If the government prohibits any good other than α_1 besides money, both clients will offer α_1 as a non-monetary good because it is more likely to match with the officer's preferences than any other good α_i. The social welfare outcomes in this case were found earlier as (22) and (24). First, note that the government will prohibit α_1, the good with the highest probability of being the most preferred good. Now, the best offer that escapes the sanction is α_2, for both types of client. There exist two possible SW functions that will be shaped by the dishonest client's choice of money and α_2. The SW function that will be derived when both clients offer α_2 is

$$SW = \gamma\Big[\pi_2\overline{u}(\phi + 1) + (1 - \pi_2)U_s(\alpha_2, 1)(\phi + 1)\Big] +$$

$$(1-\gamma)\Big[\pi_2 p_{\alpha_2}(\alpha_2)(\beta\overline{u}+b-c-h)+(1-\pi_2)p_{\alpha_j(\alpha_2)}(\beta U_s(\alpha_2,1)+b-c-h)-1\Big] \quad (25)$$

where $j \neq 2$. If (23) holds for $i = 2$, the dishonest client offers money and the SW is

$$SW = \gamma\Big[\pi_2\overline{u}(\phi+1)+(1-\pi_2)U_s(\alpha_2,1)(\phi+1)\Big]+(1-\gamma)\Big[(p(0)(\beta\overline{u}+b-c-h)-1)\Big]. \quad (26)$$

In finding out which good to prohibit as the second, we assume the following important condition that enable us to reach a conclusion about the government's strategy.

If the condition

$$\frac{U_s(\alpha_{i+1},1)}{U_s(\alpha_i,1)} \leq \frac{1-\pi_i}{1-\pi_{i+1}} \leq \frac{p_{\alpha_j}(\alpha_{i+1})}{p_{\alpha_j}(\alpha_i)} \quad (27)$$

satisfies, where $i = 1, 2, \ldots, N-1$, we get a relationship between the social welfare of the client types when their choice are the same non-monetary good. According to this generalized condition, for i= 1 we observe that the SW achieved when both clients choose α_1 is greater than that of both choosing α_2 by comparing (22) and (25). If we compare the SW functions for all i, we derive

$$SW_{\alpha_1} > SW_{\alpha_2} > \ldots > SW_{\alpha_N}$$

where the subscript α_i denotes the social welfare produced when both clients offer the same non-monetary good α_i. This condition guarantees that as the clients are restricted to choose the goods with lower π_i 's, the social welfare tends to decrease.

Now consider that the dishonest client offers money while the honest client offers any π_i (This implies that (23) holds). The SW function produced turns out to take the form of

$$SW = \gamma\Big[\pi_i\overline{u}(\phi+1)+(1-\pi_i)U_s(\alpha_i,1)(\phi+1)\Big]+(1-\gamma)\Big[(p(0)(\beta\overline{u}+b-c-h)-1)\Big]. \quad (28)$$

If only money is prohibited, $i = 1$ in the above formula. We encounter an interesting case such that if the dishonest client prefers to offer money instead of α_1, he continues to offer money even if any other of the good(s) is prohibited besides money. Since the expected payoff he takes from offering money is higher than that of offering α_1, his payoff from money will still be higher than that from offering α_2 or any of α_i. So, if the condition above (equation (27)) prevails, the social welfare produced by the dishonest client's choice of money and the honest client's choice of α_i is the highest for $i = 1$ and it decreases as π_i decreases (see eqn (28)).

Another point which is worth to note is that if the dishonest type offers α_1 ((23) does not hold for i=1) when only money is prohibited, his offer of α_1 can switch to money or another non-monetary good that can be either α_2 or itself when money plus one good is prohibited. So, we need an additional condition that gives the higher SW from the comparison of these welfare functions that vary according to the dishonest client's different choices. We derive that if the condition below holds besides (27) the SW attains its highest value.

$$\frac{\pi_i p_{\alpha_j}(\alpha_i)}{p(0)} \geq \frac{\Delta u_0}{\Delta u_i}.$$

Here, $\Delta u_0 = (\beta\overline{u} + b - c - h)$ and $\Delta u_i = (\beta U_s(\alpha_i, 1) + b - c - h)$ denote the net benefits. These conditions are also sufficient to find out the optimal strategy. It turns out that the government does not prohibit π_1 because when it is free under these two conditions stated above, maximum welfare is achieved. Hence, the government prohibits only money or money plus any good(s) except α_1.

