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The supply-side of international corruption:

A new measure and a critique

Lucio Picci[1]

October 13, 2017

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Abstract

I consider the "supply-side" of corruption in the context of international bribery, which I define as firms bribing public officials abroad. I present the "Bribe Payers Corruption Index" (BPCI), a non perception-based measure of cross-border corruption, which is coherent with a simple analytical framework based on an important distinction: that between the propensities to corrupt, and observed levels of corruption.

The BPCI is compared with a widely known indicator of the supply-side of corruption, Transparency International's "Bribe Payers Index" (TI-BPI), which I demonstrate to be flawed. Whereas, according to the TI-BPI, firms from corrupt countries are more likely to bribe abroad, the opposite emerges when the BPCI is considered. I explain and discuss such result, whose implications are framed within the global discourse on the supply-side of international corruption.

Keywords: Corruption, International corruption, supply-side of corruption, measures of corruption, judicial statistics, BPCI, Bribe Payers Corruption Index, Bribe Payers Index
J.E.L. Codes: H11, H50, D73, C18, C43, F53, F55

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1. Introduction

The discourse on the so-called supply-side of corruption is marred by the absence of reliable measures, which in part is a consequence of analytical shortcomings. In this paper I introduce a novel, non perception-based measure of the propensity of firms to corrupt abroad, the Bribe Payers Corruption Index (BPCI), which derives from ideas illustrated in Escresa and Picci (2017a), and rests on clearly defined analytical concepts. In particular, the proposed analytical framework clarifies an important distinction, that between *levels* of corruption and *propensities* to corrupt, which, to the best of my knowledge and somehow surprisingly considering its importance, has been ignored in the literature.

I focus on international bribery, defined as instances of bribery by firms headquartered in one country, of public officials in a different country.[2] The debate on international bribery is part of a broader conversation on corruption, which, being regarded as a global issue, has also become one of the domains of international relations. The most visible milestones of such "international relations of corruption" are represented by the adoption of key international legal instruments, such as the 2003 United Nations Convention against Corruption and, of particular pertinence here, the 1997 OECD Anti-Bribery Convention (see, among others, Carr and Outhwaite 2008). Also, being a global issue, corruption and in particular its international variant, has become the subject of a discourse which is carried out worldwide, and whose protagonists are not only state actors, but also international organizations, NGOs, donor agencies, civil societies, and the media. Such a discourse, which often presents a moralizing tint in its attempt to assign in different proportions the perceived blame of corruption, constitutes the backdrop of the present study.[3] I here describe its essential character.

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2 I will at times refer to the same phenomenon as "international corruption" or "cross-border bribery". Such cross-border activities could involve different types of actors – in particular, the briber could also be a state representative, and the bribed a firm. I won't consider these cases. I define public officials broadly, also to include politicians.

3 I simply note that moralizing takes place and is highly visible, and I do not engage the debate on its role (and, more generally, on the role of ethical considerations) in international

Social scientists are naturally wary of moralistic considerations and, particularly when discussing corruption, of distributing the blame between the parties involved. In fact, corrupt exchanges are the result of an agreement between the briber and the bribed, which might be seen as a bargain, on whether the corrupt transaction should take place, and under which conditions.[4] Since both parties of a corrupt transaction demand and supply valuable assets, reference to the "supply-side of corruption" might seem ambiguous, and it is adopted here for two motives. On the one, it seems sensible to focus on the bribe itself, which the briber "supplies"; also, such labeling has been used already in the literature (see, for example, Bertok, 1999).

Voluntary bargains implicitly suggest a symmetry of sort between the actors involved, so that attributing different degrees of guilt to them has a degree of awkwardness.[5] However, the difference in roles in a corrupt exchange is so obvious and important, that it pales away any theoretical niceties which might arise from considering that corruption is the result of voluntary bargaining. There are, in fact, obvious asymmetries at play: there is a giver, and a taker, who in exchange for money or favors provides some service – be it a preferential treatment in public procurement, a license, etc. Also, the giver and the taker typically belong to distinct spheres of societal action – such as, the private sector, vs. the public one.

Such distinctions have consequential implications on international corruption, and particularly so when a contrast is drawn between developed and developing countries. In fact,

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relations. I surmise that creating and manipulating narratives aimed at asserting one's rightfulness might be explained by the presence of reputational concerns in the international arena, and by their reverberation in domestic politics.

4 Some scholars have explicitly considered the possibility of non-collusive corruption (e.g. Rose-Ackerman 1999: 15-17). Philp (2006: 47) distinguishes between "A-led corruption", corresponding to situations where "public officials impose the terms" on a benefiting third party, and "C-led corruption", where the opposite occurs. However, it might be argued that those cases represent mild forms of extortion.

5 While corruption is widely perceived to be unethical, it is also illegal. The law does weight responsibilities, while meting out different punishments to the briber and to the bribed. Also, the law draws a line between instances of corruption and of extortion.

limiting attention to the former group, a degree of reciprocity in corruption is present: in a given developed country, cases are observed both of public officials accepting bribes from abroad, and of local firms paying bribes to foreign public officials. However, when we consider cross-border bribes involving both groups of countries, the situation is very different. Whereas developing countries frequently appear at the receiving end of the corrupt relation, it happens relatively less often that their firms bribe foreign officials abroad (see Escresa and Picci 2017a, and Table 2 below). One way to characterize such distinction is to see it as a peculiar form of functional specialization in international corruption: developing countries specialize in receiving bribes, while developed ones in paying them.[6] It is in this context that a distinction between the demand-side and the supply-side of corruption has emerged in the literature, with reference to a situation where the supply of bribes is provided by developed countries' firms (see, among others, Ufere et al. 2012, and Wu 2005).

Such asymmetry of roles, as it is observed at the country level, might be very pronounced. The case of Africa is particularly instructive in this respect. According to the comprehensive dataset which will be presented shortly, African firms have been involved in cases of cross-border corruption only in a handful of instances. It would be inappropriate to explain such fact by invoking African firms' higher virtues. More prosaically, the observed regularity is a consequence of the *developing* nature of those economies: there are precious few African firms which have the capability to contest foreign markets, by bribes or by other means (see Verhoef 2016). Such considerations are part of a policy debate that has witnessed a degree of cross-accusations. And here is where the "moral ground" comes into play, in a way which might be appreciated while cursorily recalling how the public discourse on corruption has evolved during the last decades.

A growing consensus on the evils of corruption developed during the 1980s, and international organizations, such as the World Bank, placed the issue at center stage during the 1990s. Transparency International, a visible advocate of the need to fight corruption, was

6 I use the term *specialization* merely to indicate an observed empirical regularity, which emerges from the aggregation of the actions of public officials accepting bribes, and of foreign firms offering them. I do not imply the presence of intentionality at the aggregate level.

founded in 1993, and two years later launched the yearly Corruption Perception Index (TI-CPI).[7] It quickly acquired visibility worldwide, in identifying which countries needed to take stronger action to fight corruption: mostly, then and now, developing ones. In the same years, the Corruption Control Indicator (WB-CCI) was developed by the World Bank as part of its "Worldwide Governance Indicators".[8]

The reprimand against corruption originated from organizations that in the world arena are at times perceived to be bearers of so-called Western values. To understand how it was received in those countries that were "named and shamed", it is necessary to consider the broader dialogue between developed and developing countries, which at times intersects a difficult post-colonial discourse.[9] Such dialogue had often taken a moralizing tone; while international organizations and donor countries have repeatedly requested developing countries to clean their acts and become less corrupt, voices have been heard from the other side of the economic divide, asserting that much corruption in developing countries is induced by foreign firms based in developed ones.[10]

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7 See http://www.transparency.org/research/cpi/overview, and Transparency International (2012). Measures of perceived corruption at the country level had been available earlier.

8 See http://info.worldbank.org/governance/wgi/. For a comparison between the WB-CCI and the TI-CPI, which provide very similar results, see Treisman (2007).

9 On colonialism and corruption in Africa, the case that has been best studied, Blundo and Sargan (2006) provide an interesting overview of the debate. See also, among others, Bayart (2006), Le Vine (1975), Mbembe (2000), McMullan (1961), Médard (1997), Njoku (2005), and Tignor (1971).

10 A reflection of such arguments clearly emerges from United Nations Economic Commission for Africa (2016). A related debate regards Illicit Financial Flows (IFFs), which are linked to corruption in several ways – for example, in allowing corrupt public officials in developing countries to stash the proceeds of their criminal activities away for future use. Developed countries' financial institutions play an essential enabling role of IFFs. It has been noted that IFFs out of Africa might surpass the amount received as foreign assistance. See Kar and Cartwright-Smith (2010), and United Nations Economic Commission for Africa (2015).

