APPENDIX A

Adaptation of the method for the computation of the Public Administration Corruption Index to the case of groups of countries

The basic adaptation of the formula of the index (equation 1 in Escresa and Picci, 2015a) that is needed in order to compute that index for groups of countries, does the following: the number of observed cases, and of expected cases, which concur to the computation of the formula for the index, are summed within subregions of countries, and then those sums are used to compute the index at the subregional level. Its values represent multiples of a benchmark of one hundred, corresponding to a world average of sort. The index has a zero lower bound, which obtains when there is no detected corruption, and no upper bound whereby corruption is an arbitrary multiple of the 100 benchmark – corresponding to a world average of sort. To clarify, the index is illustrated below for individual countries (equation 1 in Escresa and Picci, 2015a), to which the reader is referred to for further details:

\[
PACI_z = \frac{\sum_{i=z}^{W} \text{cases-obs-HQ}_{iz}}{\sum_{i=z}^{W} E(\text{case-obs-HQ}_{iz})} \cdot 100 \text{ with } i \neq z. \tag{1}
\]

The index refers to a generic country \(z\); \(\text{cases - obs - HQ}_{iz}\) denotes observed cases involving firms headquartered in \(i\) and public officials in country \(z\), which are enforced first in the headquarters’ country \(i\). The index for country \(z\) compares the total number of observed corrupt transactions involving country \(z\)’s public officials and firms headquartered in a given country \(i\), for all \(i \neq z\), that were first enforced in \(i\), with the expected number of similar transactions that would be observed if their spatial distribution reflected bilateral trade shares between country \(i\) and \(z\) – the expression in the denominator.\(^{33}\)

Shortly, it will be illustrated how such expected number is determined in the present context (expression 3 below).

To compute the PACI for groups of countries, the necessary aggregation of the relevant variables has to be performed (Escresa and Picci, 2015b). Equation 1 becomes:

\[
PACI_{r} = \frac{\sum_{i=v}^{W} \sum_{v=r}^{W} \text{cases-obs-HQ}_{iv}}{\sum_{i=v}^{W} \sum_{v=r}^{W} E(\text{case-obs-HQ}_{iv})} \cdot 100 \text{ with } i \neq v \text{ for all } v \text{ belonging to subregion } r. \tag{2}
\]

The index refers to a generic subregion \(r\), composed by \(N_r\) countries. The interpretation of the symbols is otherwise the same as above. The \(PACI_{r}\) for subregion \(r\) compares the total number of observed corrupt transactions involving public officials in any country belonging to the subregion \(r\), and firms headquartered in a given country \(i\), for all \(i \neq v\), that were first enforced in \(i\), with the expected number of similar transactions that would be observed if their spatial distribution reflected bilateral trade shares between country \(i\) and countries belonging to subregion \(r\).

The numerator, \(\sum_{i=v}^{W} \sum_{v=r}^{W} \text{cases-obs-HQ}_{iv}\), is the total number of observed corrupt exchanges between officials from any country \(v\) belonging to subregion \(r\) and firms from all \(i\) headquarters’ countries, enforced in those countries.

\(^{33}\) See expression 2 in Escresa and Picci (2015a). In fact, the formula adopted for the computation of PACI is its so-called “composite” version of the index, corresponding to Equation 3 in Escresa and Picci (2015a). It represents a generalization of Equation 1 above, which shows the adaptation of PACI to our present needs not to unnecessarily complicate our presentation.
The denominator is the total number of cross-border corruption cases involving public officials from any country \( w \) belonging to subregion \( r \), and firms headquartered and first enforced in country \( i \), if cases of corruption were distributed in each country according to \( \frac{\sum_{w=1}^{N_r} X_{iw}}{\sum_{j=1}^{X_{ij}} X_{ij}} \), which is the ratio of exports of country \( i \) to \( v \), to the total amount of country \( i \) exports to the rest of the world:

\[
\sum_{i=1}^{N} \sum_{v=1}^{V} E(\text{case – obs – HQ}_w) = \sum_{i=1}^{N} \sum_{v=1}^{V} \frac{X_{iw}}{\sum_{j=1}^{X_{ij}} X_{ij}} \sum_{j=1}^{X_{ij}} \text{case – obs – HQ}_j
\]

(3)

The denominator represents the total number of cross-border cases involving any \( v \) country belonging to subregion \( r \), and first pursued elsewhere, that we’d expect to observe if the level of corruption of public officials were the same in all countries. Under this hypothesis, the numerator would be equal to the denominator, and the expected PACI would be equal to 100. The lowest value that the index may take is zero, which corresponds to the case where no corrupt occurrences are observed.

As in Escresa and Picci (2015a, 2015b), for the purpose of computing the subregional PACI, a more comprehensive formulation is adopted, which also considers cases first enforced in third-country jurisdictions. The following equation corresponds, for the case of subregions, to equation (3) in Escresa and Picci (2015a):

\[
PACI_{r}^{All} = \frac{\sum_{i=1}^{N} \sum_{v=1}^{V} \sum_{w=1}^{N_r} \text{cases–obs–HQ}_w + \sum_{i=1}^{N} \sum_{v=1}^{V} \sum_{w=1}^{N_r} \text{cases–obs–HQ}_w}{\sum_{i=1}^{N} \sum_{v=1}^{V} \sum_{w=1}^{N_r} \text{cases–obs–HQ}_w + \sum_{i=1}^{N} \sum_{v=1}^{V} \sum_{w=1}^{N_r} \text{cases–obs–HQ}_w}
\]

(4)

The interpretation of the \( PACI_{r}^{All} \) is conceptually the same as that of the \( PACI_{r} \), (Eq. 1), but it considers all available cases of observed cross-border corruption, first prosecuted either in the country where firms are headquartered or within the jurisdictions of third countries. This is the version of the index that is used in this report.