The following proposition summarizes the sufficient conditions for the government's strategy on which good to prohibit.

Proposition 8 *:*
If $\frac{U_s(\alpha_{i+1},1)}{U_s(\alpha_i,1)} \leq \frac{1-\pi_i}{1-\pi_{i+1}} \leq \frac{p_{\alpha_j}(\alpha_{i+1})}{p_{\alpha_j}(\alpha_i)}$ *and* $\frac{\pi_i p_{\alpha_j}(\alpha_i)}{p(0)} \geq \frac{\Delta u_0}{\Delta u_1}$ *hold, the government prohibits only money or any other good(s) than* α_1 *besides money.*

The first part, $\frac{U_s(\alpha_{i+1},1)}{U_s(\alpha_i,1)} \leq \frac{1-\pi_i}{1-\pi_{i+1}}$, of the first inequality implies that if any good α_i, with a higher probability gives the officer also more utility than a good α_{i+1}, a higher surplus from the honest client-officer interaction is produced. The second part, $\frac{1-\pi_i}{1-\pi_{i+1}} \leq \frac{p_{\alpha_j}(\alpha_{i+1})}{p_{\alpha_j}(\alpha_i)}$, provides less negative surplus for α_i from the dishonest client-officer interaction when compared to α_{i+1}. The second condition guarantees that the two welfare functions obtained when α_1 is free are higher than the other functions obtained in any case.
The similarities of the analysis for N goods and only for three goods lie in the fact that since the gift is just consumed, its liquidity has no effect in the expected payoffs, SW functions and even in the conditions we derived for determining the government's policy. It is the probability of preference that plays the most important role.

5.2 The gift offered can be sold

The final step in the analysis of N goods is to allow the officer to sell the gift. The same setting continues to apply. This time we will observe the effect of the liquidity together with the probability of preference.

5.2.1 The Government prohibits one good

There is no change in the criteria of the two clients' choices. Both types offer the gift/bribe according to the order in the goods profile. The officer however, can sell the good if $\overline{u}(1-\alpha_i) > U_s(\alpha_i, 1)$ is satisfied otherwise, he consumes it. So, we formulate the officer's utility as the maximum of these two utility values. The honest client offers

α_1 and the expected payoff and the total surplus of this matching is

$$EU_{c_h} = \pi_1 \phi \overline{u} + (1 - \pi_1)\phi \max\{U_s(\alpha_1, 1), \overline{u}(1 - \alpha_1)\},$$

$$TS = \pi_1(\phi + 1)\overline{u} + (1 - \pi_1)(\phi + 1) \max\{U_s(\alpha_1, 1), \overline{u}(1 - \alpha_1)\}.$$

The dishonest client's expected payoff from offering α_1 is

$$EU_{c_d} = b\Big[\pi_1(1 - G(\frac{c}{\overline{u}})) + (1 - \pi_1)(1 - G(\frac{c}{\max\{U_s(\alpha_1, 1), \overline{u}(1 - \alpha_1)\}}))\Big] - 1.$$

This time we use the notation of $p_{\alpha_j}(\alpha_i)$ which is a little different than before, such that

$$p_{\alpha_j}(\alpha_i) = \begin{cases} 1 - G(\frac{c}{\overline{u}}), & \text{if } i = j = 1, 2, \ldots, N, \\ 1 - G(\frac{c}{\max\{U_s(\alpha_i, 1), \overline{u}(1 - \alpha_i))\}}), & \text{if } i \neq j. \end{cases}$$

Taking the dishonest client's choice of money in to account, his behavior about his two bribery strategies is characterized by the equation below:

$$\mu F_c \leq b\Big[p(0) - \pi_i p_{\alpha_i}(\alpha_i) - (1 - \pi_i) p_{\alpha_j}(\alpha_i)\Big]. \tag{29}$$

In this equation, $i \neq j$. If it holds for $i = 1$, the dishonest client prefers money to α_1 and so on for any i.