Another fault-line of the debate, mainly defined by the contrast between developed and developing countries, has cut across the former group. Transparency International's "Bribe Payers Index" (TI-BPI) has been crafted to capture the varying propensities of (mostly) developed countries to bribe abroad.[11] And the naming-and-shaming of the TI-BPI has targeted, by and large, the same countries that, among the group considered, are perceived to have a higher overall level of corruption: the correlation of the TI-BPI with the TI-CPI was equal to 0.83 in 2011. Such concordance of information would hint at the presence of country factors that are relevant and damning both for domestic corruption, as captured by the TI-CPI, and also for exporting it abroad, as indicated by the TI-BPI. The implied narrative, then, might be seen as one where the term corruption is cast as in its original etymological meaning – the Latin "com" and "rumpere", to break. Corruption, both domestically and in its export variety, would then derive from a broken national order, possibly reflecting the presence of a national collective culpability. In this article I argue that such conclusion is unwarranted, because it derives from a lack of analytical clarity, which contributes to poor measurement of the relevant phenomena.

I proceed as follows. In the next section I propose a simple analytical framework to consider the problem of measuring corruption, which draws on the distinction between the propensity to corrupt, and observed levels of corruption. In Section 3, I present the Bribe Payers Corruption Index (BPCI), to compare it with the TI-BPI, and with other measures of corruption at the country level. In Section 4 I further discuss and interpret the BPCI, and Section 5 concludes.

2. Measuring corruption: an analytical framework

When measuring corruption, it is important to distinguish between observed levels of the phenomenon on the one hand, and propensities to corrupt on the other. Perhaps surprisingly,

11 The Bribe Payers Index is available for the years 1999, 2002, 2006, 2008, and 2011 (see http://www.transparency.org/research/bpi/overview). Transition countries have begun to also be on the giving end of corrupt transactions, as their firms acquire the capabilities to actively play in foreign markets.

such important difference has not been considered in the by now vast literature on measuring corruption. I first illustrate the issue with reference to corruption in general, to argue later that it is particularly relevant in the context of international bribery.

Assume that there are *N* different types of transactions that involve public administrations. To fix ideas, one type might have to do with granting building permits, another could represent traffic tickets, and a third one, sourcing decisions concerning public works. Each type of transaction *j*, in country *i* ($Transactions_{ji}$) has an associated probability of being corrupt, $Pr(corruption_{ji})$.[12]

A meaningful measure of corruption in country *i*, for a certain type of transaction of type *j*, is provided by the fraction of (the expected) number of corrupt transactions *j*, with respect to the total number of transactions of that type occurring in that country. It simply corresponds to the probability that an activity of type *j*, in country *i*, is corrupt:

$$(1) \qquad Corruption_{ji} = \frac{Pr(corruption_{ji}) \cdot Transactions_{ji}}{Transactions_{ji}} = Pr(corruption_{ji})$$

A measure of overall corruption in a given country *i* might be defined as follows:

$$(2) \qquad Corruption_{i} = \frac{\sum_{j=1}^{N} Pr(corruption_{ji}) \cdot Transactions_{ji}}{\sum_{j=1}^{N} Transactions_{ji}}$$

It expresses the overall level of corruption in country *i* as the fraction of the expected number of transactions of any type for which a bribe is paid, divided by the total number of transactions of all types, and it is bounded between 0 (absence of corruption) and 1 (all

12 The generic country where public officials accept bribes is indicated with the subscript *i* both in this section, and later, in discussing cross-border corruption. There, the subscript *z* will denote the generic country where a firm is headquartered, with public officials receiving bribes, again, in country *i*.

transactions, of all types, are corrupt).[13]

The probability that a transaction is corrupt might vary considerably not only across countries, but also across types of transactions within a country. Equation (2) indicates that there are two channels through which the overall level of corruption might, say, decrease. Either the probability of corruption for one or more types of corruption decreases, or the composition of types of transactions shifts in favor of types of transactions characterized by lower than average probabilities of corruption.

[Table 1 about here]

To illustrate the practical implications of such fact, I consider a concrete case: corruption in Spain during the last decade.[14] Corruption in Spain is perceived to be non-systemic, but nonetheless rather high for European standards. Table 1 reports Spain's TI-CPI from the year 2000 until 2016 – please remember that lower values of the TI-CPI correspond to higher perceived corruption. As is true of many developed countries, in Spain the bulk of daily interactions of citizens with public administrations are virtually corruption-free; however, some sectors of activities have been historically problematic in this respect. In particular, the Spanish private building sector has been characterized by inadequate governance, where too much discretionary power rested with local authorities who were not subject to adequate oversight, and it has been very vulnerable to corruption.

[Figure 1 and 2 about here]

13 It might be argued that cases of corruption in different types of activities vary in importance – a small bribe to avoid paying a traffic ticket can't be put on par with a hefty bribe in public procurement. Appropriate weights would allow to take this important aspect into consideration, but the proposed simpler formulation is adequate for the purpose of the present discussion.

14 My account is based on the available data, and its conclusions emerge rather unanimously from the literature. See for example Jiménez (2009), Quesada *et al.* (2013), Sánchez (2008), Viloria (2015) and Viloria and Jimenez (2012).

The Spanish building sector experienced a major speculative bubble until the beginning of the world-wide financial crisis of 2008. A relatively high probability of corruption, together with the presence of a great number of transactions, make of this sector the main culprit of corruption in Spain in the years preceding the crisis.[15] Subsequent to the end of the speculative bubble, the building sector almost ground to a halt, as Figure 1 shows. It is rather safe to conclude that, once the main engine of corruption in Spain was reduced to a fraction of its previous over-bloated size, the *level* of corruption in Spain would be reduced: simply, there were not nearly as many high-risk transactions as before. In terms of Equation 2, the level of corruption likely decreased, basically because the number of transactions of the "corrupt" activity - that with a high $Pr(corruption_{ji})$ - dwindled.

Public investments likely also are at a high risk of corruption in Spain. In the aftermath of the crisis, as scarce public resources were increasingly targeted to various types of social expenditures such as unemployment benefits, public works fell off, as Figure 2 shows for the case of roads. Also on this count, it might be concluded that the economic context prevailing in Spain since 2008 led to a reduction of the aggregate level of corruption.[16]

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15 Such contention is also confirmed by considering the spate of highly visible corruption cases that have emerged in recent years. For a journalistic account, see the Barroso Vargas (2012), and the other chapters in the same edited volume.

16 The reorientation of public resources towards social expenditure might have resulted in an increase of corruption in those sectors. However, such effect likely was modest, since most transfers were the result of the application of objective rules and, again, the public officials involved for the most have a reputation for honesty. As a counter example, consider however the case of the *Expedientes de regulación de empleo* in Andalusia (regulated layoffs of workers by firms in dire straits; see Barroso Vargas 2012). Table 1 also shows that perceptions of corruption actually *worsened* during the same period – thus contradicting my claim to the contrary. The result is likely influenced by the high visibility, in those years, of corruption-related scandals (the same interpretation is proposed in Viloria 2015). On the unreliability of perception-based indicators of corruption, such as the TI-CPI, to measure *changes* (vs. levels) of corruption, see Escresa and Picci (2016).

The case of corruption in Spain lends itself to a discussion of the determinants of the quantities appearing in Equation (2). First, we note that $Pr(corruption_{ji})$ and $Transactions_{ji}$ likely influence each other. If the probability of corruption for a given type of transaction is high, rent-seeking corrupt officials might succeed in increasing the number of transactions that they profit from, via forms of capture of the political process. In Spain, possibilities for illegal gains arising from poor governance of the building sector contributed to a building frenzy which was politically difficult to rein in. Also, the presence of many corrupt transactions might influence the probability of corruption itself, and the building boom likely contributed to empower vested interests that, to safeguard their illegal rents, would oppose any needed reform in governance.

The case of Spain concretely clarifies that the contribution of a given type of activity to the overall level of corruption depends both on the probability that different types of activities are corrupt, and on their relative importance. It turns out that the role of compositional effects is even more prominent when considering international corruption. For simplicity, and to better focus on what is of main interest here, in what follows I assume that there is only one type of transaction. There are *K* countries, and the general level of corruption of the firms headquartered in a given country *z* in bribing foreign public officials in country *i* might be expressed as follows:

$$IntCorruption_z = \frac{\sum_{i=1}^{K} Pr(IntCorruption_{zi}) \cdot IntTransactions_{zi}}{\sum_{i=1}^{K} IntTransactions_{zi}} \qquad z \neq i \tag{3}$$

$IntTransactions_{zi}$ is the total number of transactions of firms headquartered in country *z*, involving public officials in country *i*, and $Pr(IntCorruption_{zi})$ is the probability that one such transaction is corrupt. The contribution of country *i* to the total level of corruption of country *z* firms is then equal to $Pr(IntCorruption_{zi}) \cdot IntTransactions_{zi}$, which brings to the fore the distinction between the probability that a transaction is corrupt (the propensity to corrupt, *given that there is a cross-border transaction*), and the total expected number of corrupt cross-border transactions (the product of the propensity, of probability, to corrupt, and

of the number of cross-border transactions that are amenable to corruption). Unfortunately, such essential distinction is glossed over in the leading measure of the supply-side of corruption, Transparency International's Bribe Payers Index, to which I now turn.[17]

Such country index is based on two questions posed to firms' representatives. In the first one (Question 6 of the questionnaire; see Appendix A), respondents were invited to identify the countries where the headquarters are located of firms with which with they have business relationships, "for example as a supplier, client, partner or competitor". For each one of the countries selected, the respondents were then invited to indicate, "using a scale of 1 to 5 where 1 means never and 5 means almost always, *how often* [...] firms headquartered in that country engage in bribery in this country" (emphasis is mine). The answers to this question are then used to compute the TI-BPI (see Appendix A for details).

