Behind the curtain: an empirical analysis of corporate opacity across countries and sectors worldwide to assess money laundering risks

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ABSTRACT

Beneficial ownership (BO) transparency is a pillar of the global anti-money laundering (AML) regime and is deemed as a key measure to combat financial crimes. The Financial Action Task Force (FATF) assesses countries' BO transparency in terms of technical compliance with two Recommendations (R.24 and R.25) and of effectiveness by looking at Immediate Outcome 5. Beyond FATF statutory evaluations, what is the actual level of corporate opacity across countries? What do empirical data on corporate ownership tell us? This paper addresses these questions by undertaking a groundbreaking analysis of over 100 million firms and 1.9 billion owners in more than 130 countries globally. It operationalizes the concept of corporate *opacity* through five indicators which measure the level of ownership complexity, shareholding anomalies, prevalence of legal arrangements and legal persons, and lack of BO information. It correlates these indicators with socio-economic and financial variables, and with the same FATF mutual evaluations' scores. Results reveal, among other things, that the countries which receive better FATF scores on BO transparency show instead generally higher corporate opacity values. These insights can enhance understanding of ML risks and support improvements in BO transparency solutions, including the design and implementation of more complete and effective BO registers.

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1. INTRODUCTION

The transparency of beneficial ownership has become a pillar of the global anti-money laundering (AML hereinafter) regime, and a key item of the agenda of institutions, policy-makers and civil society organizations worldwide. Beneficial owners (BO/BOs hereinafter) of a legal entity can be defined, in summary, as the natural person(s) who ultimately own or control that legal entity. However, a single universal definition of BO is lacking, and several nuances shall be taken into account when approaching this concept (Hexner et al., 2023). Generally speaking, it is presumed that identifying the BOs of a legal person (e.g. a limited company) or of a legal arrangement (e.g. a trust or a foundation) involved in a financial transaction can help to ascertain whether the funds entailed have an illicit origin, or whether corporate structures are employed to conceal criminal – or unethical – activities. In this light, the transparency of beneficial ownership is considered as a fundamental tool to prevent money laundering, corruption, fraud and other forms of financial crime; and at the same time an instrument to guarantee a more fair and equal allocation of resources. Conversely, opacity of corporate entities is deemed as a risk factor facilitating money laundering and other illicit behavior. As a result, high levels of corporate opacity in a country would entail higher money laundering risk.

One of the solutions which have been proposed, and implemented, in recent years for achieving BO transparency is the establishment of beneficial ownership registers, i.e. repositories in which firms have to declare their BOs. Numerous countries worldwide, including the entire European Union (with some exceptions[2]) and the United States have set up some form of BO register (Fraiha Granjio et al., 2023; Knobel et al., 2018). Registers differ very widely in terms of structure, content, format, and publicity of the information on BOs (see Open Ownership blog on this, or Transparency International, 2021 for what concerns the EU). Generally speaking, especially after the judgment of the European Union Court of Justice in November 2022, registers are not public. They can be accessed by competent authorities and, in some circumstances, by obliged entities (banks, financial institutions, professionals, etc), but not by the public at large.[3]

The BO register is one of the possibilities which the Financial Action Task Force (FATF hereinafter), i.e. the global AML watchdog (in its own words), recommends for achieving good corporate transparency. The FATF has devoted to this issue two of its 40 Recommendations, i.e. Recommendation 24 (devoted to the transparency and beneficial ownership of *legal persons*), and Recommendation 25 (on *legal arrangements*), and one out of its 11 Immediate Outcomes (IO), namely IO5[4]. Recommendation 24 (R.24) has been recently revised, and R.25 is under revision.[5] Countries are assessed by FATF on the basis of R.24, R.25 and IO5, and, on average, they are not performing very well (see below). However, these evaluations are based only *statutory* assessments and for this reason they have been criticized by scholars and practitioners.

What is instead the *actual* level of corporate opacity across countries? What do empirical data on corporate ownership tell us? This paper addresses this question. It does so through an innovative analysis of the ownership structure of an unexplored sample of more than 100 million firms in more than 200 countries. This would represent, currently, the largest-ever conducted investigation of the ownership structure of firms at global level, and the first systematic empirical assessment of corporate opacity across the globe.

[2] In Italy the registry has not yet become operational.

[3] According to Open Ownership, some exceptions exist, e.g. Canada, Nigeria, South Africa and, to some extent, the United Kingdom.

[4] "Legal persons and arrangements are prevented from misuse for money laundering or terrorist financing, and information on their beneficial ownership is available to competent authorities without impediments".

