Externalities in the rent-seeking strategies of lobbying and bribery

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Abstract

Studies investigating the relationship between lobbying and bribery are limited and contradictory. Some studies regard lobbying and bribery as substitutes while others consider them complementary strategies. Using congestion games this study attempts to clarify the externalities present in these rent-seeking strategies which generate complementarities between them. Lobbying cost-sharing and cooperation through business associations and congestion in benefits from competitive bribery are important sources of externalities. The theoretical model is then investigated empirically. The results indicate that lobbying and bribery are complementary strategies. However, as countries grow, lobbying will be used more intensely. The results also show that there is a positive externality in collective lobbying so that firms that cooperate can save on lobbying costs. There are also externalities in competitive bribery. The results show that the effects of social and legal punishments of bribery are considerable but become less severe as corruption becomes more widespread.

Keywords: lobbying, bribery, congestion games

1 INTRODUCTION

All government decisions, policies, laws, and regulations produce distributional effects. Economic agents have preferences for particular decision outcomes and, therefore, seek to influence them. This is known in the literature as rent-seeking and may be achieved either by lobbying rule makers or bribing rule enforcers, two primary rent-seeking methods. Each year 1 in 4 people pays a bribe for public services (Transparency International, 2020a) overly US$1.75 trillion worldwide (Transparency International, 2020b). Lobbying is also widespread. According to the Center for Responsive Politics, lobbying groups or individuals independently of, and not coordinated with, candidates' committees (outside spending) expended more than USD 2.9 billion in 2020 which in real terms was 12 times more than in 2010.[1]

Despite the extensive literature on rent-seeking few studies have comparatively analyzed both lobbying and bribery. These two means of influencing government decisions and rent seeking till now have either been studied separately or viewed as being the same (Goldberg, 2017; Harstad and Svensson, 2011) although it is clear that they differ and have different economic effects. Harstad and Svensson (2011) theorized substitutability between lobbying and bribery, noting that as economies grow and political or legal institutions develop, lobbying eventually replaces bribery. Campos and Giovannoni (2007) and Bennedsen, Feldmann and Lassen (2009) also provide empirical evidence supporting such substitutability. To illustrate this, figure 1 shows the prevalence of lobbying and bribery among countries for 2018. The figure is a three-dimensional plot representing a proxy for corruption on the vertical axis versus lobbying. The proxy for corruption is the

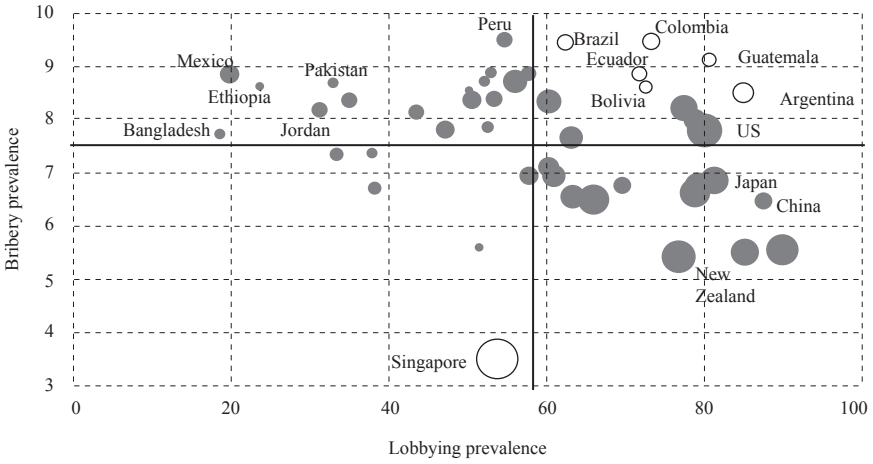
[1] USD 205.4 million in 2010.

average score for responses on how individuals perceive the level of corruption in their country (on a range of 0 = no corruption to 10 = abundant corruption). The lobbying measure is the percentage of those who have contacted their governments as a form of political action and social activism. Data for both variables are from the Wave 7 of the World Values Survey. The real per capita income of countries (in PPP-adjusted 2017 US dollars) are indicated by the size of the bubbles.

Substitutability between lobbying and bribery can be seen in the group of countries scattered in regions II and IV. Corruption rather than lobbying is more prevalent in region II countries such as Peru, Pakistan, Mexico, Ethiopia, and Jordan where bribery takes place instead of lobbying. In region IV, on the other hand, countries like Germany, US, Canada, Australia, and New Zealand are characterized by lobbying, which is more frequently for rent-seeking. According to the literature, countries in region II and IV employ only one of the rent-seeking strategies. In addition, it can be seen that lobbying is more frequent in high income countries than bribery which is more prevalent in low GDP-per capita countries. On the contrary, the concept of substitutability between lobbying and bribery does not seem to apply in regions I and III countries. This different group comprises countries like Singapore, which does not use either of the two rent-seeking strategies, or Argentina, Guatemala, and Colombia where the use of both strategies is extremely common. In these groups of countries lobbying and bribery are not substituted. This is also in accordance with Damania et al. (2004), Beckmann and Carsten (2009), Yu and Yu (2011), Kiselev (2013), Gokcekus and Sonan (2017), and Cerqueti, Coppier and Piga (2021) who consider lobbying and bribery complementary strategies.

Figure 1

Global prevalence of lobbying and bribery, 2018



Source: Author's estimates.

The failure adequately to explain the relationship between lobbying and bribery is due to the focus on the rent-seeking determinants of individual firms and due to the attempt to explain countrywide differences of their prevalence by using the characteristics of firms and ignoring social and cultural factors. This is clearly visible in the pioneering study on the relationship between lobbying and bribery by Harstad and Svensson (2011). They assume that the substitutability of successful lobbying makes bribery redundant. This study moreover assumes that firms with higher levels of capital are more powerful in bargaining with politicians and yet more vulnerable when encountering venal bureaucrats. As a result, lobbying firms invest more, which, by giving them more bargaining power, reinforces their lobbying activity. On the other hand, firms with low levels of capital prefer to bribe and invest less in order to be less defenseless. These different paths produce two extreme equilibria in which firms characterized by high levels of capital employ lobbying while those that have fallen into the bribery trap suffer from low levels of capital. They state that their "model … predicts an evolution where firms bribe at low levels of development but lobby in richer societies" (Harstad and Svensson, 2011). This conclusion is a simple extension of a single individual-firm's behavior in a country, whereas it is clear that in groups of industries or a society the numerous cooperation or free-riding opportunities may lead to different conclusions about the relationship between lobbying and bribery. For example, using a game theatrical model, Cerqueti and Coppier (2018) show that while lobbying and bribery are substitutes at the level of the firm, they can coexist at a macro level.

The main contention of this study is that rent-seeking externalities generate complementarities between lobbying and bribery and, therefore, a detailed analysis may shed light on previous vague and contradictory results about the relationship between the two strategies in rent-seeking. To fill the gap, this study presents a theoretical model showing externalities in rent-seeking which arise from the strategic choices of firms. The effect of these externalities and nonlinearities are then estimated empirically. The rest of the paper is organized as follows. Section 2 reviews the literature. Section 3 highlights the advantage of congestion games in modeling externalities and proposes a theoretical model to explain the rent-seeking behavior of firms, section 4 tests the theoretical results empirically, and section 5 presents the conclusion.