Under the light of our previous discussion, it emerges that this key question, on which the validity of the TI-BPI hinges, is badly formulated. In fact, it is very unclear whether respondents are asked to assess $Pr(IntCorruption_{zi})$ (the probability that a transaction between a country *z* firm, and country *i*, is corrupt, *given that a transaction between z and i is observed*), or the probability that a firm from country *z* engages in bribery in country *i*, *given that a business transaction is observed between a firm from any foreign country, and country i*.

The ambiguity, it might be argued, is one between a conditional probability and an unconditional probability. On the one hand we have $Pr(IntCorruption_{zi})$, the probability that a transaction between a country *z* firm, and country *i*, is corrupt, *given that there is such a transaction.* This probability should be contrasted with the *unconditional* likelihood that a firm from country *z* bribes a country *i* public official, which does not just depend on the propensity of country *z*'s firms to bribe (the conditional probability above), but also on how frequently those firms are involved in transactions that are amenable to corruption. It might be argued that there is a need for simplicity in the formulation of a questionnaire's questions,

17 I here describe the main shortcomings of the TI-BPI, and I relegate to Appendix A further details and considerations pertaining to this measure. I use the acronym TI-BPI to indicate the "country" measure (as distinct from its sectoral variant) illustrated in Transparency International (2011a: 5, Figure 1).

and that the generic question on “how often” firms engage in corruption aims exactly at that. But simplicity is of no use when it obscures important aspects of reality. In the case at hand, unless all country's *z* trading partners are similarly important (which is never the case), it is essential to distinguish between the conditional propensity to corrupt, and the overall frequency of observed corrupt transaction.

A further critique to the TI-BPI regards the dubious reliability of the information on which it is based. Respondents were invited to assess the corruption of firms with which they had business relationships, “for example as a supplier, client, partner or competitor” (Question 6 of the questionnaire – see Appendix A). It is however doubtful that they might have had adequate information on such activities, since corrupt firms likely do their best to hide their crimes from suppliers, clients and partners, and *a fortiori* from competitors. For this reason, it is doubtful that the persons interviewed had any reliable information on which to base their answer on *how often* firms from a given country offer bribes, even regardless of the intrinsic ambiguity of the question on which I dwelt upon above.

Faced with an ambiguous question, and in most cases without the benefit of first-hand information, I surmise that the answers provided tended to reflect the respondents' perceptions about levels of general corruption in foreign countries. Such outcome might be seen as the result of resorting to an “availability heuristics”, which is a tendency to form a judgment on the basis of what is readily brought to mind (Schwartz 1998), where the information is retrieved based on “associative distance” (see Tversky and Kahneman 1973, who introduced the concept). Only about 4% of the relevant answers (to Question 7 of the questionnaire: see Appendix A for details) were either “I don’t know” or “no answer”, suggesting that a type of availability heuristics provided the necessary cues to most respondents to answer the key question for the purpose of computing the TI-BPI, regardless of the very little that they likely knew about an ambiguously described subject matter.

The available evidence supports such contention. Table 4 shows pairwise correlations between the different measures of corruption that we consider; the correlation between the TI-BPI and the TI-CPI (year 2011) is equal to 0.83, and only slightly smaller when the log of the PACI (Escresa and Picci 2017a) is used instead.[18] According to such results, those developed

18 The PACI is computed using an updated version of the database illustrated in Escresa

countries where corruption is perceived to be high, also have firms that are more prone to bribing abroad. Such conclusion is however unwarranted, as I show in the next section, where I illustrate the BPCI, an index of corruption, not based on perceptions, which is coherent with the simple conceptualization provided by Equation 3 above.

3. The Bribe Payer's Corruption Index (BPCI)

The Bribe Payer's Corruption Index (BPCI) hinges on the same insight on which the Public Administration Corruption Index (PACI) is based (Escresa and Picci 2017a; see also Escresa and Picci 2017b). As in the case of the PACI, the BPCI infers levels of corruption leveraging on the geographic distribution of cases of cross-border corruption, where a firm headquartered in a "home country" (allegedly) bribes public officials in a "foreign country".[19] The PACI considers cases that were enforced first in the home country (the "country whose judiciary was the first to take action on a particular corruption case"; see Picci and Escresa 2017a), to assess the level of corruption of public officials in the foreign country (and also in 3rd country jurisdictions). The BPCI, on the other hand, considers cases that were first enforced in the *foreign* country, $cases-obs-FO_{i,z}$ in equation (4) below, to assess levels of corruption in the *home* country.

Those cases are compared to $E(cases-obs-FO_{i,z})$, which represents the number of cases that would be expected if the levels of corruption were the same everywhere:

and Picci (2017a), including cases from 2000 until 2014. See the next section for further details.

19 Often these firms act abroad through their foreign-based subsidiaries, which might raise concerns on attributing cases of corruption to the headquarters country only. Note however that statutes of corporate criminal liability, which are present in the most important jurisdictions considered, imply well-defined corporate responsibilities at the headquarters level.

$$(4)\quad BPCI_z = \frac{\sum_{i=1}^{N} cases - obs - FO_{i,z}}{\sum_{i=1}^{N} E\left(cases - obs - FO_{i,z}\right)} \cdot 100 \quad , \quad i \neq z$$

To make the expression of the denominator operational, it is equaled to the number of cases that would be expected to involve country *z* firms, if all cases were distributed according to bilateral trade shares between country *z* and all other countries. Bilateral trade, in other words, is used as a proxy for the number of transactions which are vulnerable to corruption. Such choice is obviously questionable, and it will be discussed in the next section, to reach nuanced but at the same time interesting conclusions. The BPCI, as is for the PACI, also has a lower bound equal to zero, corresponding to absence of corruption cases, and a benchmark value of one hundred, which corresponds to a level of corruption equal to a world average of sort.

Please note that the index does not assume that enforcement of cross-border corruption cases in the foreign country is in any way "efficient", or similar across borders. In fact, we expect enforcement to be vastly different in different countries. Intuitively, what is needed for the BPCI to be valid is that in enforcing cases involving firms headquartered in a given country, jurisdictions placed elsewhere, whatever is their level of activism, have no systematic bias against that country. If for example all jurisdictions were biased against firms that are headquartered in a given country, so as to more frequently "pick on them", then the index also would be biased. But even if there were biases of this type, it might be argued that they could take different signs across different jurisdictions, so that they could eventually roughly cancel out in the computation of the index.

Appendix A provides details on the computation of the BPCI, and a more formal consideration of the problem of its validity. In particular, in illustrating the details of the computation of the BPCI, it shows that the reasoning on which it is based is analogous to that leading to the PACI, so that, *mutatis mutandis*, the considerations developed in Escresa and Picci (2017a) on the validity of the index are also valid in the present case.

In terms of the discussion of Section 2, it is important to note that the BPCI is coherent with the formulation of Equation (2) and (3). The numerator of (2) represents the expected number of cases of corruption, of which the numerator of (4) is the observational equivalent.

The denominator of (4), representing the number of expected cases of corruption conditional on the probability of corruption being the same all over the world, is proportional to the denominator of (2), up to an unknown multiplicative constant.

[Table 2 about here]

To compute the BPCI an updated version of the dataset presented in Escresa and Picci (2017a) is used, where information on cases of cross-border are collected using various sources (see Appendix B in that article for a comprehensive list). Table 2 shows that between the year 2000 and 2014 there were a total of 411 cases of (alleged) cross-border corruption first enforced in the foreign country or in any third-country jurisdiction. Switzerland, France, the United States and the United Kingdom top the list, with more than 30 cases each. The total number of cases first enforced in the foreign country, which are needed to compute the BPCI, are less numerous than those that were first enforced in the home country (which were used in Escresa and Picci 2017a for the purpose of computing their PACI index). However, the number of the former has increased in recent years, making the computation of the BPCI feasible, even if only for a long interval of time. Invoking the same arguments presented there, here also all these cases are used, irrespective of their outcome.

