International Bribery Laws and Firm Strategic Behavior: Did the OECD Anti-Bribery Convention Increase Bribery?

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Abstract

The landmark OECD Anti-Bribery Bribery Convention (OECD-ABC) is a recent effort to reduce bribing and corrupt practices within global foreign direct investment. Our previous research shows that firms that ratified the OECD-ABC but failed to enforce anti-bribery laws in domestic courts bribe at the same rate as before the convention. Firms from ratifying countries with robust enforcement bribe significantly less than before, while firms from non-ratifying counties significantly increase their bribing activity. The empirical findings point to the effectiveness of the convention for state parties, but finds unanticipated effects on the bribery behavior of firms from non-participating states. We develop a game-theoretic model that helps explain these stark patterns. The model depicts an arbitrary number of firms choosing whether to enter market via bribing a public official. Our results show that, in equilibrium, firm behavior is consistent with our previous results. Specifically, firms from non-OECD-ABC countries will tend to increase their bribery effort because less competition from OECD-ABC countries translates into a higher probability of accessing rents. Moreover, the unintended increase of bribery rates amongst firms from non-OECD-ABC is exacerbated as the quality of monitoring and the severity of enforcement under the convention increases.

Introduction

In 1999, representatives from a group of advanced industrialized economics negotiated the world's most ambitious global agreement to combat business corruption. The OECD-Anti-bribery convention, eventually signed and ratified by all OECD nations plus an additional six non-OECD countries, requires signatory states to pass domestic anti-bribery legislation that criminalizes bribery by their own firms in other countries. In so doing, signatories implemented the concept of extraterritoriality, which tasks countries with policing the behavior of their own national firms abroad. Business executives from Australia, for example, are legally forbidden from paying bribes to government officials in any country in the world. With 41 signatories as of 2016, the agreement is seen as a stunning legal achievement, institutionalizing the belief that both limited capacity to enforce anti-bribery laws (Kaczmarek and Newman 2011) and the incentives of government officials that may be the recipient of bribes can be overcome with home-country policing of foreign investment (Stephan 2012; Tyler 2011; Spahn 2012; Spahn 2013; Hatchard 2013). While some countries such as the United States had long used extraterritoriality in anti-bribery legislation, namely through the landmark US Foreign Corrupt Practices Act (FCPA), combating bribery has been seen as a collective action problem requiring coordination across countries (Duvanova 2007; Magnusson 2013). By making this agreement binding for all firms from OECD countries as well as additional signatories, the convention produced a level playing field for firms from signatory countries.

How effective is the OECD-ABC in combating corruption? In previous research, Jensen and Malesky (2016) examine the case of business bribery in Vietnam, a country host to foreign investment from a diverse set of home countries, including both OECD-ABC signatories and non-signatories. On the surface, the findings from this study point to the effectiveness of the convention in limiting bribery. Simply signing the OECD-ABC has no impact on host firms, but once countries became subject to peer-review of anti-bribery enforcement efforts that began with Phase 3 of the convention in 2009, firms from OECD-ABC signatory coun-

tries dramatically reduced their bribery in Vietnam. An anti-bribery convention armed with the teeth of peer-review had a substantial impact on reducing bribery in Vietnam, pointing to a seeming success of international law.

This previous work, outlined in more detail in the next section, utilized a technique to that shields respondents from incriminating themselves or their firm over bribery (see also Malesky et al 2015). Unlike perception-based surveys that can be subject to bias (Treisman 2007; Olken 2009), corruption is measured based on firm experiences during business registration and the process of obtaining a government procurement contract. Using an Unmatched Count Technique (UCT), often called a "list experiment," Jensen and Maleksy (2016) find the OECD-ABC, after the peer-review phase of the convention (Phase 3), dramatically reduced bribery for signatory country firms. Prior to the OECD-ABC signatories bribed at equally high rates. Over 20% of foreign firms paid bribes during registration and over 40% of firms paid bribes during government procurment bidding.

These results suggest a major impact of this convention on bribery behavior by signatories, but these findings uncover a new puzzle unnoticed by previous research. The OECD-ABC led to a reduction in bribery relative to non-convention signatories. For example, South Korean firms (OECD-ABC signatories) bribe at far lower rates than Taiwanese firms (OECD-ABC non-signatories) after the convention. But this relationship is partially driven by the *increased* bribery behavior of non-signatory firms. South Korean firms reduced their bribery after the peer review process in the OECD-ABC, while Taiwanese firms increased their bribery after this phase of the OECD-ABC. It appears that the OECD-ABC achieved its intention of decreasing bribery amongst subject firms, while perversely increasing bribery by non-subject firms—potentially offsetting completely its positive effects.