[5] In a nutshell, the new R.24 provide tougher rules for BO transparency and asks for a "multi-pronged" approach towards BO transparency, including adequate access to BO information to all authorities (achieved through a BO registry or an equivalent system), stricter disclosure requirements for existing bearer shares and nominee arrangements and a solid understanding of the risks related to legal persons and arrangements in the country, which will require exhaustive risk assessment initiatives. See more on this in the conclusions.

Providing an empirical analysis of corporate opacity would help gaining a more solid understanding of the risk of misuse of legal persons and legal arrangements – and therefore of money laundering risk, as also clearly required by the revised Recommendation 24 – but would also help to support FATF evaluations, and to highlight areas for improving the solutions envisaged to date to foster BO transparency, first of all BO registers.

2. BACKGROUND AND RESEARCH QUESTIONS

FATF assessments of beneficial ownership transparency

The presence of two recommendations (R.24 and R.25) and one immediate outcome (IO5) means that countries globally are assessed by the FATF both in terms of their *Technical Compliance* and in terms of *Effectiveness* on BO transparency. According to the latest FATF assessment of consolidated risk ratings stemming from the 4th round of mutual evaluations (FATF, 2022), countries do not perform well in this domain. Only about 50% of the jurisdictions rank as 'Compliant' or 'Largely Compliant' to R.24 and R.25, and the fraction of those having 'High' or 'Substantial' effectiveness is very tiny (9%). These scores are much lower than average scores achieved by countries in other domains evaluated by FATF.

An analysis of more updated FATF ratings (as of August, 2023) on 155 countries performed by the authors confirms the same results. Jurisdictions have an average IO5 score of 19.7% (where 100% is 'High Effectiveness'), and, in terms of technical compliance, an average score for R.24 and R.25 respectively of 45.2% and 48.6% (where 100% is 'Compliant').[6] The average score between these three metrics (which we may call *BO_Mean*) is 37.8% across all countries. Table 1 below reports the countries grouped in four clusters on the basis of their *BO_Mean* score according to the criteria set out in the table.

Table 1 – FATF assessments of BO transparency

Average score between IO5, R.24 and R.25 FATF ratings (*BO_MEAN*)	**Countries and ISO Code**
HIGH (>50%)	GB - United Kingdom (77.8%), CU – Cuba, IT – Italy, FR – France, ES – Spain, PL – Poland, SG – Singapore, AM – Armenia, IL – Israel, PY – Paraguay, BM – Bermuda, GI – Gibraltar, MO – Macao, RU – Russia, NO – Norway, DK – Denmark, CZ - Czech Republic, SA - Saudi Arabia, AT – Austria, NL – Netherlands, BE – Belgium, RS – Serbia, CH – Switzerland, SK – Slovakia, AD – Andorra, AG - Antigua and Barbuda, KG – Kyrgyzstan, FI – Finland, IE – Ireland, SE – Sweden, GT – Guatemala, TR – Turkey, SI – Slovenia, BH – Bahrain, CY – Cyprus, MT – Malta, GR – Greece, EC – Ecuador, MX – Mexico, IS – Iceland, TT - Trinidad and Tobago, LT – Lithuania, QA – Qatar, KY - Cayman Islands, UY – Uruguay, VA - Vatican City, LI – Liechtenstein, BS – Bahamas, DO - Dominican Republic (55.6%)
MID-HIGH (>=33.3%, <=50%)	ET – Ethiopia (50%), DE – Germany, UA – Ukraine, CV - Cape Verde, RO – Romania, KR - South Korea, TJ – Tajikistan, MN – Mongolia, NZ - New Zealand, VU – Vanuatu, HU – Hungary, TW – Taiwan, AE - United Arab Emirates, HR – Croatia, BY – Belarus, EG – Egypt, HK - Hong Kong, DM – Dominica, AL – Albania, JM – Jamaica, CO – Colombia, LV – Latvia, UZ – Uzbekistan, KZ – Kazakhstan, SM - San Marino, ID – Indonesia, SC – Seychelles, CR - Costa Rica, PK – Pakistan, TN – Tunisia, ZW – Zimbabwe, BB – Barbados, BT – Bhutan, CL – Chile, MR – Mauritania, NI – Nicaragua, PT – Portugal, GE – Georgia, SN – Senegal, MY – Malaysia, MK - North Macedonia, AW – Aruba, EE – Estonia, JP – Japan, KN -

[6] All the jurisdictions assessed by FATF Mutual Evaluations as of 24th August, 2023, are measured on the basis of the scores received on their Technical Compliance with R.24 and R.25 and Effectiveness related to IO5 in the latest Mutual Evaluation Report - MER or Follow up Report – FUR. For each of the three dimensions, countries receive from FATF one out of four judgments which may range from low (Effectiveness/Compliance) to High. These scores are transformed in a numeric value, as in Riccardi (2022), which attributes the value 0% to 'Not compliant' or 'Low Effectiveness', and then 33.3%, 66.6% and 100% (where 100% refers to fully 'Compliant' or 'High Effectiveness').