The index is computed together with the "conditional probability of zero cases", which expresses the probability of observing zero cases, conditional on their being distributed according to trade shares (see the discussion in Escresa and Picci, 2017a). I discard countries for which such probability is greater than 0.05, judging that they are based on too little information. Table 3 presents results, and compares them with the TI-BPI for the year 2011, the PACI, and the TI-CPI for year 2011.[20] Countries are ordered according to their BPCI ranking. In comparing the different indices, please note that both the PACI and the BPCI are

20 The choice of the year was dictated by data availability – the middle year of the interval considered for the purpose of computing the BPCI is 2007. However, the number of corruption cases tends to increase with time, so that more recent years have a greater impact on the computed BPCI. Also, please note that the TI-BPI is very stable in time (see https://www.transparency.org/research/bpi/overview).

increasing in levels of corruption, while the opposite is true for the TI-BPI and TI-CPI. Whenever possible, rankings of countries are reported according to both indices. A positive (negative) rank difference indicates that a given country's firms are seen to be more (less) prone to corruption abroad according to the TI-BPI, than to the BPCI.

[Table 3 about here]

To illustrate the Table, let's consider Italy as an example. Its BPCI equals 42.7, which is lower than the world average of 100. This implies that Italian firms were involved only in about 43% of the cases that we would expect, if cases were distributed according to trade shares. Italy occupies the 14th position in a list of 31 countries, and the 16th according to the TI-BPI, so that the rank difference is equal to +2, indicating that the BPCI is slightly more generous than the TI-CPI in judging the propensity of Italian firms to bribe abroad. For some countries, on the other hand, the results according to the BPCI are dramatically different compared to those of the TI-BPI. This is the case for France, Australia, Canada, the Netherlands, whose firms are perceived to be much more prone to corruption according to the BPCI compared to the TI-BPI. Figure 3 provides a comparison between the BPCI and the TI-BPI at a glance.

[Figure 3 about here]

A more systematic comparison of the BPCI with other measures of corruption is offered in Table 4. The left-hand side of the Table reports Pearson correlations, where both the BPCI and the PACI are log transformed. The right-hand side, on the other hand, reports Spearman rank correlations. In considering the signs of these correlations, note again that both the PACI and the BPCI are increasing in levels of corruption, whereas the opposite is true for the TI-BPI, TI-CPI, and WB-CCI.

The TI-BPI is highly correlated with measures of general corruption: its correlation with the TI-CPI is equal to 0.83 (it would be 0.87 if we considered the WB-CCI instead), and with the PACI, to -0.84. Higher corruption at home, according to the TI-BPI, tends to go together with a higher propensity of domestic firms to corrupt abroad: the implied message is that corruption, as a “sin” affecting some countries more than others, also reverberates across

borders.

[Table 4 about here]

However, the BPCI tells a very different story. Its logartithm has a positive, and statistically significant correlation of about 0.5 with the TI-BPI, which implies that on average countries that are seen to be virtuous according to the BPCI, are reported to be the opposite by the TI-BPI. Also, it has a *negative* correlation of -0.56 with the log of the PACI (and a correspondingly positive correlation of 0.48 with the TI-CPI, which reaches 0.55 is the WB-CCI is used instead), indicating that countries characterized by high corruption at home, on average have firms with a *lower* than average propensity to corrupt abroad. Rank correlations lead to the same conclusions; if anything, the negative correlation between the log of the BPCI and of the PACI is more pronounced in this case (-0.63, whereas the Pearson rank correlation equals -0.56). The next section interprets these results.

4. Discussion

In considering the results of Table 3, we observe that the list of countries comprises economies with varying characteristics. There are advanced industrial economies, such as the United States and Germany, whose multinational firms traditionally have had a strong industrial and commercial presence abroad. The list also includes smaller economies which however have an industrial base, such as Poland. Last, there are emerging economies, such as Brazil and China, whose firms have been increasing their capacity to contest international markets. Such differences would also imply varying opportunities to secure foreign markets by means of bribery, even once we control for bilateral trade flows, as the BPCI does.

First, corrupting abroad entails a fixed cost for a firm, because of the necessity to learn about local habits, and to participate in the relevant informal networks which are instrumental in accessing the mere possibility of bribing. To the extent that such fixed costs are relevant, countries having relatively many big firms would be better placed to secure foreign markets by means of corruption, compared to countries where smaller firms are prevalent.

Also, the nature of exports matters. Exporting commodities whose price is determined in world markets provides fewer possibilities to bribe. When these commodities are natural

resources, for whose extraction and processing the expertise of foreign firms might be needed, corruption often flows in the opposite direction of trade, with importing countries' firms bribing public officials in the exporting country to secure permits to operate there. Such differences naturally lead to the likely relevance of compositional effects, which can't be accounted for when looking at aggregate magnitudes only. The case of the Russian Federation, whose exports are represented to a great extent by natural resources, is instructive in this respect, and it is arguable that Russian exports is a poor proxy of the number of cross-border transactions amenable to corruption by Russian firms.[21]

In what follows I proceed in two steps. First, to provide a preliminary quantitative assessment of the issue just discussed, I use a simple multivariate approach to investigate which factors might influence the BPCI, considering that it depends on trade shares as an imperfect proxy for cross-border transactions which are vulnerable to corruption. Secondly, and under the light of the conclusions of such an analysis, I provide a tentative interpretation of the BPCI, arguing on the one hand that it could be made to account for the factors discussed, but also that it is meaningful and interesting as is, once it is interpreted correctly.

[Table 5 about here]

In all regressions I include two variables. One is the ratio of stock market capitalization of listed firms to GDP, which is meant to proxy for the presence of major lucrative firms. The other is GDP *per capita*, which is meant to express the presence of many firms characterized by the generation of high value added.[22] The baseline regression (column 1 of Table 5), which

21 Also note that Russia's exports of arms constituted 22% of the world total between 2005 and 2009, climbing to 27% in the following lustrum (Sipri 2015). The secrecy that often accompanies arms trade might have implications for the likelihood that cases of corruption emerge. These considerations might contribute in explaining why the BPCI for Russia is rather low (33.7), and well below the 100 benchmark.

22 The stock market capitalization variable is the result of my computations using World Bank's country data on stock market capitalization of listed firms (see: http://data.worldbank.org/indicator/CM.MKT.LCAP.CD. GDP (in US dollars and at current

besides a constant only includes the two variables just mentioned, shows that indeed they are significant in explaining the log of the BPCI.[23] Overall, these results confirm the presumption that trade flows represent an imperfect proxy for the number of cross-border transactions that are vulnerable to corruption. However, the R^2 is about 0.51, indicating that one half of the total variation of the logged BPCI is still left unexplained by such factors, to the extent that they are captured by our proxies.

The next three columns of Table 5 present results of the same regression models of column (1), but by adding either the TI-BPI, the TI-CPI, or the log of the PACI. We observe that in all three cases these variables are not statistically significant, indicating that the negative correlations between the BPCI and measures of overall corruption such as the TI-BPI or the PACI, which the results of Table 4 witness, disappears once we account for the presence of big firms (as captured by the stock market capitalization/GDP ratio), and of firms that on average have a high value added (as captured by GDP per capita).

Once we control for the concrete possibilities that firms from a given country might have of corrupting abroad, we might research the factors which explain the differences in the observed propensities. As a purely exploratory exercise, I consider the possible role of cultural traits. The last four columns of Table 5 extend the base model to include, one by one, the main variables presented in Hofstede (2001). The result indicate a negative and significant effect both of power distance and of masculinity, and no significant effect of individualism and uncertainty avoidance (in the latter case, with a negative estimated sign, with a p-value of 0.26).

These results should be interpreted with circumspect, because of the paucity of observations, and of the possible presence, within a very parsimonious model, of an omitted variable bias. They are usefully compared with those of Husted (1999), who finds that power

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prices and market exchange rates) is from the International Monetary Fund World Economic Outlook, October 2016.

23 I employ an OLS estimator with robust standard errors. Obviously, the presence of big lucrative firms could be partly determined by their propensity to bribe, as captured by the dependent variable. The focus here is not however on the estimation of causal relationships, but simply on determining the presence of correlation patterns.

distance, masculinity and uncertainty avoidance are positively correlated with levels of corruption, whereas individualism is not found to play a role. The results here presented, which are approximately the opposite of those of Husted, could reflect the presence of an asymmetric impact of cultural factors on corruption, depending on which side of the corrupt transaction (briber vs. bribee) we focus on.

[Table 6 about here]

The BPCI, which is normalized using trade flows as a proxy for the quantity of transaction which are vulnerable to corruption, likely provides a biased estimate of $Pr(IntCorruption_{zi})$ (the probability that a cross-border transaction is corrupt, *given that a transaction is observed*; see Section 2). Such a probability represents a "deep parameter" of sort, as it indicates the intrinsic propensity to corrupt, given a chance to do so. In order to estimate it without a bias, the BPCI could certainly be modified by using a normalization more accurate than the one afforded by trade flows; such an attempt would be conceptually simple, but likely onerous in terms of data collection. A simpler solution to this problem might be to consider the residuals of the estimated baseline model (column 1 of Table 5), which represent the BPCI, conditional on the presence of major lucrative firms, to the extent that it is captured by the two proxies described above. These residuals are reported in the right-most column of Table 3. Table 6, where they are indicated as *BPCI residuals*, shows that once we control for the stock market capitalization/GDP ratio and for GDP *per capita*, the BPCI is no longer correlated with general measures of corruption such as the TI-CPI. The underlying message is that, when deciding to bribe abroad, what matters are firms' concrete chances to do so, more than anything else.