In this paper we develop a game theoretic model of bribery behavior that helps account for this observed pattern. In the model, n firms simultaneously decide whether to bribe in order to gain access to a potentially lucrative market. Although the market is competitive amongst firms that enter, entry is restricted, which generates rents for market entrants.

These rents dissipate as more firms enter. Thus, the benefits to entry are a function of the number of other firms expected to enter. However, firms possess private information about their own propensity to pay entry bribes, owing perhaps to different budget constraints, corporate culture, or other unobservables that drive bribing behavior. This means that individual firms' entry decisions are conditional on their beliefs about the distribution of other firms' types, as well as their own costs for entry.

We further show that if a subset of firms is subject to an anti-bribery convention that brings with it some probability of being caught and sanctioned (e.g., in the form of a fine), the entry decisions of the two groups diverge. Subject firms will be deterred as the probability of being caught or the severity of the sanction increases. This deterrence effect is consistent with the findings of Jensen and Malesky (2016), who conclude that firms from OECD-ABC countries reduced their bribery after the convention came into force. However, because market rents are a function of the expected number of firms entering, in equilibrium non-subject firms will enter at a higher rate. Indeed, this rate of entry is increasing as the number of subject firm goes up, and as the strength of monitoring and enforcement of the regime increases. This points to an unintended consequence of treaties like the OECD-ABD. Although conventions with teeth—in this case, extraterritorial enforcement—can successfully deter bribery, this comes with a tradeoff in competitive markets, where the deterrent effect on subject firms can translate into a permissive effect for non-subject firms. The overall welfare effects, in terms of the aggregate change in bribery, may be positive, negative, or neutral. Our theoretical analysis therefore fills a theoretical lacunae by providing an analysis of these countervailing effects.

Returning to the motivating puzzle, we argue that the reduction in bribery by firms from OECD-ABC signatories leads to an increase in bribery by non-signatories by changing the incentives of both OECD-ABC subject and non-subject firms entering certain sectors in Vietnam. The OECD-ABC discourages entry for subject firms, which decreases competition and increases the available rents for non-subject firms. In an ironic turn of events, the

convention increases the potential benefits of bribery by driving up rents in Vietnam. OECD firms are driven out of markets due to the OECD-ABC, and are replaced by non-signatory firms that are even more willing to bribe given the enormous potential benefits of bribery.

In the next section, we provide additional background on the convention and introduce the empirical pattern uncovered in previous work. Section 3 develops a formal model of bribery behavior by signatory and non-signatory countries. We use the model to motivate additional, untested empirical implications. We provide some preliminary empirical discussion regarding these patterns, but note that ongoing work will conduct more systematic analyses. In Section 4 we conclude with the implications for our work and future extensions.

Did the OECD-Anti-Bribery Convention Reduce Bribery?

We begin our discussion of the striking empirical pattern of bribery behavior by first reviewing the basic details of the OECD-Anti-Bribery Convention. In 1988 the United States amended the 1977 U.S. Foreign Corrupt Practices Act (US-FCPA). This amendment of one of the already strongest anti-corruption acts formally required Congress to negotiate with other governments to coordinate anti-bribery efforts (George et al. 2000, 495) as a means of leveling the playing field between US firms that were limited in their potential bribery behavior and firms from other countries that have few or no laws preventing their firms from bribing abroad (Pacini et al. 2002; Schmidt 2009; Tyler 2011). Thus the US, seemingly taking unilateral action on policing bribery, was actually the driving force behind a broad OECD initiative combating business bribery.

For some firms that potential for reducing global bribery would dramatically reduce the costs of doing business abroad. Bribery can see seen as a tax on business that is both illegal and uncertain (Mauro 1995; Wei 2000; Habib and Zurawicki 2002; and Cuervo-Cazurrá 2008). The costs of bribery are magnified by both the high costs of hiding the illegal activity (Schleifer and Vishney 1993) and by the unpredictability of bribery due to political changes

(Samphantharak and Malesky. 2008). For other firms, the net impact of this agreement is more mixed. Firms often bribe to win government contracts or obtain land and licenses, trading bribery payments for access to rents (Bliss and Di Tella 1997; Ades and Di Tella 1999; Hellman et al. 2000), and the impact of this convention on their business is partially a function of how effective these bribes are in winning contacts and the effectiveness of bribery by their competitors.