2 LITERATURE REVIEW

The literature on rent-seeking has its roots in the influential work of Tullock (1967). He argues that public policies that result in deadweight losses, like protectionist policies in international economics, do not come into existence spontaneously but that beneficiaries of inefficient policies have personal incentives to influence the generation and disbursement of income created by political decisions. Accordingly, the resources used in persuasion and such rent-seeking activities should be counted as a cost to society beyond the deadweight losses represented by Harberger's triangles. This concept was further theorized by Buchanan, Tullock and Tollison (1980). Studies at that time modelled rent-seeking mainly as an

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all-pay-contest success function in which the highest effort (expenditure or bid) wins. Grossman and Helpman (1994) used the rent-seeking concept to show that international trade restriction policies have been a significant source of rents. They describe a policy maker who stands ready to accept offers for "sale of protection" to industry interests. Stratmann (2005), on the other hand, in his review of the literature, states that the assumption that interest groups buy policy favors with their campaign contributions is not without ambiguity. There is an endogeneity problem, and ordinary least square generally overestimates the effect of campaign contributions on policy decisions. Moreover, "recent research shows that campaign contributions have not had much of an effect on legislative voting behavior" (Stratmann, 2005). In this regard, it is important to thoroughly consider campaign contributions and lobbying activities.

In an alternative approach to rent-seeking, Congleton (1984) considers the case where the rent might be shared by members of successful rent-seeking teams. Indeed, rent-seeking often involves groups and collective action issues as noted by Olson (1965). More interesting is when the contested rent provides a public-good benefit to a group. In this case, as Upsprung (1990) shows, free-riding incentives through substitution effects between own-spending and spending by others reduce a group's total rent-seeking effort. Van Long and Vousden (1987) explore another case in which the prize is enhanced by the total effort of rent seekers. They show that in cases where individual efforts produce both positive (larger prize) and negative (reduced probability of winning) externalities, individual investments increase. Other studies since then that have focused on externalities in rent-seeking and lobbying contests include those by Neretina (2019), Dickson, Mackenzie and Sekeris (2018), Ihori (2013), Govorun (2013), Godwin, López and Seldon (2004), Sun and Ng (1999), Lee and Kang (1998), and Chung (1996).

This paper, however, explores the relationship between lobbying and bribery and the effect of externalities that are present in these two rent-seeking strategies. To date, as noted in the introduction, studies that jointly examine the relationship between lobbying and bribery are few and obscure. Some studies consider lobbying and bribery to be substitutes (Yu and Lee, 2021; Thede and Gustafson, 2017; Yim, Lu and Choi, 2017; Campos and Giovannoni, 2007, 2008, 2017; Harstad and Svensson, 2011; and Bennedsen, Feldmann and Lassen, 2009) while others focus on their complementarities (Cerqueti, Coppier and Piga, 2021; Cerqueti and Coppier, 2018; Gokcekus and Sonan, 2017; Kiselev, 2013; Yu and Yu, 2011; Beckmann and Cartsen, 2009; Damania et al., 2004). The literature has mainly ignored the externalities involved in lobbying and bribery, whereas it is clear that in groups such as industries or a society, many cooperation or free-riding opportunities exist that may lead to different conclusions about the relationship between the two activities.

To understand externalities in rent-seeking, consider a queue as example. Individuals staying in a queue have three strategies available to them. The first is to comply with the rules and spend time in the queue, second, to lobby with rule

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makers for an alternative to remove the requirement for staying in line, or, third, to bribe bureaucrats and move forward by taking the place of others. In the case of lobbying, there are two positive externalities. One is to save on costs as more firms cooperate in lobbying for a change. Lobbying is a form of collective action, and its benefits are non-excludable because, by removing the queue, all firms regardless of their participation in the lobbying will benefit. Moreover, to lobby, individuals need to build links with rule-makers and negotiate, which is costly. The high cost of linkages with rule-makers and the fact that the benefits of lobbying are non-excludable force individuals to pursue it in groups. The second source of externality arises from the fact that collective lobbying increases the chances of success. Numerous studies consider lobbying as a cooperative and collective action. Despite its necessity and significant advantages, however, there are factors preventing cooperation. The term "free-riding" first introduced by Olson (1965) is known as the main impediment. He stressed that because of the non-exclusion feature of public goods, rational individuals will have the incentive to free-ride on the efforts of others. In their study of lobbying over common pool resource regulations, Freeman and Anderson (2017) emphasize that the non-participation of other firms makes lobbying more costly. They show that lobbying is a public good and free-riding on it may lead to insufficient lobbying and inefficient regulations. In exploring the second positive externality existing in the lobbying efforts of firms, Weiler and Reißman (2019) show that the more intensely lobby groups cooperate, the more they make use of both insider and outsider lobbying tactics.

There are also different sources of externalities involved in bribery. As in the example of the queue, individuals may pay a bribe and move forward but the exemption they get through bribery is worth less as more people do the same. Competition forces bribers to increase their corrupt payments (Diaby and Sylwester, 2015; Songchoo and Suriya, 2012). Baumann and Friehe (2016) state that, "With respect to the number of firms in the industry, our framework yields the prediction that more intense competition will reduce crime." In other words, there are negative externalities and bribery due to congestion.

Although these important factors and externalities in lobbying and bribery are studied separately, they have been neglected in studies that consider both strategies at the same time. The few existing studies on the relationship between lobbying and bribery have attempted to explain it using individual behavior whereas individual factors cannot explain the positive and negative externalities in rent-seeking that can be crucial determinants of the relationship.

One of the difficulties in studying externalities is dealing with non-linear relationships and modelling them. However, this should no longer be an obstacle as there are now various extremely efficacious theoretical game frameworks, such as congestion games, that can model non-linear payoffs and externalities. In a congestion model, players use several facilities (resource or alternatives), and the costs or benefits associated with each facility are possibly, among others, determined by the number of users of that same facility (Blumrosen and Dobzinski, 2007; Voorneveld et al., 1999).

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Congestion games have been applied in economics wherever externalities are the focus of the study. "Congestion models can be used to model … local public goods, where it is common to speak about 'anonymous crowding' to describe the negative externality arising from the presence of more than one user of the same facility" (Voorneveld et al., 1999). Another example of the application of congestion games in economics is to compute the price of anarchy by measuring how the efficiency of a system degrades due to the selfish behavior of its agents in the worst case. The price of anarchy is the comparison of the costs between two equilibria, i.e., the optimal one, and the bad equilibrium where externalities have led to some form of inefficiency. Since taxation is the classic solution to externalities, this price of anarchy can be used to compute optimal taxes. Brown and Marden (2016), Christodoulou and Gairing (2015), and Bilò and Vinci (2019) are among those who have studied this area. Other studies apply congestion games to model the positive externalities presented by cooperation and cost-sharing among atomic players. Gairing, Kollias and Kotsialou (2020) explore the existence and efficiency of cost-sharing equilibria.

Such advantages of congestion game models make them extremely useful for the purpose of this paper in studying the externalities of lobbying and bribery. After a short introduction to congestion games, the following section presents the theoretical model used in this study.