The officer on the other hand, gets $(\beta\overline{u} - c)$ utility if he is of type α_1 and has $\beta \geq \frac{c}{\overline{u}}$. Otherwise he gets $(\beta \max\{U_s(\alpha_1, 1), \overline{u}(1 - \alpha_1)\} - c)$ utility with $(1 - \pi_1)p_{\alpha_j}(\alpha_1)$ probability. So, his expected payoff is

$$EU_o = \pi_1 p_{\alpha_1}(\alpha_1)(\beta\overline{u} - c) + (1 - \pi_1)p_{\alpha_j}(\alpha_1)(\beta \max\{U_s(\alpha_1, 1), \overline{u}(1 - \alpha_1)\} - c).$$

After determining the expected payoffs, the total surplus of the dishonest client-officer interaction is

$$TS = \pi_1 p_{\alpha_1}(\alpha_1)(\beta\overline{u} + b - c - h) +$$

$$(1 - \pi_1)p_{\alpha_j}(\alpha_1)(\beta \max\{U_s(\alpha_1, 1), \overline{u}(1 - \alpha_1)\} + b - c - h) - 1.$$

The social welfare produced by the dishonest type's choice of α_1 (if so, then (29) does not hold for $i = 1$) and the honest type's offer of α_1 produces the SW function which is in the form of

$$SW = \gamma\Big[\pi_1(\phi + 1)\overline{u} + (1 - \pi_1)(\phi + 1) \max\{U_s(\alpha_1, 1), \overline{u}(1 - \alpha_1)\}\Big] +$$

$$(1 - \gamma)\Big[\pi_1 p_{\alpha_1}(\alpha_1)(\beta\overline{u} + b - c - h) +$$

$$(1-\pi_1)p_{\alpha_j}(\alpha_1)(\beta\max\{U_s(\alpha_1,1),\overline{u}(1-\alpha_1)\}+b-c-h)-1\Big]. \tag{30}$$

where $j \neq 1$. Consider now if the dishonest client offers money ((29) does holds for $i=1$). The SW function is given as:

$$SW=\gamma\Big[\pi_1(\phi+1)\overline{u}+(1-\pi_1)(\phi+1)\max\{U_s(\alpha_1,1),\overline{u}(1-\alpha_1)\}\Big]+$$

$$(1-\gamma)\Big[p(0)(\beta\overline{u}+b-c-h)-1\Big]. \tag{31}$$

5.2.2 The Government prohibits money plus one good

First, we handle the case of prohibiting α_1, then α_2 and so on in order to observe the change in the SW functions and to decide on which good to prohibit. If α_1 is prohibited, then the honest type certainly offers α_2 and the dishonest type also offers α_2 if (29) does not hold for $i=2$. In this case

$$SW=\gamma\Big[\pi_2(\phi+1)\overline{u}+(1-\pi_2)(\phi+1)\max\{U_s(\alpha_2,1),\overline{u}(1-\alpha_2)\}\Big]+$$

$$(1-\gamma)\Big[\pi_2 p_{\alpha_2}(\alpha_2)(\beta\overline{u}+b-c-h)+$$

$$(1-\pi_2)p_{\alpha_j}(\alpha_2)(\beta\max\{U_s(\alpha_2,1),\overline{u}(1-\alpha_2)\}+b-c-h)-1\Big]. \tag{32}$$

where $j \neq 2$. The other SW function produced by the dishonest client's choice of money (29 holds for i=2) is given by

$$SW=\gamma\Big[\pi_2(\phi+1)\overline{u}+(1-\pi_2)(\phi+1)\max\{U_s(\alpha_2,1),\overline{u}(1-\alpha_2)\}\Big]+$$

$$(1-\gamma)\Big[p(0)(\beta\overline{u}+b-c-h)-1\Big]. \tag{33}$$

Now, consider the prohibition of the good α_2. The honest type chooses α_1 and the SW outcome if the dishonest type also chooses α_1 is given by (30). When the dishonest client offers money, the SW will take the form of (31). If the expected utility he receives from offering money is greater than from offering α_1, he always offers money even if any good(s) is prohibited. We will have the same SW outcomes even if any good(s) other than α_1 is prohibited besides money. Hence, we first compare the equations (30) and (31) with (32) and (33).