Previous work has analyzed the impact of the OECD-ABC in the context of a single country that has been successful in attracting foreign direct investment from a number of source countries (Jensen and Maleksy 2016). Using original firm-level surveys of bribery behavior in Vietnam, Jensen and Malesky (2016) analyze how bribery payments changed after the implementation of Phase 3 of the OECD-ABC, where peer reviewing led to scathing reports of some countries enforcement efforts in 2010 (Stevenson 2014; Tyler 2011).

Jensen and Malesky's (2016) research design, outlined in more detail below, accounts for a number of research design issues in the measurement of corruption. First, it accounts for the potential bias of asking direct questions about bribery behavior which is both illegal (for some countries) and unethical, leading to a bias towards underreporting corruption by the use of the unmatched count technique, or "list experiment" (Couts and Jann 2011). Second, OECD-ABC signatories consist of the most advanced industrialized democracies in the world, making it difficult for previous studies to differentiate selection into the convention from the impact of the convention on bribery behavior (Cuervo-Cazurrá 2008; D'Souza 2012; Spencer and Gomez 2011; Jeong and Wiener 2012). Jensen and Malesky minimize this issue by asking managers about their experience with bribery when they registered their business. For some firms, this registration was post-2010 (after Phase 3), but for many this was prior to the enforcement phase of the conventions. Thus, their research design was able to directly examine the change in bribery behavior from OECD-ABC signatory firms relative to non-OECD-ABC signatory firms using a difference-in-difference sestimator.

Bribery is measured by including two questions on bribery behavior on the Vietnam

Provincial Competitiveness Index (PCI) survey which surveys firm managers in four waves from 2010-2013.[1] This survey of 4,821 foreign firms in Vietnam provides a nationally representative of foreign investment in Vietnam. The top investors in Vietnam include a mix of OECD-ABC signatories (Vietnam's second largest investors of Japan and South Korea are both signatories) as well as non-signatories (top investor Taiwan as well as the fourth and fifth largest investors of China and Singapore). In total, investors from countries that are signatories of the OECD-ABC make up 42% of the foreign firms in our sample.

The PCI survey, fielded every year between 2010 and 2011, was mailed out to firms in both English and Vietnamese. Managers are asked questions about corruption, but given that the OECD-ABC convention made bribery a criminal act, directly asking managers about bribery could lead to legal and political repercussions (Knack 2006; Seligson 2006; Kraay and Murrel 2013). Rather than directly asking respondents about their bribery activities, the authors harness the Unmatched Count Technique (UCT) or "list question" to shield managers from directly admitting bribery (Ahart and Sackett 2004; Coutts and Jann 2011). Jensen and Malesky (2016) show that this question leads to dramatically lower levels of non-response bias in the PCI survey.

The UCT questions and research design are as follows. Half of the mangers are provided a "control group" question which lists a number of activities that the firm could have engaged in during the process of registration. None of these items are controversial and are only used as a benchmark comparison. Firm managers are asked to review this list of non-sensitive activities and list a number of activities that the firm engaged in during registration. The managers provide a number between 0 and 4, but, importantly, do not indicate which specific activities correspond with the number.

The other half of the sample receives an expanded list that includes the same questions as the control group along with a question about bribery during registration. This "treatment group" is also instructed to only indicate a number of activities that the firm engaged

[1] See http://www.pcivietnam.org/ for methodological details.

Figure 1: List Question

UCT Question 1: Please take a look at the following list of common activities that firms engage in to expedite the steps needed to receive their investment license/registration certificate. How many of the activities did you engage in when fulfilling any of the business registration activities listed previously?

1. Followed procedures for business license on website.
2. Hired a local consulting/law firm to obtain the license for your firm.
3. *Paid informal charge to expedite procedures.*
   (Only Available on Form B of the Survey; emphasis only added here)
4. Looked for a domestic partner who was already registered.

in during registration, from 0-4, and not the specific activities. Thus for the control group and treatment group each manager only provides us with a number of activities and thus any differences between the control group and treatment group average responses is due to the inclusion of the bribery question. Put another way, the authors can examine the propensity to bribe by looking at the difference between the number of responses in the control (3 items) and treatment group (3 items plus a corruption item).