	Saint Kitts and Nevis, MD – Moldova, GH – Ghana, MU – Mauritius, PH – Philippines, PE – Peru, MC – Monaco, BW – Botswana, WS – Samoa (33.3%)
MID-LOW (>0%, <33.3%)	BF - Burkina Faso (22.2%), CG - Republic of the Congo, AU – Australia, CM – Cameroon, FJ – Fiji, GD – Grenada, GM – Gambia, GW - Guinea-Bissau, BG – Bulgaria, MA – Morocco, KH – Cambodia, LC - Saint Lucia, JO – Jordan, ML – Mali, VN – Vietnam, MW – Malawi, KE – Kenya, NE – Niger, SL - Sierra Leone, TG – Togo, TM – Turkmenistan, TH – Thailand, PA – Panama, NG – Nigeria, ZA - South Africa, LK - Sri Lanka, LR – Liberia, NA – Namibia, ZM – Zambia, BD – Bangladesh, HN – Honduras, CN – China, US - United States, MG – Madagascar, PW – Palau, SB - Solomon Islands, SZ – Eswatini, TD – Chad, TO – Tonga, CA – Canada, TZ – Tanzania, MM - Myanmar (Burma) (11.1%)
LOW (0%)	BJ – Benin, CD - Democratic Republic of the Congo, DZ – Algeria, GA – Gabon, HT – Haiti, SR – Suriname, UG – Uganda, VE – Venezuela, MZ – Mozambique, AO - Angola

Note: several countries such as Brazil, India, Argentina, Luxembourg and many others do not appear in the table as they have not yet been evaluated during the 4th round, or were not been evaluated as of 24th August, 2023, date in which consolidated MER/FUR assessments were processed.

Source: Authors' elaborations of FATF data

No jurisdictions show an average score of 100%. Highest score is that of United Kingdom and Cuba (both 77.8%). It is interesting to note that in the first cluster, there are some countries (such as Italy and Switzerland) which, despite some regulatory advancements, do not have yet in place a fully operational BO register.[7] Ten countries have received 0% in all the three dimensions, showing complete *ineffectiveness* and *non-compliance* in terms of BO transparency – according to FATF.

It has to be remarked that evaluations by FATF of BO transparency are made upon statutory judgments of the existence of certain regulations and rules (Nance, 2018; Sharman, 2009). This means, as it often happens with FATF, that these results, especially those related to the effectiveness, are not always corroborated by solid empirical evidence about the actual vulnerabilities and risks (Riccardi, 2022; Littrell, 2021; Halliday et al., 2019). Despite this criticism, FATF scores of R.24, R.25 and IO5 remain at the moment the only available measures of BO transparency across countries, at least the one with the widest coverage and allowing comparisons across states. Other indicators exist (e.g. some sub-indicators of the Financial Secrecy Index of Tax Justice Network) but they are still based on statutory evaluations. What is missing is a measure of BO transparency which could stem from empirical data.

***Measuring corporate* opacity**

But how to measure corporate transparency (or its opposite, corporate *opacity*) in practice? The simple answer would be to check for which portion of the firms registered in a country there is an indication of who are the beneficial owner(s). This is a simplistic option for a number of reasons, some methodological and other more substantial.

First, on the methodological level, we shall distinguish among two types of beneficial owners: (i) those who are officially declared as BOs by firms (or other institutions) and are then reported in BO registers; (ii) those who may be identified as such through an analysis of the entire corporate ownership of a firm. The two BOs may not be coincident (although statistics on the degree of overlap do not exist, at least publicly). If one looks at the first type of BO, the challenge is to access the information. As said, BO registers have been established so far only in a minority of countries worldwide; and in most cases they cannot be employed by researchers, at least for large-scale analyses. According to a recent Open Ownership map[8], only 58 countries have a BO registry, and only 34 of them (58.6%) have a *public* register, which in any case does not mean that data can

[7] In Italy the BO register started collecting data in October 2023, but at the moment it has been suspended until March 2024 due to an appeal of some parties related to an interpretation of BO disclosure obligations upon fiduciaries.
[8] https://www.openownership.org/en/map/, accessed in September, 2023.

be downloaded massively. Often it is only possible to do single queries. Therefore, this metric may be computed, with difficulty, only in a very limited number of jurisdictions for a low number of firms.

Should the second operationalization of BO be employed, a larger coverage would be achieved, given that the almost totality of world countries have a company registry with some company ownership information (directly accessible or accessible through second-hand corporate data providers). However, it would not be always possible to identify the BOs because of the constraints posed by local company law regulations (which, e.g., for certain legal forms, do not foresee the disclosure of ownership information) or simply because the ownership chain would end up with a foreign legal person or arrangement, for which a BO is not reported by the local registry.