Under the condition $\frac{p_{\alpha_j}(\alpha_2)}{p_{\alpha_j}(\alpha_1)} \geq \frac{1-\pi_1}{1-\pi_2} \geq \frac{\max\{U_s(\alpha_2,1),\overline{u}(1-\alpha_2)\}}{\max\{U_s(\alpha_1,1),\overline{u}(1-\alpha_1)\}}$, the SW achieved when both clients offer α_1 is greater than when they both offer α_2. Moreover, if we impose the condition $\frac{\pi_1 p_{\alpha_j}(\alpha_1)}{p(0)} \geq \frac{\Delta u_o}{\Delta u_1}$, the SW produced by both client's choice of α_1 is greater than the SW produced by the dishonest client's choice of money when α_1 is prohibited.

Explicitly, Δu_o is the same as before but this time

$$\Delta u_1 = (\beta \max\{U_s(\alpha_1, 1), \overline{u}(1-\alpha_1)\} + b - c - h).$$

We can generalize these two conditions for N goods by the following proposition and have the same outcome for the government's strategy.

Proposition 9 *:*
If the two conditions below hold, the highest social welfare is achieved when only money or money plus any good except α_1 is prohibited .

$$\frac{p_{\alpha_j}(\alpha_{i+1})}{p_{\alpha_j}(\alpha_i)} \geq \frac{1-\pi_i}{1-\pi_{i+1}} \geq \frac{\max\{U_s(\alpha_{i+1}, 1), \overline{u}(1-\alpha_{i+1})\}}{\max\{U_s(\alpha_i, 1), \overline{u}(1-\alpha_i)\}}$$

$$\frac{\pi_i p_{\alpha_j}(\alpha_i)}{p(0)} \geq \frac{\Delta u_o}{\Delta u_i}$$

Again, Proposition 9 offers a sufficient condition. The exact condition is given by the comparison of the corresponding welfare functions, which, unfortunately cannot be reduced to simple formulas.

6 Concluding Remarks

This thesis incorporates the possibility of gift giving as a form of bribery and analyzes the gift's properties in causing corrupt interactions. The properties of the gifts we discuss in our model are the liquidity and the possibility of matching with the officer's preferences. At the first stage of our analysis in which we consider only three goods, we find out that the officer's preferences play the key role in determining the bribery conditions whereas liquidity has no effect. As the probability (π) that a gift is the officer's most preferred choice increases, it is more likely that the dishonest client offers that gift as bribe and achieves his bribery goal because the probability of successful bribe when a free good is offered is higher than that when the prohibited good is offered. The impact of preferences on the social welfare however, is not obvious. While the total surplus of the honest client-officer pair increases due to an increase in π or $(1-\pi)$, the total surplus from the corrupt dealing of a dishonest client-officer pair decreases. In determining the optimal government policy, we seek the conditions that maximize the surplus of the honest client-officer matching and that at the same time minimize the loss from the corrupt interaction of the dishonest client and the officer. Another effect of π also appears in government's decision on which good to prohibit besides money. We observe in Section 3.2 that while the good with the lower π value is prohibited, in some cases an additional condition in order to guarantee less loss form the corrupt dealings is necessary. These results suggest that it is optimal to allow the good which is believed to be more appropriate for gift-giving in society as long as the conditions stated by Proposition 3 are satisfied.

Secondly, we allow the officer to exchange the gift for his most preferred good in order to highlight the impact of the liquidity on corrupt incentives. This time, liquidity besides preferences plays role in bribe-aimed interactions. As the non-monetary gift offered has higher liquidity, the dishonest client has higher chance for successful bribe because even if the officer's preferences do not match with the gift offered as bribe, he can exchange it for his favorite good that will provide him nearly with the maximum utility. For higher liquidity values, the number of officers that accept the bribe increases. Analogously as in the previous stage, while higher liquidity results in higher total surplus of the honest client-officer matching, it produces more loss in the social welfare due to the dishonest client-officer interaction. Related to the impact on the social welfare, liquidity besides the value of π will determine the government's decision on which good to prohibit besides money. If the gift which has higher π is also more liquid, the government can allow it only if its potential social harm that stems from its susceptibility to bribery is minimized by an additional condition (see section 4.2). The assumption that the officer can sell the gift is more realistic. The reason we handle the analysis at two stages is that we aim to highlight the impacts of the preferences and the liquidity on corrupt dealings separately.