Figure 1 presents Jensen and Malesky's list question for business registration. They also field a second bribery question on government procurement contracts, which is presented Figure 2. As noted in Jensen and Malesky (2016), there is excellent balance across treatment and control groups, and with the average score between 1 and 2 total activities, readers can be re-assured that respondents aren't concerned about revealing their activities by indicating a zero (no on all of the activities) or the maximum (admitting to engaging in all of the activities).

In Table 1, we present the average number of activities for four groups on the bribery during registration question. In Panel 1 we provide the average for the whole sample. This is interpreted by comparing the difference between control group firms and treatment firms across all years. The study indicates that 20.3% of firms engaged in bribery during registration across all years. This average number of firms bribing hides considerable variance across home country firms and over time. In Panel 2 we examine the difference between

Figure 2: Procurement Question

UCT Question 2: If your firm competed for business with a government agency last year, please look at the following list of common activities firms engage in to make their goods or services more attractive to government clients. Please do not answer about any one of these activities specifically; we are only interested in the TOTAL NUMBER you may have utilized to win government business. How many of the below activities did you engage in when fulfilling business registration or licensing activities?

1. Dropped off pamphlets or fliers at government offices advertising your goods or services.
2. Opened your business or a branch of your business near government offices in order to be nearer to the decision-makers.
3. *Paid a "commission" to a government official to ensure that your business won the contract, he would receive a small percentage. (Only on Form A; emphasis only added here)*
4. Attended government functions or meetings in order to meet officials and make them aware of your goods or services

OECD signatories and non-signatories. The last column, Bribe, shows that the difference between the control and treatment group indicates both signatories and non-signatories had similar propensities across all years. Non-signatories bribed at slightly lower rates, 20.6% vs 23.1%, which are statistically indistinguishable.

We find the dramatic reversal that motivates the model in the next section when we compare bribery prior to the enforcement phase of the convention (Panel 3) to the post-enforcement phase (Pane 4). OECD signatories had a dramatic decrease in bribery behavior as we expected. Bribery decreased from a remarkable 23.1% of firms to 11.5% of firms, providing clear evidence for the effectiveness of the convention for signatory firms. Unfortunately, this positive findings is coupled with a disturbing pattern among the non-OECD firms. Non-signatories more than doubled their propensity to bribe, from an already high 18.6% to a shocking 40.7% of firms.

We use this descriptive analysis of the data, reported in more detail in Jensen and Malesky (2006), as the starting point for our theoretical model. In the next section we build

Figure 3: Calculation of Bribing Firms Using Unmatched Count Technique

1. All Firms, All Years

Treatment	Mean	SE	Low	High	Bribe
No	1.421	0.02	1.38	1.46	*20.3%*
Yes	1.624	0.02	1.58	1.67	

2. All Years by OECD Anti-Bribery Convention Signatory Status

OECD	Treatment	Mean	SE	Low	High	Bribe
No	No	1.369	0.03	1.31	1.43	*20.6%*
No	Yes	1.575	0.03	1.51	1.64	
Yes	No	1.454	0.03	1.40	1.51	*23.1%*
Yes	Yes	1.686	0.03	1.63	1.75	

3. Before Phase 3 by OECD Anti-Bribery Convention Signatory Status

OECD	Treatment	Mean	SE	Low	High	Bribe
No	No	1.370	0.03	1.31	1.43	*18.6%*
No	Yes	1.556	0.03	1.49	1.62	
Yes	No	1.437	0.03	1.38	1.50	*23.7%*
Yes	Yes	1.674	0.03	1.61	1.74	

4. After Phase 3 OECD Anti-Bribery Convention Signatory Status

OECD	Treatment	Mean	SE	Low	High	Bribe
No	No	1.339	0.11	1.11	1.56	*40.7%*
No	Yes	1.746	0.12	1.51	1.99	
Yes	No	1.548	0.07	1.41	1.69	*11.5%*
Yes	Yes	1.664	0.09	1.48	1.85	

a simple model that focuses on the bribery behavior of non-OECD convention signatories. We follow this model with new empirical tests of the impact of the convention on bribery behavior.