3 MODELING EXTERNALITIES IN RENT-SEEKING

The benefits and costs of collective lobbying and bribery depend on the cooperation or competition between individual rent-seeking agents. In this case, the equilibrium levels of lobbying efforts, campaign contributions, bribe payments, etc., are determined by the state of the population and pervasiveness of these qualities. The dynamics of the population and an imitation of these qualities can best be modelled by evolutionary games. This is because they involve bounded rationality, meaning that agents to some extent copy and follow each other and, as a result, their strategic decisions depend on the state of the population. To illustrate this, assume a fixed payoff matrix π whose arrays a_{ij} show the payoff of agent i being matched with other agents, j, of different types in the strategy-set S. The probability of different types or strategies matching each other depends on the state of population or the prevalence of strategies. Thus, $F_i(X)$, the expected payoff of agent i playing the game with the fixed payoff matrix Π among members of a population with the state $X = [x_1\ x_z \ldots\ x_n]$ is as follows (equation 1) with the arrays x_j indicating the prevalence of strategy or type of j in population.

$$\pi = \begin{bmatrix} a_{11} & a_{12} \ldots & a_{1n} \\ a_{21} & a_{22} \ldots & a_{2n} \\ \vdots & & \\ a_{n1} & a_{n2} \ldots & a_{nm} \end{bmatrix}$$

$$\Pi_i(X) = \pi_i X' = \sum\nolimits_{j \in S} a_{ij} x_j \qquad (1)$$

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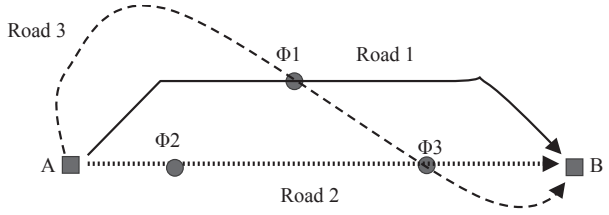
The Matrix $\Pi(X) = \pi X$ indicates the expected payoff of all the population members which is clearly linear in respect to the state of the population. This linearity is a restriction, and, indeed, may not seem reasonable especially in economics and the modelling of externalities. Evolutionary games are based on the major assumption that the payoff matrix π is fixed and independent of the population's state. This assumption has its roots in the fact that evolutionary game theory is based on random matching games. Random matching is the first stage of population games in which the population is divided into independent identical groups whose members are randomly matched. The payoffs are determined at the end based on randomly matched identical groups. Then, at the second stage, which is purely biological, the payoffs of different species are compared and the equilibrium state of the population determined. The first stage of the game played between random species is independent of the second stage and the state of the population. This independency makes the payoff matrix fixed and unrelated to the population state. In reality, however, payoffs are themselves contingent upon the population state. Interactions in which each agent's payoff is determined directly by all agents' behavior, a situation labeled the "playing the field" by Smith (1982), seems to be the rule rather than exemption. According to Hammerstein and Selten (1994), "One often meets situations in which the members of a population are not involved in pairwise conflicts but in a global competition among all members. Such situations are often described as a "playing the field." Focusing only on matching in normal form games is quite restrictive. The payoff matrix can itself be a function of the state of the population. The payoff of agent *i* being matched with agent *j* may depend on the population of *i* and *j* types or even agents from other types. This is what we know as externalities.

However, the dependence of the payoff matrix on the population state leads to a non-linear expected payoffs matrix. Sandholm (2010) states that, "One might expect that moving from linear to non-linear payoffs would lead to intractable models, but it does not." Some games, like congestion in highway networks which consider the game among all population members, are capable of modeling both linear and non-linear payoffs. As a short introduction of congestion games, suppose there are three ways of going from point A to B each of them entailing a cost that is an increasing function of the number of cars on the road. In other words, these roads are rivalrous public goods that would be congested at some point. Since each car imposes a negative externality on others, each utilizer minimizes costs by choosing the least crowded road from A to B (see figure 2).

Figure 2

An example of a road congestion game



Source: Author.

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The three ways may be interpreted as three strategies, $S = \{Road1, Road2, Road3\}$. These strategies use facilities $\varnothing = \{\varphi 1, \varphi 2, \varphi 3\}$, for which some are common. Consider, in addition, $X^{\varnothing} = \{x^{\varphi 1}, x^{\varphi 2}, x^{\varphi 3}\}$ as the utilization level of the facilities. The cost of road usage, due to assumed negative externalities, is an increasing function of the utilization level or state of the population. For example, as shown in equation 2, the cost of using road 3 is $C\{x^{\varphi 1} + x^{\varphi 3}\}$ which depends on the utilization level of the first and third facilities, shared respectively with road 1 and 2. The payoff corresponding to this strategy, $\Pi_{Road3}(X)$, in this case is negative and solely determined by the cost of using road 3. The optimal choice between these three roads could then be obtained by minimizing the corresponding costs of the strategies.

$$\begin{bmatrix} \pi_{Road1}(X) = -C\left(x^{\varphi 1}\right) \\ \pi_{Road2}(X) = -C(x^{\varphi 2} + x^{\varphi 3}) \\ \pi_{Road3}(X) = -C(x^{\varphi 1} + x^{\varphi 3}) \end{bmatrix} \tag{2}$$

The benefits of different strategies now, in contrast to linear evolutionary games, could be a non-linear function of the utilization level and state of population. This is an important point for the purpose of this study, which focuses on externalities in lobbying and bribery. Previous studies on these rent-seeking strategies neglected the element of externalities which could critically have an effect on their relationship.

To model externalities in rent-seeking, consider lobbying, compliance, or bribery as the three strategies available to firms for which compliance with the rules is costly. Firms may lobby governments for a change in the rules, avoid them through bribery, or do nothing and comply with them. In the case of lobbying, there is only one alternative rule which is in the interest of all firms.[2] Although this study's focus is on the relationship between lobbying and bribery, compliance is added to the strategy set because there are countries where neither of the two rent-seeking strategies are prevalent. In other countries too, compliance strategy could be considered as a fallback position for firms. In this regard, $S = \{L, C, B\}$ represents the set of pure strategies for lobbying, compliance, and bribery, respectively.

Six facilities are commonly or exclusively used under the three strategies, namely lobbying negotiations with government (LN), linkage cost sharing (LCS), rule breaking through bribery (RBB), the social costs of corruption (SCC), social and legal penalties imposed on bribers (PB), and punishment of free-riding (FRP). The total payoffs for the three strategies are shown in equation 3 which will be discussed in more detail. Here, instead of C indicating the facilities-usage cost, the term π is used for the benefits provided by the facilities.

[2] Although in the real world rival industries compete with each other, this study concentrates on firms within an industry having common interests where the issue relates only to cooperation in lobbying or acting individually.

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$$\begin{cases} \Pi(L) = \pi(LN) + \pi(LCS) + \pi(SCC) \\ \Pi(C) = \pi(LN) + \pi(SCC) + \pi(FRP) \\ \Pi(B) = \pi(LN) + \pi(FRP) + \pi(RBB) + \pi(PB) \end{cases} \tag{3}$$

In lobbying negotiations (LN) with the government the benefits are non-exclusive and all firms, regardless of their cooperation, enjoy the rule changes produced by the successful lobbying. Here, others would free-ride on this facility provided by lobbyists. As shown in equation 3, all the three strategies utilize the benefits of this facility. Standardizing the corresponding costs of the current and alternative rules respectively as one and zero, the benefits of this facility may be shown as equation 4. Since the gains of a rule change are durable, it is discounted by parameter δ. The benefits of LN and rule change, $\pi(LN)$, depend positively on the population of lobbyists x^L, which is indicative of a larger and more powerful coalition. In fact, the chance of success in lobbying is not exogenous but increases with the population of lobbyists.

$$\pi(LN) = \left(\frac{1}{1-\delta}\right) x^L \tag{4}$$

In the example of the queue, if firms cooperate in lobbying and set new rules that do not require having to be in a queue anymore, all firms will commonly benefit from a non-excludable non-rival ease. But this benefit doesn't come without cost. Lobbying firms are required to link with governments to negotiate.