Having a reliable knowledge of the deep parameter $Pr(IntCorruption_{zi})$ would be of interest, for example, to ask questions on the cultural determinants of corruption, a theme that has been attracting increasing attention. In a purely exploratory fashion, I presented some evidence in this respect, by adding some of Hofstede's variables to the base model of Table 5.[24] I surmise however that to research such questions, it might be more productive to explore

24 Incidentally, I note when those variables are compared with the residuals of the base

different routes, such as those afforded by experimental methods, rather than focusing on cross-national evidence of the type that is presented here. However, if the purpose is to measure the propensity of a country's firms to “export” corruption abroad, then normalizing the number of observed cases of cross-border bribery using bilateral trade, which is what the BPCI does, arguably is the correct choice. The result indicates that, on average, countries having more big firms, and in general a more developed economy, also have a higher BPCI. True, these countries export more corruption because their firms on average have more opportunities to do so, and not necessarily because they are more “evil”. But if the interest is in knowing which countries need to take more urgent action to rein in foreign corruption, the BPCI, as is, provides exactly the information which is needed.

5. Conclusions

I considered the supply-side of corruption in the context of international bribery, and I argued that such issue has great salience within a global discourse on corruption that often is tinted by a moralizing veneer. One well-known measure of the supply-side of corruption, Transparency International's Bribe Payers Index, together with the same organization's Corruption Perception Index, inform a simple narrative: among developed and developing countries, more corrupt ones are also hosts to firms that have a higher propensity to corrupt when doing business abroad.

I have shown such conclusion to be unwarranted. The TI-BPI's high correlation with general cross-country measures of corruption, such as the TI-CPI and Escresa and Picci (2017a) PACI, is misleading. It likely derives from the fact that respondents, confronted with ambiguous questions regarding episodes of corruption that they have no reason to know much about, base their answers on the little that they think they know, which is, on generic perceptions of corruption in the foreign country in question. An open question is whether the presence of such “availability heuristics” (with reference to Schwartz 1998) is more generally

model (column 2 of Table 5), the estimated correlations are never significant. In particular, for power distance, masculinity and uncertainty avoidance, the p-values of the estimated (negative in all cases) correlations equal 0.26, 0.22, and 0.24 respectively.

relevant when assessing levels of corruption, in a situation where measures such as the TI-CPI have become very visible, to the point that they might, in a sense, be feeding on themselves

I proposed a new measure of cross-border corruption, the “Bribe Payers Corruption Index” (BPCI). This measure does not suffer from the shortcomings of the TI-BPI, it is not based on perceptions, and it provides a very different picture of the supply-side of corruption. It is *negatively* correlated with general levels of corruption in a country, likely because more developed countries, which tend to have lower levels of corruption, host a higher number of firms that have the muscles to contest foreign markets, also with the help of bribes. Using trade flows as a proxy for cross-border transactions, as I do for the purpose of computing the BPCI, does not allow to control for any such differences, a fact that, in the preceding section, led to its nuanced interpretation.

Such interpretation is consistent with a general message that I have argued: when measuring corruption, care should be exercised in defining exactly what it is that we want to measure. And thinking this question through requires a clear view of objectives. Once the required attention is paid, the contention that the same “name and shame” narrative applies to both domestic corruption, and to its exported variety, appears to be unjustified.

Appendix A – The computation of the TI-BPI

This appendix describes the computation of the country TI-BPI for 2011 (Transparency International 2011a, Figure 1, page 5), using the individual responses to the survey on which it is based (a total 3016 personal interviews), kindly provided by Transparency International. I also consider the sectoral index (Transparency International 2011a, Figure 4, page 15), and I argue that it does not measure the "perception of foreign bribery by sector", as declared. I then illustrate how the information contained in the survey could be used to compute a more meaningful "sectoral index" - which, however, would still be prone to the "availability heuristics" problem that was highlighted in the main text of this paper.

Computation of the index at the country level (Transparency International 2011a; Figure 1, page 5)

To compute the index at the country level (TI-BPI) the answers to two questions, n. 6 and n. 7 in the questionnaire (Transparency International, 2011b), are used:

6. In your principal lines of business in this country, do you have business relationships – for example as a supplier, client, partner or competitor - with companies whose headquarters are located in any of the following countries?
[TELEPHONE ONLY – I have a list of 28 countries] SHOWCARD OR READ OUT. ROTATE START. MULTICODE OKAY
(there follows a list of 28 countries)

7. For each of the countries you have selected, could you please tell us, using a scale of 1 to 5 where 1 means never and 5 means almost always, how often do firms headquartered in that country engage in bribery in this country?
READ OUT COUNTRIES SELECTED AT Q6. SHOWCARD OR READ OUT SINGLE CODE AGAINST EACH COUNTRY

1 (never) –2 – 3 – 4 – 5 (almost always)
Don't know - 6
No answer -7

In Question n. 7, persons are allowed to express an assessment of more than one country (depending on their answer to Question 6), resulting in a total of 9274 records. About 4% of them corresponded to the choice "Don't know" (320 cases) or "No answer" (29 cases), which, once they are excluded, leave a total of 8925 usable records. Of these, 1611 refer to assessments being made of the same country of residence of the respondent – somehow confirming that the overall meaning of the question was missed by at least many respondants.

Once those are also excluded, 7314 records are left for the purpose of computing the TI-BPI, which is a re-scaled average of the answers of question 7, according to the following formula:

(A1) $$TI-BPI_i = 10 - 2.5 \cdot (average(Q7^i) - 1) \quad , i = 1, \dots , 28$$

where *i* represents one of the 28 countries listed as possible (and non-exclusive) answers for Question 6, and $average(Q7^i)$ is the average of the answers to Question 7, for all answers concerning country *i*. Applying such formula, which is not explicitly spelled-out in Transparency International (2011a), allows to replicate exactly the results published there in Figure 1, pg. 5.

Computation of the perception of foreign bribery by sector (Transparency International 2011a; Figure 4, page 15)

Transparency International (2011a) also publishes a measure of the "perceptions of foreign bribery by sector" (which I denote here as TI-BPI-SEC). However, such measure can hardly be seen as a measure of *foreign* bribery, as the following explanation indicates.

The following questions (Transparency International 2011b) are relevant for the computation of the TI-BPI-SEC.

Part C – Bribe payers by sector

Please answer these questions in relation to the sectors you have business relationships with, in this country or abroad:

8. In your principal line of business, with which of the following sectors do you have business relationships with, for example as a supplier, client, partner or competitor?
SHOWCARD OR READ OUT. [TELEPHONE ONLY – I have a list of 19 sectors].
Please select no more than five. ROTATE START. MULTICODE UP TO FIVE SECTORS

Banking and Finance - 1
Real Estate, Property, Business and Legal Services - 2
Heavy Manufacturing (Including industrial machinery, vehicles and building materials)-3
Arms, Defence and Military - 4
Civilian Aerospace - 5
Public Works Contracts and Construction - 6
Information Technology (Computers and Software) - 7
Consumer Services (Retail, Hotels, Restaurants and Leisure) - 8
Light manufacturing (Including food and beverage products and household goods) - 9
Mining - 10

Agriculture - 11
Fisheries - 12
Forestry - 13
Pharmaceutical and Healthcare - 14
Oil and Gas - 15
Utilities - 16
Power Generation and Transmission - 17
Telecommunications and Equipment - 18
Transportation and Storage - 19

9. For each of the sectors you have a relationship with, in your experience, how often do firms in each of these sectors engage in bribery? Please use a scale of 1-5 where 1 means never and 5 means almost always.
READ OUT SECTORS SELECTED AT Q8. SINGLE CODE AGAINST EACH SECTOR
1 (never) –2 – 3 – 4 – 5 (almost always)
Don't know - 6
No answer -7

10. Using the same scale, in your experience, how often do firms in each sector engage in bribery of low level public officials, for example to speed up administrative processes and/or facilitate the granting of licenses?
READ OUT SECTORS SELECTED AT Q8. SINGLE CODE AGAINST EACH SECTOR
1 (never) –2 – 3 – 4 – 5 (almost always)
Don't know - 6
No answer -7

11. Using the same scale, in your experience, how often do firms in each sector use improper contributions to high ranking politicians or political parties to achieve influence?
READ OUT SECTORS SELECTED AT Q8. SINGLE CODE AGAINST EACH SECTOR
1 (never) –2 – 3 – 4 – 5 (almost always)
Don't know - 6
No answer -7