There is another reason, more substantial. The concept of *opacity* cannot be summarized uniquely in a dichotomous variable 'BO present/BO absent'. As suggested by the same FATF, by relevant regulations worldwide (see, just as a matter of example, Annex III to the Fifth EU AML Directive), and stressed by a wide literature (e.g. van der Does de Willebois et al., 2011; Knobel & Financial Transparency Coalition, 2022; Tax Justice Network, 2020; Jofre, 2022; Jofre et al., 2021; Aziani et al., 2021; Riccardi et al., 2018), and media investigations (such as *Panama Papers* or *Troika Laundromat*) there are further factors related to corporate ownership which may signal high risk of money laundering. These risk factors are not necessarily related to *who* controls a company, but *how* control takes place (Riccardi, 2022). This becomes crucial given that it is not even possible to say with certainty that the declared BO will be the real one, but a figurehead or a nominee. Let's assume there is a small firm, active in a local market (e.g. a construction company), controlled through several layers of holding firms and legal arrangements, some of them based in off-shore jurisdictions. Even though a BO for this firm were declared in the registry, the presence of these corporate patterns, which appear to be unjustified on the basis of firm size and sector, depict a higher opacity which would suggest a higher risk of money laundering or fraud – to be investigated by AML supervisory authorities, relevant competent authorities or to be addressed in customer due diligence (CDD) by banks or other obliged entities.

For all these reasons, this paper looks at the concept of corporate opacity through several dimensions, which are listed and discussed here below. It has to be remarked that these features are highlighted by the FATF itself as risk factors, either in FATF Recommendations, in FATF guidelines or in its 'Methods and trends' reports (see e.g. FATF, 2006 and especially FATF & Egmont Group, 2018):

- *Complexity:* the use of (anomalously) complex corporate structures is indicated by the FATF as a key money laundering risk factor (FATF, 2022, p. 31). AML Regulations and official guidelines require obliged entities to take into account this element in enhanced customer due diligence.[9] Numerous media investigations and studies (see Bosisio & Jofre, 2022; Knobel & Financial Transparency Coalition, 2022 for a review) have indeed provided evidence about the use of complex corporate structures in corruption, tax evasion, money laundering and sanction circumvention schemes. This paper operationalizes this factor in terms of *vertical complexity* (see below for details).
- *Shareholding anomalies:* one of the criteria suggested for identifying the BO(s) of a legal person is the possession of a fraction of the share capital above a certain threshold (FATF & Egmont Group, 2018). Usually – also recommended by FATF – this threshold is set as of 25% of the share capital (although several countries have a lower one, and others are evaluating if to change this limit on a risk-based approach). Those cases in which there are shareholders possessing a capital share just below the threshold can signal a high money laundering risk, because they may be interpreted,

[9] For example, Annex III of Directive (EU) 2015/849, as amended by Directive (EU) 2018/843, lists the following among higher risk factors: *"the ownership structure of the company appears unusual or excessively complex given the nature of the company's business".*

potentially, as an attempt to avoid BO disclosure. Specifically, in this paper we detect for each firm all those cases in which there are capital shares between 24.9% and 24.99%.[10]

- *Legal arrangements:* Although the use of legal arrangements is fully legitimate in most jurisdictions, and sometimes an historical pattern of a country business culture (see trusts in the UK and British protectorates/former colonies, or foundations – *stichting* – in the Netherlands), evidence about the employment of legal arrangements in financial crime schemes has been highlighted by both journalists and scholars on the basis of several judicial cases, and suggested by the regulation as a risk factor to be taken into account. Again Annex III of the 5AMLD lists *"legal persons or arrangements that are personal asset-holding vehicles"* as one of the triggers for enhanced CDD. In this paper we are able to map the existence of corporate ownership links with legal arrangements.
- *Lack of information on BOs:* in certain (complex) corporate structures it is possible to identify BOs only for a fraction of owners. This may be due to the fact that certain owners are legal persons registered in foreign countries or legal arrangements which do not disclose their BOs. In all these circumstances, the ownership chain stops at a non-natural person, i.e. a BO is not identifiable. Measuring the share of final nodes in ownership chain which are not natural persons is a good indication about the unavailability of BO information.
- *Legal persons owner:* generally speaking, the amount of legal persons among owners of a specific firm, at all the ownership level, is a good proxy of the difficulty of identifying beneficial owners. Indeed, this is not necessarily a symptom of ML risk, but makes the identification of natural persons more challenging and often not feasible.