The second facility used by lobbying firms is the linkage cost sharing (LCS). Linking to, bargaining with, and persuading governments are costly, and firms can save on them through sharing. The costs of this facility would be incurred solely by the lobbying firms as others free-ride on it. Assuming the fixed linkage cost or contribution demanded by government is C, the benefits of LCS could be shown as equation 5. If all firms cooperate in lobbying, x^L=1, the costs of linking could be negligible.

$$\pi(LCS) = -C(1 - x^L) \tag{5}$$

The third facility is the social cost of corruption (SCC). The prevalence of bribery and corruption also entails some costs to society as a whole. In the queue example, bribing bureaucrats is harmful to society because bribers steal projects or take the place of others. Since bribers achieve a better position at the cost of a worse position for non-bribers, this harm could be considered as the opposite of what bribers get from rule breaking, which is equal to one because the corresponding cost of the current rule is standardized to one. shown in equation 6, the SCC increases as bribers grow in number.

$$\pi(SCC) = -x^B \tag{6}$$

The payoff for lobbying is the sum of benefits obtained through these three facilities. Equation 7 shows the payoff for the lobbying strategy and is a non-linear function of the state of the population and incorporates several positive and negative externalities. Lobbyists share the benefits of lobbying negotiations (LN) and rule change with the whole of the society but exclusively incur its linkage costs. The benefits of linkage cost sharing or LCS is limited to the size of their coalition. They also suffer from the social cost of corruption (SCC).

$$\Pi(L) = \pi(LN) + \pi(LCS) + \pi(SCC) = \frac{x^L}{1-\delta} - C\left(1 - x^L\right) - x^B \qquad (7)$$

Firms compare the payoff of lobbying with that of other strategies. Another strategy is compliance which could be considered as the fallback position. The payoff for compliance is the sum of benefits of three facilities. The first is the benefit of LN with government which is provided by lobbying firms but having compliers free-riding on it. The second is the social cost of corruption (SCC). As stated, this is the harm or losing the place in the queue example, incurred as a result of venal conduct. Compliers and lobbyists commonly suffer from corruption. Another cost that compliers experience is the retribution or punishment *d* inflicted by lobbying firms for their free-riding behavior. Free-riders not only refuse to contribute to the costs of lobbying, but also decrease the chance of success by preventing the formation of a stronger coalition. Direct or indirect[3] punishments which decrease payoffs for free-riders act as a stabilization mechanism for the lobbying coalition. Nonetheless, these punishments for free-riding may be shared as well by compliers and bribers. Alternatively, it can be said that this punishment, as shown by equation 8, would not be very effective when the lobbying coalition is weak.

$$\pi(FRP) = -\mathrm{d}x^L \qquad (8)$$

In sum, the payoff for the compliance strategy could be shown by equation 9. The payoff is again a non-linear function of the state of the population and incorporates several positive and negative externalities.

$$\Pi(C) = \pi(LN) + \pi(FRP) + \pi(SCC) = \frac{x^L}{1-\delta} - dx^L - x^B \qquad (9)$$

The third strategy is bribing bureaucrats to breach existing rules. The payoffs for bribery consist of the benefits or costs of four facilities. First, bribers like compliers incur no costs and economically enjoy the fruits of lobbying negotiations (LN). However, for their free riding behavior bribers, like compliers, are also punished (FRP) by lobbying firms. In contrast to compliers, however, bribers are not passive. While bribers free-ride on lobbying efforts to change rules, they proactively try to bypass the costly current rules through bribery. Breaching the rule facility provided by bribers (RBB) is specific and benefits only the bribers. Because the corresponding costs

[3] Indirect punishment, known as selective incentive mechanism in the literature. For example, a trade union is able to create selective incentives by providing some excludable goods like insurance exclusively to its members. Withholding these goods from non-members is a form of punishment for non-cooperators.

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of current rules are standardized to one, the benefits of breaking them is equal to one. However, two points need noting. First is that the benefits of the rule breaking facility (RBB) decreases with the population size of lobbyists because its benefits, breaking the rule, is advantageous only in case of lobbying failure. If lobbyists succeed in changing the rule, then the current rule-breaking through bribery is worthless. The second point is the fact that the benefits of bribery are due to congestion. The rent corresponding to rule breaking, $\pi(RBB)$, diminishes as the number of firms bribing increases. In other words, competition among bribers eliminates their rent. Therefore, the benefit of breaking the current rule is a negative function of the briber population. If a smaller number complies with the rule, getting an exemption is less profitable. In the queue example, if there is an increase in the number of firms offering bribes to secure a better position the rent will vanish earlier. Bribery also entails an explicit cost which is the money paid to bureaucrats, B. The benefits of the rule-breaking-through-bribery (RBB) facility is shown by equation 10.

$$\pi(RBB) = (1 - x^L)(1 - x^B) - B \tag{10}$$

However, due to its illegal nature and societal harm bribery is subject to social and legal sanctions, shown by *f*. Nonetheless, when bribery is common, it is less likely to be detected and, even then, is not deemed a disgraceful act. Thus, it can be said that bribers may share the costs of the social and legal punishments of their venal conduct. Equation 11 identifies the corresponding social and legal benefits or costs of penalties imposed on bribers (PB).

$$\pi(PB) = -f(1 - x^B) \tag{11}$$

The total payoff for bribery is shown in equation 12 which is again a non-linear function of the state of the population and incorporates several positive and negative externalities.

$$\begin{aligned} \Pi(B) &= \pi(LN) + \pi(FRP) + \pi(RBB) + \pi(PB) \\ &= \frac{x^L}{1-\delta} + (1-x^L)(1-x^B) - f(1-x^B) - dx^L - B \end{aligned} \tag{12}$$

Equation 13 again presents the payoff for the three strategies. Lobbyists utilize the benefits of lobbying negotiations (LN), which is the direct benefit of their lobbying efforts, and contribute their share of linkage costs (LCS). They also suffer from the social costs of corruption (SCC). While lobbyists negotiate with rule makers, their projects, or their place in the queue, may be usurped by bribers. This harm is not experienced only by lobbyists but also by compliers. Compliers, in addition, incur the retribution of lobbying firms for their non-cooperative behavior (FRP) although they benefit from a change in the rule as they free-ride on other firms' lobbying efforts. Bribers, on the other hand, not only similarly free-ride on lobbying efforts and endure retribution, they also proactively breach costly existing rules by bribing bureaucrats (RBB) although such conduct is illegal and subject to social and legal punishment (PB) if detected.

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$$\begin{cases} \Pi(L) = \dfrac{x^L}{1-\delta} - C\left(1-x^L\right) - x^B \\ \Pi(B) = \dfrac{x^L}{1-\delta} + \left(1-x^L\right)\left(1-x^B\right) - f\left(1-x^B\right) - dx^L - B \\ \Pi(C) = \dfrac{x^L}{1-\delta} - dx^L - x^B \end{cases} \tag{13}$$

To understand the spread and proliferation of different strategies in a population, evolutionary dynamics are again commonly used, each player being pre-programmed to adopt a pure strategy but able to "review" it and switch to another type. A revision protocol $\rho_{ij}(\Pi, x)$ taking the payoffs and state of population as inputs, describes how frequently, agents who play strategy $i \in S$, switch to strategy $j \in S$ after receiving a revision opportunity. The game and the revision protocols together define a stochastic evolutionary process. There are various different protocols such as best response dynamics, excess payoff, projection dynamics, or replicator dynamics. In some protocols, agents are extremely rational and their decisions depend only on the payoff structure of the game. In others, agents copy and follow each other and, thus, their decisions depend only on the state of the population. The level of information-demanding, positive correlation (incentive consistency requiring that whenever a population is not at rest, the system grows according to payoffs), and Nash stationarity are some criteria that should be considered in selecting the different types of dynamics.[4]

The focus of this study, however, is not the dynamics itself but the way that the spread of strategies and number of agents taking different strategies affect the payoffs of their own and alternative strategies. These effects are the externalities existing in rent-seeking. The payoffs matrix Π is clearly a non-linear function of the state of the population and incorporates these externalities, in contrast to evolutionary games where the payoff matrix is fixed and independent of the population.