12. Using the same scale, in your experience, how often do firms in each sector pay or receive bribes from other private firms?
READ OUT SECTORS SELECTED AT Q8. SINGLE CODE AGAINST EACH SECTOR
1 (never) –2 – 3 – 4 – 5 (almost always)
Don't know - 6
No answer -7

The sectoral index computed by Transparency International is then "an average of the answers to three questions in the Bribe Payers Survey" (Questions n. 10, 11, and 12). Each person is allowed to assess more than one sector (see Question n. 8), resulting in a total of 8591

observations. Re-scaling is performed as in the case of the general index (see above). The average of the answers to those three questions is then averaged over all the available (8591) observations, separately for each of the 19 sectors contemplated in Question 8:

(A2) $$TI-BPI-SECT_j = 10 - 2.5 \cdot \left(average\left((Q10 + Q11 + Q12)/3 \right)^j - 1 \right) \quad , \text{i} = 1, \ldots, 19$$

where *j* represents one of the 18 sectors listed as possible (and non-exclusive) answers for Question 8, and $average\left((Q10 + Q11 + Q12)/3 \right)^j$ is the average of all answers concerning sector *j*, of the average answer to Questions 10, 11 and 12. The result of these computations is very similar, but not identical, to what is reported in Transparency International, Figure 4, pg. 15 (see Table A1), which could not be replicated exactly.

However, this index, if anything, measures perceptions of sectoral corruption *tout-court* in the country where the interviews are done, but not of "foreign" bribery. Please note again that Question 8 ("*In your principal line of business, with which of the following sectors do you have business relationships with, for example as a supplier, client, partner or competitor?")* generically asks about perceptions of corruption in a given sector, with no reference to *international* bribery proper. To build a more meaningful index of international bribery by sector, using the available data, it would be more appropriate to use instead the answers to questions 7 and 8, that is, the same that are used to compute the country wide index TI-BPI (equation A1 above). First, I adopt equation (A1), but I apply it separately to the distinct sectors of the economy. The relevant formula is the following:

(A3) $$LP-BPI-SECT_j = 10 - 2.5 \cdot \left(average\left(Q7 \right)^j - 1 \right) \quad , j = 1, \ldots, 19,$$

where $average\left(Q7^i \right)$ represents the average to Question 7 for each one of the 19 sectors listed as possible (and non-exclusive) answers for Question 8. In this way, the index is computed separately for the sectors, and irrespective of country. Table A1 shows TI-BPI-SECT and LP-BPI-SECT. They are only weakly, and not significantly, positively correlated (Pearson correlation = 0.1242; Spearman rank correlation = 0.086).

Appendix B – The computation of the BPCI

Equation (4) in the main text of the paper, which I report below as equation B1, expresses the

$BPCI_z$ in its general terms:

$$(B1) \quad BPCI_z = \frac{\sum_{i=1}^{N} cases-obs-FO_{i,z}}{\sum_{i=1}^{N} E\left(cases-obs-FO_{i,z}\right)} \cdot 100 \quad , \quad i \neq z$$

where $cases-obs-FO_{i,z}$ is the number of cases involving public officials in country *i* that were enforced first in that (foreign) country, whereas *z* is the country whose firms' propensity to corrupt abroad we desire to measure. The expression of the denominator might be interpreted as the total number of cross-border corruption cases involving country *z* firms, first enforced in the country of residence of the corrupt public officials, that could be observed if the level of corruption of firms were the same in all countries. More specifically, the denominator is the total number of cases which could be observed if cases of corruption were distributed according to the ratio of exports of country *i* to *z* ($X_{i,z}$) with respect to the total amount of country *i* exports to the rest of the world:

$$(B2) \quad \sum_{i=1}^{N} E\left(cases-obs-FO_{i,z}\right) = \sum_{i=1}^{N} \frac{X_{iz}}{\sum_{j=1}^{N} X_{ij}} \sum_{j=1}^{N} E\left(cases-obs-FO_{ij}\right)$$

As in Escresa and Picci (2017a), I also develop a "composite" version of the index, which is the one computed and commented upon in the present research. It differs from the formulation of Equation (B1) (Equation 4 in the main text of the paper) because it considers cases that were first enforced not only in the foreign country (that of the corrupt public officials), but also in all other countries except *z* – that is, in all 3rd country jurisdictions:

$$(B3) \quad BPCI_z^{ALL} = \frac{\sum_{i=1}^{N} cases-obs-FO_{i,z} + \sum_{w=1}^{D} \sum_{i=1}^{N} cases-obs-OTH_{i,z}^{w}}{\sum_{i=1}^{N} E\left(cases-obs-FO_{i,z}\right) + \sum_{w=1}^{D} \sum_{i=1}^{N} E\left(cases-obs-OTH_{i,z}^{w}\right)} \cdot 100$$

with $i \neq j$, $w \neq i$, D is the number of third countries that first enforced cases. The

denominator now considers cases first enforced in third countries:

$$\sum_{w=1}^{D}\sum_{i=1}^{N} E(cases-obs-OTH_{i,z}^{w}) = \sum_{i=1}^{N} \frac{X_{iz}}{\sum_{w=1}^{D}\sum_{j=1}^{N} X_{ij}} \sum_{j=1}^{N} E(cases-obs-OTH_{ij}^{w})$$

As is true for the *PACI* in Escresa and Picci (2017a), the interpretation of the $BPCI_z^{ALL}$ is conceptually the same as that of the $BPCI_z$ (Equation B1), but the former considers all cases of observed cross-border corruption, first enforced either in the foreign country, or in any third country jurisdictions.

I also define $Pr-zero-cases_z^{BPCI}$, the probability that zero cases are observed, conditional on the probability of firms bribing abroad being equal in all foreign countries. It is equal to:

(B4) $$Pr-zero-cases_z^{BPCI} = Pr\left(\sum_{i}^{N} cases-obs-FO_{i,z} | Pr-corr-HQ_z = c\right)$$,

where $Pr-corr-HQ_z$ is the underlying probability that a firm offers a bribe when entertaining a cross-border transaction. It is the mirror concept of $Pr-corr-FO_z$, and it might be computed as the product of individual probabilities, as explained in Escresa and Picci (2017a, Appendix A). There it is also shown that under a set of assumptions, the PACI is valid, in the sense that it increases as the underlying probability of corruption increases. The same concepts carry over to the present context. In particular, the condition of validity is:

Definition: The BPCI is valid if $\partial BPCI_z / \partial pr-corr-HQ_z > 0$, and Assumptions 1 in Escresa and Picci (2017a), as adapted to the present context, is as follows:

Assumption 1

The probability that a corrupt transaction involving firms from country *i* and public officials in country *j* is observed and first enforced in country *j* does not depend on the identity of the home country *i*:

$$pr-obs-FO_{i,j} = pr-corr-FO_j$$

Assumption 2, 3 and 4 are identical to the ones in Escresa and Picci (2017a, Appendix A).

Given their assumptions 1,2,3 and 4, straightforward manipulations lead to prove the following:

Proposition 1. The $BPCI_z$ is valid: $\partial BPCI_z / \partial pr - corr - HQ_z > 0$

Assumptions 1–4 guarantee that the BPCI is valid in the sense that higher levels of probability of corruption of foreign public officials results in a higher value for the index.

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Tables and Figures

Table 1. TI-CPI and country rankings, Spain.

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
TI-CPI	7.0	7.1	7.1	6.9	7.1	7.0	6.8	6.7	6.5	6.1	6.1	6.2	65	59	60	58	58
Rank	20	22	20/23	23/24	22/23	23	23	25	28	32	30	31	30/31	40	37	36	41/43
N. of countries	90	91	102	133	146	159	163	179	180	180	178	183	174	177	175	168	176

Notes. Source: TI-CPI, http://www.transparency.org/research/cpi/overview. Starting from 2012, the TI-CPI is reported on a 0-100 scale, instead than the previously used 0-10 scale. Lower values of the TI-CPI, and a higher rankings, correspond to higher levels of perceived corruption. The rank is on the ordered list comprising all countries considered in a given year, whose number is reported in the last row. Multiple entries (in 2002, 2003, 2012 and 2016) indicate ties.

Table 2. Cases of cross-border corruption, 2000 – 2014. By headquarters country.