It is clear that these indicators, per se, may be not necessarily indicative of money laundering. A higher complexity can be more likely for firms active in more capital intensive industries (e.g. pharmaceutical or energy sector). For this reason, appropriate controls shall be applied both when constructing the firm-specific indicators (see next paragraph), and when performing the analysis. The factors therefore become more meaningful when combined together, and when combined with other indicators of anomaly and ML risk beyond corporate opacity.

Among the risk factors which one may look at, is the amount of ownership links with foreign high-risk jurisdictions. The involvement of foreign shareholders in a firm's ownership structure, especially if coming from high-risk regions, is unanimously accepted as an indicator of higher ML risk. However, this driver is not taken into account among the indicators of corporate opacity by this paper due to two issues: (i) first, the understanding of what are 'high-risk jurisdictions' largely varies and depends on the adopted perspective (see Riccardi, 2022, for an in-depth discussion); (ii) second, there is an endogeneity problem, because one of the objective of the paper is exactly to support the determination of the ML risk of a country through mapping its corporate opacity. For these reasons, the ownership exposure towards foreign countries and high-risk jurisdictions is only marginally analyzed.

Aim of this paper

This paper aims at measuring the level of corporate opacity globally by means of an analysis of the risk factors above mentioned for each world country. It explores (a) what are the countries with the highest level of corporate opacity; (b) what are their characteristics, in terms of size, economic structure, corporate tax rate, and rule of law; (c) what is the relationship between the newly calculated measures of corporate opacity and the level of BO transparency as assessed by FATF in its mutual evaluations.

[10] We know that the 25% threshold is not the same in all countries. For example some countries have 10% or 20%. In these cases, anomalous capital share ranges may be those, respectively, between 9.9% and 10%, and between 19.9% and 20%. However, the 25% is a good proxy, and the one suggested by FATF in its R.24 guidelines.

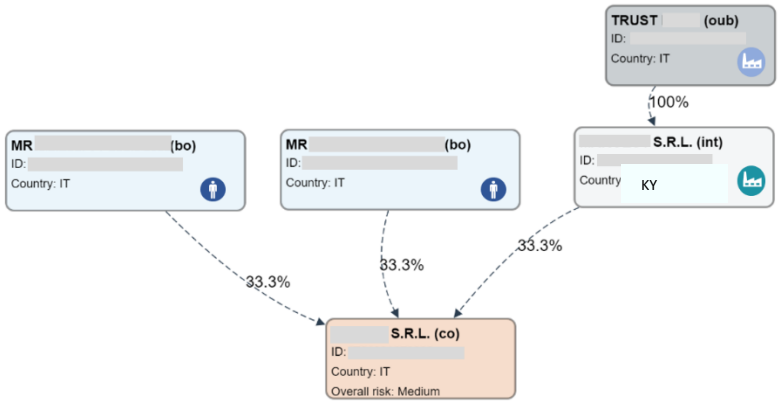
3. METHODOLOGY AND DATA

Methodological approach

For achieving these objectives, we operationalize the factors of corporate opacity above illustrated into firm-specific indicators, which can be then calculated for each firm in a country, and eventually aggregated at country level, so as to obtain country-specific measures of corporate opacity.

Preliminary to this operation, for each firm we reconstruct the entire ownership structure, which means identifying first and further level shareholders, and the BOs, i.e. the natural persons on top of direct or indirect ownership chains. As stated above, they may be different from those declared in official BO registers. We reconstruct the ownership graph by setting a minimum threshold of 3% for any ownership link, so as to get rid of very minor ownership connections and facilitate the reconstruction of ownership trees. We define as BOs those natural persons on top of any ownership chain with a percentage higher than 25% of the share capital[11] although, as said, we also map all natural persons on top of any firm above 3%. In some cases, it is not possible to identify natural persons (and BOs), and the ownership chain ends up with a legal person or arrangement for which no further information on natural persons ultimate owners is available. We can call these entities *other ultimate beneficiaries* (OUB). Also, we reconstruct the full network of first level subsidiaries in which the firm at stake owns any share. We call the owners (either first and further level shareholders, BOs and OUBs) as the *upper* nodes of a corporate network, while the subsidiaries are the *lower* nodes. In Figure 1 below, the firm has four upper nodes: two natural persons (who are BOs, because they are above 25%) from Italy (IT), and two non-natural persons, including a trust (which is a OUB) registered in Italy which controls 100% of an intermediate owner based in the Cayman Islands (KY).

Figure 1 – Example of a corporate ownership structure



For each firm then, a set of five corporate opacity indicators related to the risk factors illustrated in the previous section is calculated, as detailed in the table 2 below.

[11]We identify as BOs also those natural persons who, at the last level of ownership chain, have an unknown/unspecified ownership percentage.