To analyze the externalities in more detail, we can start with lobbying strategy. In the case of collective lobbying, it was stated that there are two positive externalities. One is to save on costs as more firms cooperate in lobbying collectively for a change. The other externality arises from the fact that collective lobbying has a higher chance of success. These potential externalities are comprehensible when looking at the slope of the lobbying payoffs in respect to the population of lobbyists. In addition, an increase in the briber population has a negative effect on lobbyists due to the social costs of corruption. These effects are shown in equation 14.

$$\begin{bmatrix} \dfrac{\partial \pi(L)}{\partial x^L} \\ \dfrac{\partial \pi(L)}{\partial x^B} \end{bmatrix} = \begin{bmatrix} C + \dfrac{1}{1-\delta} \\ -1 \end{bmatrix} \tag{14}$$

[4] Sandhom (2010) has a thorough explanation of deterministic dynamics and their properties.

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The fixed lobbying payoff slope in respect to lobbying population consists of two parts. The first is the positive externality generated through cost sharing. Linkage costs have a negative effect on lobbying payoffs, but can be seen to become less severe as the population of lobbyists increases. The second part indicates the other source of externality. Lobbyists, in case of cooperation in a larger coalition, have a higher chance to succeed and benefit from a rule change.

Corollary 1: *The slope of the lobbying payoff in respect to the lobbying population is fixed and, thus, linear. Two positive externalities are observed in collective lobbying. The first is cost sharing through which the linkage cost becomes less burdensome as the number of lobbyists increases. The second derives from the fact that larger lobbying coalitions enjoy higher chances of success. In addition, the slope of the lobbying payoff in respect to the population of bribers and the prevalence of corruption is negative.*

There are also some sources of externalities among bribers. The first is a positive externality similar to the linkage cost sharing of lobbyists. It was stated that paying bribes is illegal and, if detected would be subject to legal and social penalties, as shown by f in the model. However, it is known that the social indignities and stigmas attached to bribery are not that serious when the act is prevalent. In other words, the social punishments for bribery become less severe the higher the number of bribers in a society. This may also be the case for legal punishments as the probability of detection is influenced by how pervasive corruption is in society. This can be seen in the first order derivative of the payoffs for bribery in respect to the population of bribers.

As shown in equation 15, there is also a negative externality among bribers due to congestion. The gains from rule breaking become less worthwhile as bribers become more numerous. In other words, their gain, $(1-x^L)(1-x^B)$, would completely vanish if the whole population starts bribing, $x^B=1$. Bribery payoffs are also affected by the pervasiveness of the lobbying cooperation in the population. As seen from the first order derivative of payoffs for bribery in respect to the population of lobbying firms, bribers benefit from a change in the rules provided by lobbying firms but they would also be punished by them for their non-cooperative behavior. The final effect could be positive or negative and depend on other parameters.

$$\begin{bmatrix} \frac{\partial \pi(B)}{\partial x^L} \\ \frac{\partial \pi(B)}{\partial x^B} \end{bmatrix} = \begin{bmatrix} \frac{1}{1-\delta} - \left(1-x^B\right) - d \\ f-(1-x^L) \end{bmatrix} \tag{15}$$

Corollary 2: *Positive and negative externalities exist among bribers themselves. The positive externality is where the social and legal punishments they incur would be less severe when the number of bribers increase in society. Negative externality arises due to congestion. Competition in bribery and a larger number of bribers*

decreases rent, and the corresponding compliance exemption becomes less worthwhile. In addition, the payoffs for bribery will be affected positively or negatively by the population of lobbying firms depending on the size of the parameters involved.

4 EMPIRICAL ANALYSIS

As mentioned in the introduction lobbying and bribery are generally considered to be substitute strategies although some studies dispute this. The main conjecture of this study is that the vague and contradictory results on this issue are due to the excessive focus by previous studies on individual-firm determinants of rent-seeking. However, a more detailed analysis of the opportunities for cooperation or other externalities may shed light on the relationship between lobbying and the bribery strategies of rent-seeking. The theoretical model presented in the previous section helps in providing explicit corollaries of the externalities that exist in lobbying and bribery activities. This section provides an empirical test of these corollaries and investigates the relationship between lobbying and bribery in different countries. The primary sources used in the estimations are the Wave 7 data from the World Values Survey (2018).[5,6] The structural equations for bribery and lobbying are as follows:

$$\begin{aligned} Bribery = {} & \alpha_0 + \alpha_1 Lobbying + \alpha_2 \log(GDP) + \alpha_3 Economic\ Instability \\ & + \alpha_4 Press\ Confidence + \alpha_5 Judiciary\ Confidence \\ & + \alpha_6 Social\ disapproval \\ & + \alpha_7 (Social\ disapproval \times Bribery\ Prevalence) \\ & + \alpha_8 (Social\ disapproval \times Judicary\ Confidence) \end{aligned} \tag{16}$$

$$\begin{aligned} Lobbying = {} & \beta_0 + \beta_1 Bribery + \beta_2 \log(GDP) + \beta_3 Economic\ Instability \\ & + \beta_4 Gov.\ Expenditures + \beta_5 Linkage\ Cost \\ & + \beta_6 Business\ Cooperation \\ & + \beta_7 (Business\ Cooperation \times Linkage\ cost) \end{aligned} \tag{17}$$

The two dependent variables are bribery and lobbying. Bribery, as mentioned in the introduction, is the average score across all answers in a country to the question "How would you place your views on corruption (i.e., when people pay a bribe, give a gift, or do a favor to other people in order to get the things or services they need done or the services they need) in your country" (in a range from 0 = no corruption to 10 = abundant corruption). As also stated, lobbying measures relate to individuals

[5] The reason for using the Word Values Survey (2018) is that there is a direct question about lobbying in its Wave 7 questionnaire. Information about lobbying activities is limited and, as far as I know, is not available in other worldwide databases. Although BEEPS's older version of countrywide standardized questionnaire core2 for 2002 to 2005 asked enterprises about their lobbying activities, its newer core4 version for 2006 to 2019 unfortunately lacks it.

[6] The Word Values Survey (WVS) is biased toward countries outside the European Union. The 46 countries surveyed by WVS (2018) used in this study for estimation are: 7 in South America (Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, and Peru), 5 in North America (Canada, Guatemala, Mexico, Nicaragua, and the United States), 7 in Europe (Cyprus, Germany, Greece, Romania, Russia, Serbia, and Ukraine), 21 in Asia (Bangladesh, Myanmar, China, Hong Kong, Indonesia, Iran, Iraq, Japan, Kazakhstan, Jordan, South Korea, Kyrgyzstan, Lebanon, Malaysia, Pakistan, Philippine, Singapore, Tajikistan, Thailand, Vietnam, and Turkey), 4 in Africa (Ethiopia, Nigeria, Tunisia, and Zimbabwe), and 2 in Oceania (Australia and New Zealand). European Union countries are covered by the European Values Survey (EVS) which, unfortunately, does not report on lobbying activities.