Model of "Market for Bribery"

We develop a simple model of market entry among n firms that vary only in their marginal cost or marginal propensity for bribing. This firm-level propensity is consistent with the degree of "budgetary slack," and well as how prone individual firms are to bribe. On the one hand, firms vary greatly in the degree to which they possess disposable income for use on bribes. On the other hand, firms rarely expend all their disposable income on bribery, and there is no simple correlation between firm size and propensity to bribe, likely because firms have unique propensities to bribe based on various facets of their cost structure, corporate culture, and other unobservables. We therefore conceptualize this propensity as a reduced form parameter, capturing the objective cost of a bribe relative to the firms' underlying propensity to bribe. We refer to this as the marginal cost of bribing. This propensity (a firm's type) is private information, and firms simultaneously choose whether to bribe for market entry, unaware of which other firms are making bribes. Yet because rents dissipate in markets with barriers to entry as the number of entrants increases, we conceptualize the value of entering the market as a function of the number of entrants.

We then analyze an extension of this basic model in which k firms that are subject to an anti-bribery treaty, like the OECD anti-bribery convention, have some probability of being caught fined by their home countries (these are the firms from OECD signatory countries). We examine how this changes the bribing behavior of those k firms as well as the remaining $n-k$ firms. In the remainder of this section we present the model formally.

Baseline Model

Actors and Sequence

We model the interaction between n firms that vary only in their marginal cost of bribing, x_i. The sequence of the game is as follows:

1. Nature draws firm types, defined as their marginal cost of making a bribe, from a distribution with support $x_i \in [0, \bar{x}]$.
2. Firms choose whether to pay a bribe, x_i
3. Entry contracts obtain and payoffs accrue.

Payoffs

Firms want to enter the market to capture rents. But rents decrease as more firms enter. Thus, the rents from entry are $\frac{1}{f^*}$, where f^* is the number of firms entering the market in equilibrium. The payoff of entry is

$$EU_i(\text{entry}) = \frac{1}{1+f^*} - x_i,$$

where f^* is the equilibrium number of *other* firms entering and x_i is the marginal cost of the bribe to firm i. Firms receive 0 for staying out.

Information Structure

Firms' budgetary "slack," or the marginal cost of making a bribe, are private information. Each firm knows its relative costs but not that of others. We adopt the simplest type of naive priors for the moment and assume that firms' prior beliefs over the budgetary slack of their competitors are distributed according to the uniform distribution, $U[0, \bar{x}]$.

Equilibrium

Because firms make simultaneous entry decisions but possess private information about their own marginal costs, the appropriate solution concepts is Bayesian Nash equilibrium. The Bayesian Nash equilibrium defines best responses and beliefs for each type. We can identify the equilibrium through several steps.

Proposition 1. *There exists a Bayesian Nash equilibrium in which firms enter iff* $x_i < \hat{x}_i$. *All other types choose not to enter.*

In equilibrium, firms will pay to enter if

$$\frac{1}{1+f^*} - x_i \geq 0,$$

or, rearranging in terms of the firm's marginal cost of bribing, if

$$x_i \leq \frac{1}{1+f^*}.$$

This entry rule lends itself to a straightforward interpretation: firms will choose entry when their marginal cost of bribing is offset by the rents they can capture in the market.

Recall that f^* is the number of other firms entering in equilibrium, over which firm i forms an expectation based on prior beliefs about the distribution of marginal costs amongst the population of competitor firms. Therefore, f^* is also the probability of $n-1$ other firms entering the market (depending on $n-1$ other firms' types). For any single firm, the probability that the above inequality holds is equal to $\frac{1}{\bar{x}(1+f*)}$. The probability for $n-1$ firms is $(n-1)\frac{1}{\bar{x}(1+f^*)}$. Solving for f^* yields

$$f^* = \frac{1}{2}(\frac{\sqrt{4n+\bar{x}-4}}{\sqrt{x}} - 1).$$

Substituting this into i's entry rule, the type that is indifferent between entering or not is

$$x_i = \frac{2\sqrt{\bar{x}}}{\sqrt{\bar{x}}+\sqrt{\bar{x}+4n-4}} \equiv \hat{x}_i.$$

Firms make their entry decision by comparing their marginal cost of entry to their likely profits, which are determined by the number of competitors for rents in the market. This number is unknown because other firms' marginal cost of entry, or budgetary slack, is private information. In the absence of knowledge about precisely which other firms will find it profitable to enter, the firm compares its own cost to an expectation formed by the total number of other possible competitors and the upper bounds on the distribution of firm "types" or marginal costs or "budgetary slack."