Table 2 – Indicators of corporate opacity

	Variable name	Description
A	*Complexity*	Average distance, intended as the average number of ownership layers, between the firm and its BOs or OUBs (in the case depicted in the figure, it is equal to 1.33 – because we have two BOs with a direct control – equal to 1 – and one OUB with a distance of 2).
B	*Share_anomalies*	Prevalence of upper nodes having an ownership link included in the range [24.9%, 25.0%), encompassing both natural and non-natural persons (In the case depicted in the figure, it is equal to 0)
C	*Legal_arrangements*	Prevalence of upper nodes which are legal arrangements (e.g. trusts, foundations, fiduciaries, funds), including both natural and non-natural persons. In the figure, it is equal to 25%.
D	*Legal_persons*	Prevalence of non-natural persons on all upper nodes. In the figure, it is equal to 50% (2 non-natural persons and 2 natural persons).
E	*Lack_BO*	Prevalence of OUBs on all upper nodes. Where OUB is an ultimate non-natural person node for which it is not possible to identify any natural person or non-natural person on top. In this case, it is equal to 25%.

Alternative specifications of these indicators are calculated. In particular, an alternative indicator of complexity (*complexity_peer*) is also computed by comparing each firm with peers in terms of size and sector, so as to detect only *anomalous* complexity patterns, i.e. those cases in which firms show a complexity which is higher than similar companies and therefore appears not easily justified. As it will be showed in Section 4, the correlation between the two specifications of this indicators is high (>.8), but firms in some countries (such as Sweden, Canada or Japan) show sensibly lower levels of average corporate complexity once we control for peers. Finally, a composite indicator of corporate opacity (*INDEX*) on a scale 0-1 is computed as the average between the five indicators listed in Table 2, after normalizing each of them on a 0-1 feature scaling (min-max).

We calculate also indicators of ownership exposition to foreign jurisdictions and of exposition towards jurisdictions listed in FATF list of 'High-risk jurisdictions subject to a Call for Action' (i.e. the *blacklist*) and in the FATF list of 'Jurisdictions under Increased Monitoring' (i.e. the *grey list*). Both lists are taken in their most updated version (27th October 2023).[12]

Table 3 – Indicators of foreign exposition and exposition towards FATF black- and grey listed jurisdictions

	Variable name	Description
F	*Foreign_exposure*	Prevalence of nodes which are foreign (i.e. non national) among all upper nodes (both natural and non-natural persons)
G	*FATF_GLBL*	Prevalence of nodes which are registered/resident in countries included in FATF grey list or black list among all upper nodes (both natural and non-natural persons)
H	*FATF_GLBL_foreign*	Prevalence of nodes which are foreign (i.e. non national) and are registered/resident in countries included in FATF grey list or black list among all upper nodes (both natural and non-natural persons)

[12] In the October 2023 version, the *black list* included Iran, Democratic People's Republic of Korea and Myanmar; the *grey list* includes Barbados, Bulgaria, Burkina Faso, Cameroon, Croatia, DR of Congo, Gibraltar, Haiti, Jamaica, Mali, Mozambique, Nigeria, Philippines, Senegal, South Africa, South Sudan, Syria, Tanzania, Turkey, Uganda, UAE, Vietnam and Yemen.

Once indicators are calculated for each firm in each country, they are then aggregated at country level by calculating centrality measures (median, mean). In this paper, we use the mean value (but correlation for all indicators between mean and median is above .85).

Data

Data on corporate ownership is collected from the Orbis global database managed by Bureau van Dijk / Moody's Analytics (BvD/MA). This is a corporate data repository which includes both financials and corporate ownership data, and which, as of today, covers more than 200 countries and 400 million firms (including individual enterprises and unlimited companies).[13] Although the repository is updated on a weekly basis, we analyze here a datafeed corresponding to the situation as of 31st December 2021. As suggested by previous studies (see for example Aziani et al., 2021), the quality and coverage of BvD/MA data differs across countries. The coverage – intended as ratio of firms in the Orbis database on the total number of firms registered in the country – widely varies (although it is rapidly increasing in most countries). And also the percentage of firms, of those recorded in Orbis, which have ownership information available. On average, in our dataset at least one ownership link is available for 94.9% of the firms in the dataset, but this figure varies across countries. For example in the United States it is 76%, and in France 56%. Differences may be due to local company law requirements, gaps of the local company registries, different agreements of BvD/MA with local data providers and registries. It is not possible to establish a single rule and whether the different availability of ownership data can impact in terms of corporate opacity scores.[14] But for sure this element must be taken into account when interpreting the results (see Section 5 for a discussion of this point). Despite these discrepancies in terms of data coverage, this is the best dataset one could employ nowadays for carrying out a comparative analysis of corporate ownership structures worldwide. No (feasible) alternatives are available, unless one collects data for each and every company register in the world, combine and standardize it – i.e. the same exercise which MA/BvD Orbis has done for the last 20 years.