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in a country who have contacted government officials in response to the question "Whether you have done (score = 1) 'contacting a government official' as a form of political action and social activism, whether you might do it (score = 2), or would never under any circumstances do it (score = 3)". Although this is a direct question, since lobbying is legal there isn't much to worry about the possibility of false reports. In addition, this variable offers a better measure of lobbying than the proxies used in some studies such as participation in business associations. Data on both variables are reported by World Values Survey. The equations for bribery and lobbying affect each other either as substitutes or complements and should probably be determined simultaneously, as will be discussed later.

The two equations also include some control variables. The first variable common to both equations and shown as GDP is the real GDP per capita (in PPP-adjusted 2017 US dollars) of countries as reported in the World Bank's World Development Indicators. This variable is important because, according to the literature, lobbying is more common in rich, developed countries while bribery is more widespread in developing states. In other words, it is expected that, ceteris paribus, GDP has a negative impact on the prevalence of bribery and a positive effect on lobbying.

Economic instability is another explanatory variable used in the bribery and lobbying equations. According to the literature, stability in policy-making increases lobbying while in unstable and uncertain situations firms prefer to bribe and bypass the rules instead (Bennedsen, Feldmann and Lassen, 2009; Campos and Giovannoni, 2008). The reason is that when governments have a short expected life or when regulations are unpredictable, investing in costly negotiations and lobbying is not justifiable and, as a result, temporary and short-term rent-seeking strategies like bribery are preferred. Therefore, it can be expected that economic instability has a positive effect on bribery while negatively impacting lobbying. The data source is again the World Values Survey. It is the percentage of people who believe "a stable economy" is the most important issue for their country.[7] Higher scores indicate economic instability and widespread concerns over it.

In the bribery equation, the other independent variables are the confidence people have in the courts and the media. Public confidence in the courts and judicial systems reflects the severity of legal punishment and, thus, is expected to affect bribery negatively. Public confidence in the press represents the reliability and trustworthiness of journalism and reporting. The vast amount of literature supporting the influential effect of the press in the fight against corruption (Hamada, Abdel-Salam and Elkilany, 2019; Jha and Sarangi, 2017; Themudo, 2013) shows that these variables have a negative effect on the prevalence of bribery in rent-seeking. Data on these variables are collected from World Values Survey database. They represent the average scores to the question on the amount of confidence individuals have in the courts and the press, respectively. The answers range from 1 (great

[7] The actual question is, "In your opinion, which one of these is most important? A stable economy, progress toward a less impersonal and more humane society, progress toward a society in which ideas count more than money, or the fight against crime?"

deal of confidence) to 4 (no confidence at all). The variables are then adjusted such that higher scores indicate higher public confidence.

Social disapproval of bribery is the next explanatory variable in the bribery equation. It is the average score across all answers on whether individuals think bribery can always be justified, never be justified, or something in between on a range of one to ten. This variable is obtained from World Values Survey (2018). The variable is adjusted in such a way that higher scores indicate more severe disapproval of bribery. Social disapproval of bribery is interpreted as higher social punishment and, therefore, should have a negative effect on bribery.

This variable is also incorporated into the model on the interaction with the prevalence of bribery. The interacted variable between social disapproval and bribery prevalence is incorporated to test Corollary 2 that the prevalence of bribery makes social disapproval less effective in curbing corruption. In fact, the positive coefficient of this interaction variable demonstrates that social punishments and the negative effect of social disapproval becomes less severe when the number of bribers increases in society. A similar interaction effect is incorporated into the model to measure how the impact of confidence in judicial systems and legal punishment are affected by the number of bribers.

In the lobbying equation, the variables on GDP per capita and economic instability are common with the bribery equation. As stated, lobbying is expected to be more prevalent in countries with high levels of GDP per capita and stable economies. Lobbying can be considered as a firm's attempt to protect itself against any potential loss. In unstable and uncertain situations, firms prefer to bribe and bypass rules instead of investing in lobbying to change them. Government expenditure is another explanatory variable and is represented by the ratio of government expenditures to the corresponding country's GDP for 2018. Data are from the World Bank's World Development Indicators. This variable reflects the general assertion by economists that rent-seeking is the direct result of government intervention in markets whereby a bigger government creates more opportunities for rent-seeking and lobbying. Therefore, a positive relationship between government size and lobbying is to be expected.

Two other variables that can influence lobbying prevalence and its externalities are lobbying linkage costs and business cooperation among lobbying firms. As discussed in the previous section, the strategy in which lobbying firms link with government can be costly though they can economize on this through sharing. To measure linkage costs, an index of democratic governance of countries is considered. Democracy is an inclusive political system in which all groups can participate and all voices are heard. Therefore, public perceptions of democracy represent the openness of government to the voice of their citizens and businesses. Data are collected from World Values Survey. The responses of individuals to how democratically their country is governed is scaled on a range of 1 (not at all democratic) to 10 (completely democratic). The data are then adjusted so that higher scores indicate weak democracies and a higher cost of linkages with government. This variable, as discussed, is expected to have a negative effect on lobbying.

Nevertheless, as noted, lobbying firms can share linkage costs and their cooperation leads to stronger coalitions and a higher prevalence of lobbying. The percentage of firms that are a member of some professional organization is considered a measure of cooperation. Data are again from the World Values Survey. The business cooperation variable is incorporated in the estimation itself and in interaction with the linkage cost. The interaction between cooperation and linkage costs is important because it could be expected that when establishing links is particularly difficult, cooperation will seem to be more necessary and effective. In fact, this shows the positive externalities in lobbying through linkages cost sharing as mentioned in Corollary 1. Apart from this interaction effect, cooperation still is expected to have a positive effect on lobbying as it also makes lobbying firms stronger in their negotiations with government.

The preliminary data on the variables are presented in table 1. A point to be noted here is that the variables, despite having a limited range, are not multi-level or discrete choices as they are average scores across all answers to the corresponding questions in a country.

Table 1
Preliminary statistics of variables

	Min	Mean	Max	Range
Lobbying	18.39	58.76	89.76	0-100
Bribery	35.24	76.84	95.07	1-100
GDP per capita (PPP-adjusted 2017 US dollars)	2,103.5	22,551.6	97,801	
Confidence in the judiciary	1.533	2.548	3.246	1-4
Confidence in the press	0.81	1.317	1.893	1-4
Economic instability	30.03	53.27	75.24	0-100
Social disapproval of bribery	6.78	9.01	9.82	1-10
Government expenditures	5.6	14.68	20.77	0-100
Linkage costs	2.02	3.88	6.3	1-10
Business cooperation	3.7	22.29	54	0-100

Source: Author's calculations.

To test the negative externality that exists due to congestion and competition in bribery as presented in Corollary 2, bribery will be entered in regression in different functional forms. In econometrics, although the equations must be linear in their parameters, it is possible to incorporate non-linear functional forms. Logarithmic forms are one means of estimating non-linear exponential equations. To model a curve with a decreasing slope, a semi-log model of a relevant predictor is suitable and would be tested empirically.

However, we need to check for endogeneity before going to estimation. A Durbin-Wu-Hausman test is used to test whether bribery and lobbying must be estimated simultaneously or not. The test is conducted by regressing the reduced form

equations, i.e., regressions where the endogenous variables are written solely in terms of exogenous variables. The residuals of the reduced form equations are then, as the second step, included in the original structural model. The null hypothesis $\mu=0$, where μ is the coefficient of residuals, would be tested. If the residuals are significantly different from zero it can be concluded that the two variables are endogenous and must be determined simultaneously. The residuals of both structural equations were highly insignificant at P-values of 0.958 and 0.982 for the bribery and lobbying structural equation, respectively. These results show that bribery and lobbying are independent of each other and thus do not require an instrumental variable or simultaneous estimation. Therefore, the ordinary least square (OLS) method is used for estimation. Table 2 summarizes the results.