Country	Total Cases	Positive Cases	Ongoing Cases
Switzerland	51	41	9
France	50	26	24
United States	38	13	22
United Kingdom	34	13	17
Germany	28	15	12
China	27	12	15
Netherlands	19	8	10
Japan	18	12	6
Spain	17	3	2
Australia	12	7	5
Canada	12	5	6
Sweden	11	2	9
India	8	5	2
Brazil	7	0	6
Israel	7	5	2
Italy	7	1	5
Russia	6	1	3
Austria	5	0	5
Bermuda	5	1	0
Chile	5	1	4
Czech Republic	5	0	5
Korea	5	3	2
Singapore	4	3	1
Portugal	3	1	1
Turkey	3	1	2
South Africa	3	1	2
United Arab Emirates	2	1	1
Argentina	2	1	0
Virgin Islands, British	2	1	1
Angola	1	0	0
Bangladesh	1	1	0
Belgium	1	0	1
Bulgaria	1	1	0
Denmark	1	0	1
Estonia	1	1	0
Ghana	1	1	0
Hong Kong	1	1	0
Ireland	1	0	1
Iran	1	0	1
Iceland	1	1	0
Jamaica	1	1	0
Luxembourg	1	1	0
Ukraine	1	1	0
Venezuela	1	0	1
Totals	411	192	184

Notes: The headquarters country is where the firm in question is based. Cases are those first enforced in the foreign country (where public officials are located) or in any third-country jurisdiction. Positive cases refer to cases that were concluded with a judgment in favor of the prosecution or a settlement. Ongoing cases are those that are still pending. The dataset is an updated version of the one described in Escresa and Picci (2017a).

Table 3. Measures of corruptions.

Country	BPCI	Pr Zero Cases	Rank BPCI	TI-BPI, 2011	Rank TI-BPI	Rank difference	PACI	TI-CPI, 2011	BPCI Residuals
Saudi Arabia	0.000	0.000	1	7.409	22	21	206.425	4.387	.
Taiwan	0.000	0.001	2	7.500	21	19	30.658	6.136	.
Malaysia	0.000	0.002	3	7.579	18	15	116.621	4.307	.
Indonesia	0.000	0.010	4	7.092	25	21	599.452	3.028	-2.049728
Mexico	0.000	0.024	5	7.045	26	21	38.322	2.971	-2.326024
Poland	0.000	0.043	6	.	.	.	119.645	5.482	-2.507127
Honk Kong	10.093	0.000	7	7.596	17	10	21.576	8.400	-1.25084
Belgium	12.016	0.000	8	8.733	3	-5	4.081	7.487	-1.696523
Un Arab Emirates	24.172	0.000	9	7.292	23	14	142.503	6.823	.
Korea	31.009	0.000	10	7.862	13	3	44.235	5.356	-0.4495715
South Africa	31.803	0.000	11	7.635	15	4	121.134	4.080	1.186226
Russia	33.706	0.000	12	6.105	28	16	356.315	2.449	-0.0689593
Singapore	37.247	0.000	13	8.340	9	-4	15.694	9.167	.
Italy	42.744	0.000	14	7.613	16	2	25.871	3.907	-0.5069304
Argentina	43.043	0.010	15	7.283	24	9	486.545	2.996	1.22858
Turkey	43.961	0.001	16	7.536	20	4	103.115	4.207	1.399771
China	54.026	0.000	17	6.493	27	10	202.128	3.636	0.9412785
Brasil	68.722	0.000	18	7.669	14	-4	187.020	3.774	1.057022
India	73.082	0.000	19	7.539	19	0	257.315	3.099	2.336116
Japan	79.736	0.000	20	8.629	4	-16	3.200	8.041	-0.8283028
Germany	90.120	0.000	21	8.607	5	-16	3.394	8.046	-0.1831808
USA	93.996	0.000	22	8.099	10	-12	19.504	7.136	-1.155588
Austria	134.778	0.024	23	.	.	.	48.281	7.787	0.5619816
Spain	201.476	0.000	24	7.983	12	-12	9.344	6.230	0.8272495
Netherlands	209.442	0.000	25	8.837	1	-24	3.888	8.894	0.8912636
Australia	227.045	0.005	26	8.512	6	-20	0.000	8.844	0.342043
Canada	246.761	0.008	27	8.505	7	-20	0.000	8.672	-0.1947864
Sweden	275.908	0.019	28	.	.	.	0.000	9.298	0.888895
France	291.643	0.000	29	8.011	11	-18	11.058	7.005	0.5486628
UK	323.106	0.000	30	8.345	8	-22	0.000	7.775	0.4308908
Switzerland	818.169	0.002	31	8.760	2	-29	0.000	8.802	0.5775824

Notes. Source of the data: BPCI: my computations; TI-BPI: my computations using data collected by Transparency International (see Appendix A); PACI: my computations using methodology illustrated in Escresa and Picci (2017a) and an updated version of their database; TI-CPI: Transparency International, http://www.transparency.org/cpi2011/. *Pr Zero Cases* is $Pr-zero-cases_z^{BPCI}$ (see Appendix A). Ranks are computed on the subset of countries for which both the BPCI and the TI-BPI are available. *BPCI Residuals* are the residuals of the OLS regression of Column (1) of Table 5.

Table 4. Correlation between different indexes of corruption.

	Pearson Correlation			Spearman Rank Correlation		
	log(BPCI)	TI-BPI	TI-CPI	log(BPCI)	TI-BPI	TI-CPI
log(BPCI)	1			1		
TI-BPI	0.5051 0.0061	1		0.6256 0.0004	1	
TI-CPI	0.4832 0.0092	0.8295 0.0000	1	0.4598 0.0138	0.8331 0.0000	1
log(PACI)	-0.5629 0.0018	-0.8432 0.0000	-0.8577 0.0000	-0.6262 0.0004	-0.8615 0.0000	-0.8396 0.0000

Notes. N = 28 in all cases (only countries for which both the BPCI and the TI-BPI are available have been considered; see Table 3). P-values are reported below each estimated correlation. Source of the data: see notes to Table 3. For the purpose of computing Pearson correlations, the logged BPCI and PACI have been used. When the BPCI equals zero, it has been set equal to 1 + $Pr-zero-cases_z^{BPCI}$ in order to compute its log, while attributing lower rankings for countries for which more information is available.

Table 5. OLS regression results. Dependent variable: log(BPCI).

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GDP per capita	47.944*** (11.642)	29.523 (18.523)	33.823 (23.047)	53.070** (23.544)	40.122** (16.520)	27.838* (13.769)	47.975*** (12.146)	45.863*** (11.442)
Capitalization/ Gdp ratio (2006)	1.021** (0.418)	1.023** (0.461)	0.996** (0.424)	1.055** (0.495)	0.962** (0.449)	1.109** (0.429)	1.089** (0.427)	1.048** (0.425)
TI-BPI (2011)		0.446 (0.500)						
TI-CPI (2011)			0.152 (0.215)					
log(PACI)				0.063 (0.228)				
Individualism					0.105 (0.134)			
Power distance						-0.328** (0.140)		
Masculinity							-0.185** (0.087)	
Uncertainty avoidance								-0.152 (0.134)
Constant	1.883** (0.706)	-0.969 (3.571)	1.441 (0.947)	1.503 (1.717)	1.529 (0.742)	4.252 (1.026)	2.774 (0.698)	2.821 (1.103)
N	26	23	26	26	26	26	26	26
R^2	0.509	0.500	0.517	0.510	0.521	0.565	0.540	0.538
Adjusted R^2	0.466	0.421	0.451	0.443	0.456	0.505	0.477	0.475

Notes. GDP per capita is Gross domestic product per capita, expressed in current U.S. Dollars and at market exchange rate (source: IMF World Economic Outlook, October 2016; variable NGDPDPC). Capitalization/GDP ratio: my computation, using World Bank's country data on stock market capitalization of listed firms (see see: http://data.worldbank.org/indicator/CM.MKT.LCAP.CD). For a descriptions of the other variables, see the notes to the previous Tables, and the main text of this article. Asterisks indicate statistical significance at the 10% , 5%, 1% level, using robust standard errors, which are reported in parentheses.