Eventually, in this preliminary analysis, indicators are calculated over a dataset of more than 103.5 million firms from 208 jurisdictions worldwide (98.2 million firms having at least one ownership link available). We took all the firms provided by Orbis for each country, without carrying out any sampling. The distribution of firms largely varies. Countries on top are China (27.9 million firms), the United States (12.8 million), Russia (6.8), Brazil (5.7) and Italy (5.4 million). However, (i) for about 520 thousands firms there is no indication of the country of incorporation, and therefore we exclude them; and (ii) 74 countries have less than 1000 firms represented in the sample. For this reason, the dataset is reduced to those 133 countries having more than 1000 firms (and 500 firms with ownership data); and most of the analyses are carried out on further filtered datasets – namely by setting a minimum amount of 2000 and 5000 firms with ownership data – so as to focus only on those countries with representative and meaningful samples of firms. Some descriptive statistics on the number of firms and nodes analyzed are provided in Table 3 below.

The reconstruction of the entire ownership graph for firms in the sample is very challenging from a computational perspective. Just to provide a tangible figure, the 103.5 million firms in the dataset correspond to around 1.9 billion of *upper* ownership nodes and 16.7 million *bottom* nodes. For processing the entire dataset, we employed a dedicated last-generation 80 CPU server equipped with 40GB RAM running for two full days.

[13] The reason of the difference between our 103 million firms analyzed by this paper and the 400 million firms in Orbis is that (a) we analyzed a dataset updated as of 31st December 2021, meanwhile Orbis has increased its coverage and (b) we focused on limited companies, while Orbis includes also data on individual enterprises and unlimited firms.

[14] It may be possible, for example, that in certain countries with low number of firms, only larger companies may have ownership information available, and this can obviously impact in terms of complexity values, therefore biasing the analysis.

Table 4 – Dataset coverage

	Filter	*N. Firms (million)*	*N. Upper nodes (billion)*	*N. countries*
Original dataset	None	103.5	1.86	208
Whole sample	>=1000 firms AND >500 firms with ownership data;	97.8	1.84	133
Sample > 2000	>=2000 firms with ownership data	97.8	1.83	111
Sample > 5000	>=5000 firms with ownership data	97.7 M	1.82	103

Note: in the three samples (basis, >2000, >5000) about 520 thousands firms are excluded because not associated to any country.

Source: Authors' elaboration

4. RESULTS

Corporate opacity across countries. Descriptive statistics

Table 5 below reports some descriptive statistics over the whole sample of the five indicators of corporate opacity (plus *complexity_peer*, the alternative indicator of complexity controlled for peer size and sector). Indicators are generally highly correlated among themselves, with *Complexity, Legal_arrangements* and *Legal_persons* having a Pearson's correlation higher than .8 (Spearman's correlation higher than .9). The only indicator showing weaker Pearson's correlation (but still positive and significant) with the rest is *share_anomalies*, which however increases when filtering the dataset on the 2000 and 5000 firms threshold.

Table 5 – Corporate opacity indicators. Descriptive statistics

	Indicator	Obs.	*Mean*	*Std. Dev.*	*Min*	*Max*
A	Complexity	133	1.50	.692	1.0	3.50
A-bis	Complexity_peer	133	1.78	.924	1.0	4.17
B	Share_anomalies	133	0.04%	.00049	3.60e-06 %	0.27%
C	Legal_arrangements	133	4.29%	.056	0.001%	18.78%
D	Legal_persons	133	10.21%	.151	0.008%	78.17%
E	Lack_BO	133	28.89%	.298	0.03%	93.33%

Source: Authors' elaboration of BvD/MA Orbis data

Table 6a and 6b report the 15 jurisdictions ranking highest in terms of values of the 5+1 corporate opacity indicators. When looking at *complexity*, Sweden, Indonesia and Marshall Islands show an average complexity higher than 3: it means that, on average, between a target firm and its BOs (or OUBs) there are at least 2 layers of intermediate owners. Other six countries have an average distance higher than 2, i.e. they have one intermediate shareholder on average. However, after controlling for firms' size and sector, some countries – such as Sweden, the Netherlands and Canada – get out from the top ranking while others – such as Papua Nuova Guinea, Panama or Iran – increase their ranking. Austria ranks first in terms of shareholding anomalies: on average, the 0.23% of the owners of Austrian firms control a percentage of the share capital included between 24.9% and 24.99%, which may suggest an attempt to elude BO identification obligations. Similar values are those of Malta, Portugal and Lesotho. To be noted that among the top 10 countries, six are members of the European Union – for which the 25% is indeed the threshold suggested by the AML regulation (at least until the entry into force of the new AMLA Regulation and Directive in 2024).