The bribery equation is estimated in two models. Model 1 is a level-level linear model while Model 2 estimates a logarithmic equation. Comparing the second model with the first shows that the logarithmic relationship fits better for the bribery equation as the significance of several variables is clearly improved. The economic instability variable is also dropped from the estimation in Model 2. Economic instability is expected to positively affect bribery while having a negative effect on lobbying. This is because economic instability and regulatory uncertainty discourages firms from lobbying. Its effects on bribery and lobbying are not significant although they have the expected signs. This variable is dropped from the second bribery model because of its lack of significance and consequent improvement in the adjusted R-square. Two models are also estimated for the lobbying equation. Again, economic instability is dropped from the second model because of its insignificance, which has also improved its adjusted R-squares. Another difference is that the interaction effects of business cooperation and linkage costs are incorporated into the second model's lobbying equation. This interaction term is not only significant but its incorporation in the model also increases the significance of other variables and the regression where the adjusted R-square and the results of the F-test are improved. The Model results 2 are discussed in what follows.

The discussion begins by addressing the main interest of this study which is the relationship between lobbying and bribery and the externalities of these two main rent-seeking strategies. As the results show, bribery has no impact on lobbying while the latter has a positive effect on bribery. This effect is expected because bribery is an individualistic rent-seeking strategy while lobbying is a collective action whose benefits in seeking a change to the rules are not excludable. In other words, the positive effect of lobbying on bribery are based on the fact that bribers benefit from the positive externalities provided by lobbying firms. In game theory, the decisions of players are either strategic complements or substitutes depending on whether they mutually reinforce or offset one another. As such, it can be said that bribery and lobbying work as two complementary strategies. Since the estimated relationship is logarithmic, the coefficient has a percentage interpretation. A ten percent increase in lobbying raises the prevalence of bribery by 0.6 percent. This result matches earlier studies emphasizing the positive relationship between lobbying and bribery.

Table 2
Estimations of corruption and lobbying

	Model 1		Model 2	
	Bribery	**Lobby**	**LN (Bribery)**	**Lobby**
Lobbying	0.0001 (0.005)		0.0006 (0.0002)***	
Bribery		0.18 (0.25)		0.14 (0.24)
LN (GDP per capita)	0.021 (0.14)	8.32 (3.23)**	-0.0097 (0.0044)**	8.2 (3.01)***
Economic Instability	0.01 (0.009)	-0.084 (0.24)		
Confidence in the Judicial System	-4.3 (1.7)**		-0.26 (0.054)***	
Confidence in the Press	0.13 (0.38)		-0.021 (0.012)*	
Social Disapproval of bribery	-6.8 (0.51)***		-0.053 (0.016)***	
Interaction (Social Disapproval × Bribery)	0.094 (0.006)***		0.00056 (0.0002)***	
Interaction (Confidence in the Judiciary × Bribery)	0.043 (0.02)**		0.0035 (0.0006)***	
Gov. Expenditures		1.81 (0.62)***		2.31 (0.63)***
Linkage Costs		-2.41 (2.83)		-9.76 (4.57)**
Business Cooperation		0.28 (17.1)		-0.923 (0.63)

	Model 1		Model 2	
	Bribery	**Lobby**	**LN (Bribery)**	**Lobby**
Interaction (Business Cooperation ∗ Linkage Cost)				0.34 (0.17)**
Constant	75.46 (2.24)***	-54.15 (39.6)	4.49 (0.067)***	-35.04 (38.9)
R-Square Adjusted	0.998	0.299	0.99	0.361
F-test statistic	2616.9	4.2	647.34	5.24
F-test P-value	0.000	0.002	0.000	0.000

*Standard deviations are reported in parentheses. Statistical significance of coefficients are shown by asterisk; *** (significant at 1%), ** (significant at 5%) and * (significant at 10%).*

Source: Author's estimations.

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Factors generating this relationship are the externalities existing in cooperative lobbying and competitive bribery. To illustrate and discuss the effect of these externalities, however, it is first necessary to discuss the important control variables. According to the literature, the GDP of countries is the key factor for the substitute relationship between lobbying and bribery. As expected, the income level of countries have a positive effect on lobbying whereas it decreases the prevalence of bribery. The variable used here is the natural logarithm of GDP per capita in PPP-adjusted 2017 US dollars. The results show that a ten percent increase in GDP per capita, decreases the prevalence of bribery by almost 0.1 percent. The impact of GDP on lobbying is also significant where a similar increase in GDP per capita increases the lobbying prevalence score (the percentage of firms in a country which have contacted a government official) by 0.82 percent.[8] This result, in accordance with the literature theorizing the substitute strategy between lobbying and bribery, confirms that lobbying is more commonly used in rich and developed countries while bribery is more widespread in poor and developing countries. Nevertheless, GDP cannot fully explain the worldwide differences in the prevalence of lobbying. This effect, for example, predicts that the prevalence of lobbying in China, which has a per-capita GDP that is 344% larger than that of Bangladesh, should be 28.2 percent higher. But in fact lobbying prevalence scores in China and Bangladesh are 87.35 and 18.39 respectively. In other words, GDP per capita explains only 40 percent of the differences in lobbying prevalence between China and Bangladesh.

In the bribery equation, there are three other control variables. Confidence in the judicial system, social disapproval of bribery, and confidence in the press are expected to have negative effects on bribery and corruption. Confidence in the judicial system is used as a proxy for severity of legal penalties and the probability of the detection of illegal acts like bribery. Its effect is highly significant. A single point increase in such confidence (on a range of 1 to 4) decreases the bribery prevalence score by 26 percent. A one-point increase in confidence in the judiciary corresponds to an increase in the rank of, for example, Peru which rates lowest with a score of 1.533, to the 45th percentile in its worldwide distribution. The effect of confidence in the press, although significant, is weaker. A single point increase (on a range of 1 to 4) decreases bribery by 2.1 percent. The one-point increase corresponds to a rise in the rank of, for example, Greece with the lowest confidence at 0.813 to the 90th percentile in its worldwide distribution. The negative effect of social disapproval on bribery is also confirmed in both models and is extremely robust. A single point increase in the social disapproval of bribery (on a range of 1 to 10), decreases the prevalence of bribery by 5.3 percent. This effect confirms that social punishments render bribery unprofitable.

There are numerous grounds, however, to believe that the impact of legal and social punishments is contingent upon the prevalence of bribery. As stated in Corollary 2

[8] In linear-log equations, a 1 percent change in X has an effect of size $\beta/100$ on Y. Therefore, a ten percent change in per capita GDP increases the lobbying score by 0.82 points.