Table 6. Correlation between different index of corruption and regression residuals.

	log(BPCI)	BPCI residuals	TI-BPI (2011)	TI-CPI (2011)
BPCI residuals	0.7010 0.0000 26	1		
TI-BPI (2011)	0.5078 0.0058 28	-0.0127 0.9541 23	1	
TI-CPI (2011)	0.5051 0.0038 31	-0.0357 0.8624 26	0.8302 0.0000 28	1
log(PACI)	-0.5814 0.0006 31	0.0245 0.9054 26	-0.8406 0.0000 28	-0.8472 0.0000 31

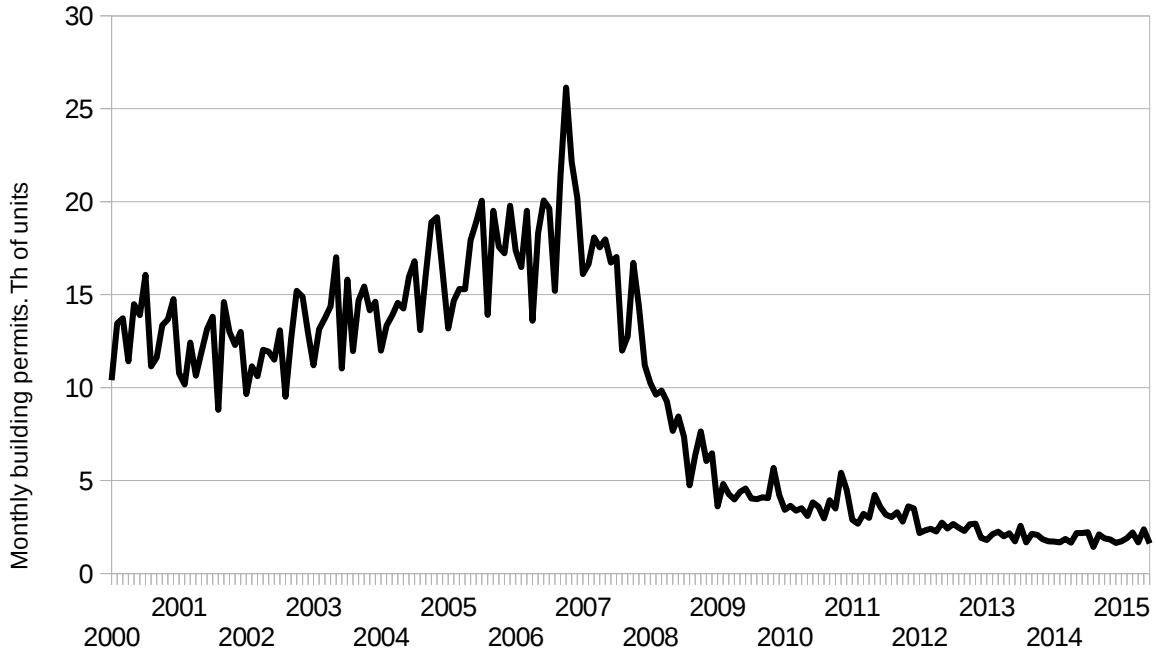
Notes. Pearson correlations, p-values, number of observations. *BPCI residuals* are the residuals of the baseline regression of Table 5, columns (1), and they are reported in the right-most column of Table 3. Sources of the data: see notes to previous Tables, and the main text of this article.

Table A1. TI-BPI-Sect and LP-BPI-Sect.

Sector Code	TI-BPI-Sect	LP-BPI-Sect
Civilian aerospace	7.012195	8.912213
Agriculture	7.045765	7.885802
Banking and finance	6.931176	7.617188
Consumer services	6.788643	7.795519
Arms, defense and military	6.508772	6.600000
Fisheries	6.504329	8.258427
Forestry	6.91358	7.790698
Heavy manufacturing	6.494445	8.172489
Information technology	6.97065	7.592308
Light manufacturing	7.090884	7.940948
Mining	6.086956	8.606558
Oil and gas	6.163979	8.515038
Pharmaceutical and healthcare	6.375227	8.068400
Power generation and transmission	6.355634	6.448864
Public works contracts and construction	5.327768	7.629758
Real estate, property, legal business services	6.126761	7.405583
Telecommunications	6.724255	7.090909
Transportation and storage	6.677928	8.551625
Utilities	6.113388	7.185315

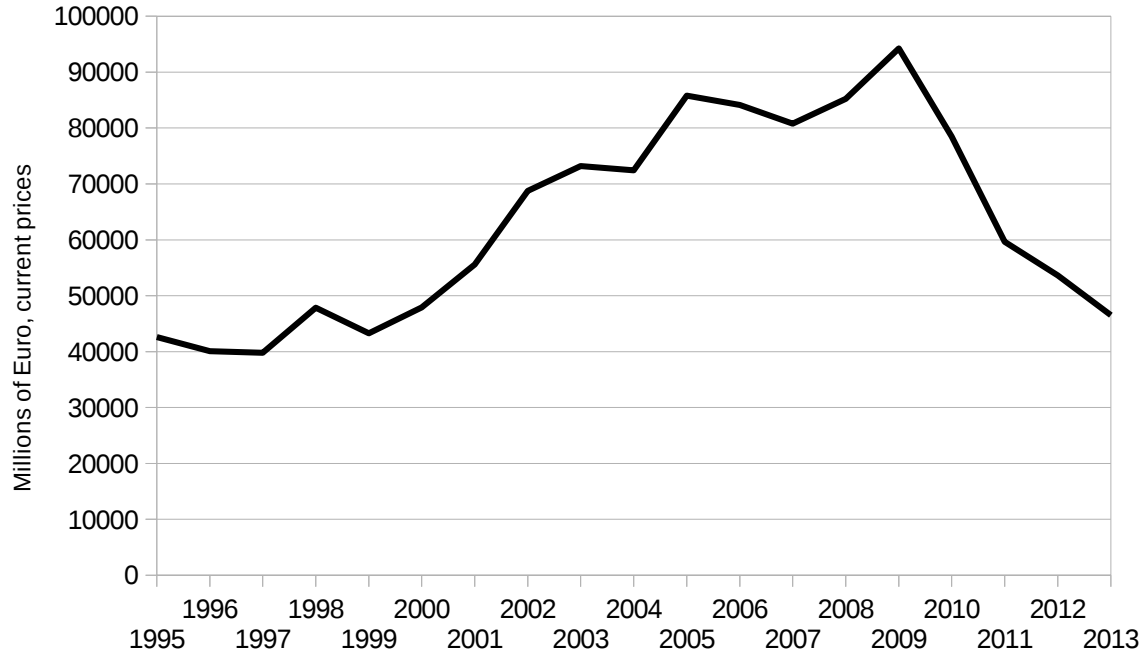
Note. See Appendix A for details on the computation of TI-BPI-Sect and LP-BPI-Sect.

Figure 1 – Monthly building permits by Spanish municipalities. Thousand of units.



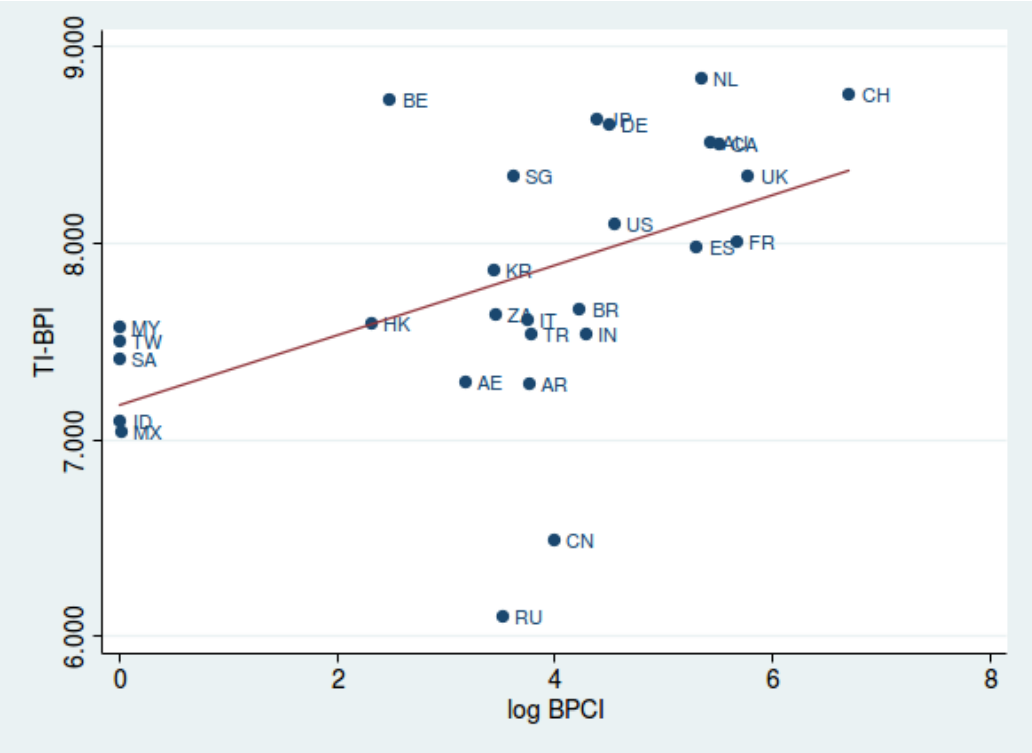
Notes. Building permits, Spanish municipalities (*Edificios*, *Licencias de los ayuntamientos*). Monthly data, millions of square meters. Source: *Instituto Nacional de Estadistica – Estadisticas de la contrucción*. http://www.ine.es/dynt3/inebase/index.htm?type=pcaxis&path=/t38/bme2/t07/a081&file=pcaxis.

Figure 2 – Yearly expenditures in road construction and maintenance, Spain.



Notes. Road construction and maintenance spending, million Euros, current prices. Source: OECD, https://data.oecd.org/transport/infrastructure-investment.htm.

Figure 3 – Log of the BPCI and TI-BPI (2011), with OLS regression line.



Notes. The BPCI is increasing in levels of corruption, while the opposite holds for the TI-BPI. See notes to Table 4 on cases when the BPCI equals zero.