The equilibrium entry rate is

$$n\frac{\hat{x_i}}{\bar{x}} = \frac{2n}{\bar{x} + \sqrt{\bar{x}}\sqrt{\bar{x} + 4n - 4}}.$$

Again, this is a function of the number of other firms and the distribution of resource constraints. Generally speaking, as the upper bound of that distribution goes up, the entry rate goes down, because firms will expect to be facing more competitors, diminishing rents.

Equilibrium with anti-bribery convention

Now we introduce the anti-bribery convention by adding two parameters to the model that, in effect, introduce a second type of firm: those from OECD signatory countries. We conceive of the convention as introducing the possibility of being caught and sanctioned for bribing for those firms from signatory countries. But monitoring and enforcement is not perfect for any treaty, so the probability of being observed making a bribe by the relevant authorities is q, and the cost is s. The expected cost is simply $q * s$, which is subtracted from the expected utility of bribing for firms from OECD signatory countries as follows:

$$EU_i(\text{entry}) = \frac{1}{f^*} - x_i - qs$$

Next, suppose we have k firms from OECD convention signatory countries. The "entry rule" for the $n - k$ firms from non-OECD convention signatory countries is simply the baseline entry rule established above, or

$$x_i \leq \frac{1}{1 + f^*}.$$

However, the utility comparison for the k firms from OECD signatory countries is now

$$\frac{1}{f^*} - x_i - qs \geq 0.$$

Rearranging in terms of x_i yields

$$x_i \leq \frac{1}{f^*} - qs.$$

The "entry rule" for the k firms from signatory countries also has a straightforward interpretation: as rents to be had go up and as the probability of being caught and sanctioned goes down, the more likely is a firm to enter the market.

At the Bayesian Nash equilibrium, entry decisions are made by two groups: k firms subject to the anti-bribery convention, for which each pays qs additional costs of entry, and $n-k$ firms not bound by it.

Proposition 2. *There exists a Bayesian Nash equilibrium in which subject firms enter iff $x_i < x_s$ and and non-subject firms enter iff $x_i < x_o$. All other types choose not to enter.*

A Bayesian Nash equilibrium defines types x_s and x_o as those types indifferent over entry and no entry, where t^* and f^* are the expected number of entrants from the subject and non-subject groups, respectively. A non-subject firm enters if

$$\frac{1}{1+f^*+t^*} - x_i \geq 0,$$

which yields

$$x_o = \frac{1}{1+f*+t*}.$$

And a subject firm enters if

$$\frac{1}{1+f^*+t^*} - x_i - qs \geq 0,$$

which yields an indifferent type

$$x_s = \frac{1}{1+f^*+t^*} - qs.$$

Solving this system of equalities requires that we define f^* and t^*. First, f^* is a function of $n-k-1$ other firms' types. If types are drawn independently from the uniform distribution x_i $U[0,\bar{x}]$, then the probability that any one firm joins is the probability that $x_i \leq \frac{1}{1+f^*+t^*}$, which is $\frac{1}{1+f^*+t^*}$. In turn, the expectation that $n-1$ firms join is

$$f^* = (n-k-1)\frac{1}{\bar{x}(1+f^*+t^*)},$$

and the expectation that $k-1$ firms would join is

$$t^* = \frac{k-1}{\bar{x}}(\frac{1}{1+f^*+t^*} - qs).$$

Solving for f^* and t^* yields

$$f^* = \frac{(1+k-n)(qs(k-1)-\bar{x}+\sqrt{(k-1)^2q^2s^2+\bar{x}(4n-8-2qs(k-1)+\bar{x})})}{2\bar{x}(n-2)}$$

and

$$t^* = \frac{(k-1)(qs(3+k-2n)-\bar{x}+\sqrt{(k-1)^2q^2s^2+\bar{x}(4n-8-2qs(k-1)+\bar{x})})}{2\bar{x}(n-1)}.$$

Both types still enter when n is not too large, or when

$$n < 1+k+\frac{\bar{x}(1-qs)}{q^2s^2},$$

but when n is too large, the available benefits aren't enough to convince the subject firms to bribe at all. With these components in place we can define the types that are indifferent over entry and non-entry, such that

$$x_o = \frac{2x}{q(s-ks)+\bar{x}+\sqrt{(k-1)^2q^2s^2+\bar{x}(4n-8-2qs(k-1)+\bar{x})}}$$

and

$$x_s = \frac{qs(3+k-2n)-\bar{x}+\sqrt{(k-1)^2q^2s^2+\bar{x}(4n-8-2(k-1)qs+\bar{x})}}{2(n-2)}.$$

These types are indifferent over entry from their respective groups; types below the relevant cut-point enter, while types above do not.