The extension to the case of N goods is more restrictive because we impose a few more conditions to reach a conclusion on the government's optimal policy. We again find out that for the case in which the gift can only be consumed, only preferences will be effective in bribery decisions. As long as the conditions derived by Proposition 8 hold, the government allows the good with the highest probability. An important point concerning this outcome is that the good with the higher probability is assumed to give the officer higher utility. Due to this assumption when α_1 (the good with the highest probability) is allowed, the social welfare attains its maximum. It is similar to the conclusion of the previous stage in which we assumed only three goods in that the government allows the good with the higher probability under some conditions. The government's optimal policy is the same for the case in which the gift can be sold. This time the conditions that render the conclusion are a bit different. Proposition 9 implies that the government allows α_1 to achieve the maximum welfare only if we maintain the condition that the good with the higher probability provides the officer with the higher utility. We observe that the conditions given by Proposition 8 is a special case of the ones given in Proposition 9 because the officer chooses between the options of either consuming it or selling depending upon the utility he derives from each. The liquidity value in this case will play the role if the officer exchanges the gift for his favorite choice. We can also have such an extreme situation that the officer prefers to sell the gift for all possible offer of goods. So, the conclusion about the optimal policy turns out to sound as if the good with the higher probability is also more liquid, the government's strategy will be to prohibit any good other than α_1. This case's similarity to the previous stage is that the government allows the good with the higher probability and liquidity only if the stated conditions given by the relevant propositions are satisfied.

Another extension which is not plausible to deal with is to consider a continuum of goods. The difficulty of this case is to define the officer's preferences over the infinite number of goods. So, any assumption on officer's preferences will leave us with a very restrictive framework that is not worthwhile.

7 References

[1] Ackerman, R. Susan, 1975. The Economics of Corruption. *Journal of Public Economics* 4, 187-203.

[2] Ackerman, R. Susan, 1999. Corruption and Government: Causes, Consequences, and Reform. Cambridge: Cambridge University Press.

[3] Bac, M., 1996. Corruption, Supervision and the Structure of Hierarchies. *Journal of Law, Economics & Organizations* 12, 277-298.

[4] Bardhan, P., 1997. Corruption and Development: A Review of Issues. *Journal of Economic Literature* 35, 1320-1346.

[5] Becker, G. S., 1968. Crime and Punishment: An Economic Approach. *Journal of Political Economy* 76, 169-217.

[6] Bowles, R., Garoupa, N., 1997. Casual Police Corruption and the Economics of Crime. *International Review of Law and Economics* 17, 75-87.

[7] Calvo, R. A. Guillermo, 1984. The Economics of Supervision. Columbia University, New York, Mimeographed.

[8] Cadot, O., 1987. Corruption as a Gamble. *Journal of Public Economics* 33, 223-244.

[9] Camerer, C. F., 1988. Gifts as Economic Signals and Social Symbols. *American Journal of Sociology* 94, 180-214.

[10] Carmichael, H. L., Macleod, W., 1997. Gift Giving and the Evolution of Cooperation. *International Economic Review* 38, 485-509.

[11] Mookherjee, D., Png, I., 1995. Corruptible Law Enforcers: How Should They Be Compensated? *The Economic Journal* 105, 145-159.

[12] Prendergast C., Stole L., 2000. The Non-monetary Nature of Gifts. *European Economic Review* 45, 1793-1810.

[13] Scleifer, A., Vishny, W. R., 1993. Corruption. *Quarterly Journal of Economics* 108, 599-617.

[14] Tanzi, V., 1995. Corruption, Governmental Activities and Markets. IMF Working Paper No. 94/99.

[15] Waldfogel, J., 1995. The Deadweight Loss of Christmas. *American Economic Review* 83, 1328-1336.

[16] Zeckhauser R., 1991. Strategy and Choice. ed.2, MIT Press.