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in the previous section, as the number of bribers increase, the social and legal punishments become less severe. The interaction between social disapproval and the prevalence of bribery is positive and significant. The positive coefficient shows that corrupt backgrounds or the prevalence of bribery reduce the negative effects of social punishment. This is similar to the interaction term between confidence in the judiciary as a proxy for legal punishments or the government's seriousness in its fight against corruption and the prevalence of bribery in the corresponding country. These results confirm the existence of a positive externality in cost sharing among bribers. The final effects of the social disapproval of bribery and confidence in the judiciary depends on these externalities or interaction variables.

$$\frac{\Delta\ Corruption}{\Delta\ Social\ Disapproval} = -0.053 + 0.00056 \times \text{Background in bribery} \qquad (18)$$

$$\frac{\Delta\ Corruption}{\Delta\ Judiciary\ Confidence} = -0.26 + 0.0035 \times \text{Background in bribery} \qquad (19)$$

The impact of the prevalence of bribery on social disapproval is significant. Since the interaction effect has an opposite sign, it can be concluded that the prevalence of bribery lessens the negative effects of social disapproval. This means that the effect of social disapproval on bribery in countries with corrupt cultures and prevalent bribery is weaker; for example, the final effect of social disapproval in Peru with a bribery score of 95.07 (on a range of 1 to 100) is zero. The same applies to legal punishment. The effect of bribery's prevalence on the impact of confidence in the judiciary is also significant. Since the interaction term has an opposite sign, it can be concluded that the prevalence of bribery reduces the negative effect of confidence in the judiciary. This means that the effect of confidence in the judiciary and the legal penalties for bribery in countries with corrupt cultures and prevalent bribery is weaker; for example, the prevalence of bribery in Peru completely neutralizes the negative effect of legal punishments on corruption. These results confirm Corollary 2.

In the lobbying equation, government expenditure is another control variable used besides GDP to explain the prevalence of lobbying. This variable reflects the general assertion by economists that rent-seeking is a direct result of government intervention in markets. Bigger governments create more opportunities for rent-seeking and lobbying. According to the results, if the ratio of government expenditures relative to GDP increases by ten percentage points, lobbying becomes more prevalent by 23.1 percentage points. To see how large this impact is, consider that the ten percentage point increase corresponds to a rise in the rank of, for example, Nigeria with the lowest score (government expenditure at 5.6 percent of its GDP) to the 55th percentile in its worldwide distribution. As another example, the ten percentage points are almost equal to the difference between China (government expenditure at 16.53 percent of GDP) and Bangladesh (6.36 percent) and, hence, government expenditure explains 33 percent of the difference between the two countries in the prevalence of lobbying.

Investigations on the externalities existing in collective lobbying should focus on the effects of linkage costs and business cooperation. The variable "linkage cost" is significant and, as expected, decreases lobbying prevalence. High scores of this variable show that linking and negotiations with government are difficult and rule-makers do not listen to business. According to the results, a single score increase in linkage costs (on a range of 1 to 10) decreases lobbying prevalence by 9.76 percentage points. Its deterrence, however, depends on cooperation between lobbying firms. As stated, since lobbying for a change in the rule is a non-excludable non-rival public good, there are various possibilities for cooperation among firms such as sharing the costs of lobbying.

Although cooperation is incorporated into the model, the estimated coefficient is not significant, meaning that it does not have a direct effect on lobbying. To see whether the effect of cooperation is indirect and contingent upon linkage costs, the interaction variable is added to the estimation. This variable is significant and its opposite sign to the negative coefficient of linkage costs shows that, as stated in Corollary 1, business cooperation makes linkage costs less of an impediment. The final effects of linkage costs on lobbying are shown in equation 20. In countries with high levels of business cooperation, lobbying linkage costs are not prohibitive; for example, for the United States which has the highest score of 54 percent membership in professional organizations, the final effects of linkage costs would be completely neutralized. This shows that by reducing the negative effects of linkage costs, business cooperation indirectly increases lobbying. This is another externality that exists in collective lobbying.

$$\frac{\Delta\ Lobbying}{\Delta\ Linkage\ cost} = -9.76 + 0.34 \times \text{Business Cooperation} \qquad (20)$$

5 CONCLUSION

Economic agents have the incentive to influence government. Two rent-seeking strategies available to them are lobbying or linking to rule-makers in order for them to set favorable rules, and bribing to circumvent rules by paying off rule-enforcers. Unfortunately, few studies have considered the two strategies together in analyzing the choices of firms between the two strategies. They, moreover, focus mainly on the individual characteristics of firms such as their size, capital endowment, or ownership to explain their behavior. This unidimensional focus has not been able to comprehensively explain the relationship between lobbying and bribery. This study thus attempts to fill that gap by focusing on the externalities present in rent-seeking.

This study first tries to shed light on these externalities and their effects in a theoretical model through the application of congestion games. Various kinds of externalities were explored and stated in theoretical corollaries. The first positive externality existing in collective lobbying is that firms share and save on lobbying costs. The linkage costs become less burdensome as the number of lobbyists

increases. Other sources of externality may still exist in lobbying such as lobbyists benefitting from the higher possibility of success in negotiations with governments by cooperating as group. The same is true for bribery. Firms may offer bribes and take the position of others, as in a queue, for example, but the exemptions they enjoy through this become less worthwhile as more firms do the same. In other words, the rent obtained from competitive bribery is due to congestion. The other externality is that the stigma attached to bribery would be less severe if it is more prevalent.

The final section of this paper addresses the empirical testing of the presented theoretical results and proposed externalities. The results show that as countries develop, lobbying strategies will be used more intensely than bribery. GDP levels have a positive effect on lobbying but decrease corruption. A ten percent increase in GDP per capita decreases the prevalence of bribery by almost 0.1 percent but increases that of lobbying (the percentage of firms which have contacted government officials) by 0.82 percentage points. This effect is in accordance with the literature theorizing GDP as the source of substitutability between lobbying and bribery. This study, however, adds rent-seeking externalities into the model and shows that lobbying and bribery somehow reinforce each other. According to the results, an increase of ten percentage points in lobbying makes bribery more prevalent by 0.6 percent. This complementary effect has been extrapolated in some studies especially for developing countries.

In the case of bribery, the results show that public confidence in the judicial system and press as indices that reflect their commitment to the fight against corruption have significantly influential effects. A single point increase in confidence in the press decreases bribery by 2.1 percent. On the other hand, a similar increase in confidence in the courts decreases bribery prevalence by 26 percent which, though much stronger in magnitude, becomes less severe as the number of bribers increases owing to the positive externality of cost sharing among bribers. In fact, there are many reasons to believe that the impact of legal and social penalties is contingent upon the prevalence of bribery. To test this, an interaction term between it and confidence in the judicial system is added to the estimation. According to the results, this interaction term is significant and has an opposite sign, which shows that the prevalence of bribery reduces the negative effects of confidence in the judiciary. The prevalence of bribery, as in the case of Peru, completely neutralizes the negative effects of legal penalties on corruption.

This applies also to social punishments for bribery. The negative effect of social disapproval on bribery is also confirmed empirically. A one-point increase in social disapproval of bribery decreases its prevalence by 5.3 percentage points. The significance and opposite sign of the interaction term between social disapproval and the corresponding country's prevalence of bribery, however, shows that a corruptive environment or the pervasiveness of bribery reduces the negative

effects of social punishments. For example, the final impact of social disapproval in Peru which has a bribery-prevalence score of 95.07 is zero.

Similar externalities exist in the case of collective lobbying. Firstly, the results show that government expenditure has a positive effect on the prevalence of lobbying. This variable underscores the general point by economists that rent-seeking is a direct result of government intervention in markets. The larger the government, the greater the opportunities for rent-seeking and lobbying. As shown by the results, a ten percent increase in the ratio of government expenditures to GDP makes lobbying more prevalent by 23.1 percentage points. Lobbying, however, has some costs. The impeding effects of linkage costs were also confirmed. According to the results, a one-point increase in linkage costs decreases the prevalence of lobbying by 9.76 percentage points. Its deterrence, however, depends on the level of cooperation among lobbying firms. The effect of cooperation on lobbying is indirect through its alleviation of the difficulties involved in linking with the government. Whenever and wherever linking to governments is a challenge, cooperation among firms such as through membership in professional organizations, can help make it less of an impediment.

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