We can use these cut-points to analyze the rates of entry that motivated the model. First, we show that as the number of subject firms k increases, the maximal type of non-subject firm that bribes (x_o) also increases. Therefore, as more firms are deterred from entry by the threat of being caught and punished for bribery, the more likely is any given non-subject firm to pay a bribe to enter the market.

Proposition 3. *Non-subject firms are more likely to enter as the number of subject firms increases.*

To prove this proposition, take $\frac{\partial x_o}{\partial k}$, which is positive for the entire range of parameter values (see Appendix).

We can also make a cross-equilibrium comparison by noting how the entry rate of non-subject firms varies across the model with no subject firms and the model with firms subject to the convention. Specifically,

Proposition 4. *In equilibrium, as q or s, or both, go to 0, the entry rate of non-subject firms converges to the entry rate of firms in the model with no OECD convention.*

To prove, set q or s to 0 in x_0, and compare f^* across the two equilibria identified above (see Appendix).

Discussion

Proposition 3 establishes that as the number of firms subject to the OECD convention increases, the rate of bribery and entry for non-subject firms increases. This proposition predicts a perverse effect of a bribery convention that is applied only to some possible market entrants. If these subject firms are deterred, even at the margin, by the expected cost of being caught bribing and sanctioned, some firms who would otherwise bribe and enter the market in a world with no convention will instead opt to stay out. This means analysts should observe less bribery emanating from firms who are subject to the convention, which

is, after all, what the convention hopes to accomplish. But because rents in markets with barriers for entry are decreasing in the number of entrants, the reduction in bribery from subject firms will create additional profit incentives for non-subject firms. Thus, bribery will go down amongst subject firms but up amongst non-subject firms.

Proposition 4 shows that the degree to which these dual impacts of the convention obtain is a function of the quality of monitoring, represented by the probability of being caught bribing, q, and the severity of enforcement, represented by the sanction if caught bribing, s. Recall that the main effect of the convention is to generate some expected costs of bribery, represented by qs. As either or both of these parameters go to zero, the entry decision for subject firms converges to that of the non-subject firms. At the same time, the decision rule of the non-subject firms converges to that in the equilibrium with no convention. Put differently, increased monitoring and enforcement will indeed deter more subject firms, but because entry deterrence for these firms increases rents available for the non-subject firms, it will perversely increase bribery amongst non-subject firms.

These two propositions point to interesting overall welfare effects of any anti-bribery convention. On the one hand, if q and s are greater than 0, meaning there is some positive probability of being observed bribing and sanctioned, the convention will work as intended and reduce bribery *for subject firms*. On the other hand, this will tend to increase bribery for non-subject firms, and this tendency will be magnified as more firms become subject to the convention and as the quality of monitoring and severity of enforcement go up. Thus, the overall effect of the convention on bribery rates may be null, or even positive, depending on conditions. This logic should be cause for concern if the goal of the convention is to create general disincentives for bribery. If the convention applies unequally to firms from different countries, it may just have the effect of generating competitive barriers for firms from member countries.

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Appendix

Proof of Proposition 3. To prove this proposition, take the first partial derivative of x_o with respect to k,

$$\left(\frac{2qs\bar{x}}{\sqrt{\bar{x}(\bar{x}-2(k-1)qs+4n-8)+(k-1)^2q^2s^2}}\right)\times$$
$$\left(\frac{2qs\bar{x}}{\sqrt{\bar{x}(\bar{x}-2(k-1)qs+4n-8)+(k-1)^2q^2s^2}+\bar{x}+q(s-ks)}\right),$$

which is sure to be positive for $\overline{x}>0$, $k>2$, $0<q<1$, $s>0$, $n>k$. □

Proof of Proposition 4. To prove this proposition, note that $x_O - x_S = qs$. As either q or s, or both, goes to zero, $x_O - x_S$ approaches zero. □