Table 6a – Corporate opacity indicators/A. Top 15 jurisdictions

Rank	Complexity		Complexity_peer		Share_anomalies	
	Country	Value	Country	Value	Country	Value
1	SE – Sweden	3.50	MH – Marshall Islands	4.0	AT – Austria	0.23%
2	ID – Indonesia	3.22	PG – Papua New Guinea	3.7	MT – Malta	0.20%
3	MH – Marshall Islands	3.0	KY – Cayman Islands	3.6	PT – Portugal	0.19%
4	KY – Cayman Islands	2.46	ID – Indonesia	3.6	LS – Lesotho	0.19%
5	VG – British Virgin Islands	2.45	VG – British Virgin Islands	2.8	FR – France	0.13%
6	NL – Netherlands	2.36	IR – Iran	2.7	CY – Cyprus	0.13%
7	CA – Canada	2.34	PA – Panama	2.7	IN – India	0.12%
8	PH – Philippines	2.29	JP – Japan	2.6	UA – Ukraine	0.08%
9	JP – Japan	2.18	NG – Nigeria	2.5	LU – Luxembourg	0.07%
10	KZ – Kazakhstan	1.86	KE – Kenya	2.5	EC – Ecuador	0.07%
11	IL – Israel	1.61	IN – India	2.3	MH – Marshall Islands	0.06%
12	LU – Luxembourg	1.52	PE – Peru	2.2	MU – Mauritius	0.06%
13	PE – Peru	1.51	LU – Luxembourg	2.2	KY – Cayman Islands	0.06%
14	MX – Mexico	1.51	MU – Mauritius	2.1	TH – Thailand	0.06%
15	MT – Malta	1.36	MT – Malta	2.0	CO – Colombia	0.05%

Notes: only those countries with at least 5000 firms with ownership data are reported in the table. [a]The value of complexity_peer shall not be read as complexity, but is an indicator scaled 1-5 where 5 = highest value

Table 6b – Corporate opacity indicators/B. Top 15 jurisdictions.

Rank	Legal_arrangements		Legal persons		Lack_BO	
	Country	Value	Country	Value	Country	Value
1	KY – Cayman Islands	16.6%	KZ – Kazakhstan	78%	SE – Sweden	93%
2	NL – Netherlands	15.0%	NL – Netherlands	73%	NL – Netherlands	93%
3	JP – Japan	13.8%	US – United States	67%	KZ – Kazakhstan	91%
4	MH – Marshall Islands	13.4%	SE – Sweden	64%	JP – Japan	87%
5	ID – Indonesia	13.1%	ME – Montenegro	64%	CA – Canada	84%
6	VG – British Virgin Islands	11.0%	CA – Canada	53%	IR – Iran	80%
7	IR – Iran	10.6%	BA – Bosnia Herzegovina	43%	MH – Marshall Islands	76%
8	CA – Canada	9.0%	JP – Japan	38%	US – United States	75%
9	MX – Mexico	8.0%	UZ – Uzbekistan	34%	ID – Indonesia	74%
10	LU – Luxembourg	7.7%	ZA – South Africa	24%	KY – Cayman Islands	70%
11	ZA – South Africa	7.0%	BE – Belgium	22%	ME – Montenegro	65%
12	NZ – New Zealand	6.9%	AR – Argentina	18%	VG – British Virgin Isl.	62%
13	PH – Philippines	6.9%	GR – Greece	16%	ZA – South Africa	48%
14	PE – Peru	6.6%	MH – Marshall Islands	16%	BA – Bosnia Herzegovina	48%
15	CY – Cyprus	4.3%	LU – Luxembourg	15%	LU – Luxembourg	43%

Note: only those countries with at least 5000 firms with ownership data are reported in the table

Source: Authors' elaboration of BvD/MA Orbis data

The Netherlands show high values also in relation to the other indicators of corporate opacity (Table 6b). Among the upper nodes (i.e. both direct and indirect owners) of Dutch firms, 15% are legal arrangements such as trusts, foundations, funds or fiduciaries. It is not possible – at this stage – to determine exactly the type of arrangement involved, but, as already highlighted by previous research, it may be attributed to the widespread use of *stichting*, i.e. Dutch foundations, which, despite being part of the Dutch corporate culture, may also expose the country to high money laundering risks (Riccardi, 2022, p. 114; OECD, 2019, pp. 25-27). High values of *legal_arrangements* can be reported also for Cayman Islands, Japan, Marshall Islands and BVI, due to the high number of trusts and investments funds. New Zealand has a high prevalence of legal arrangements: they represent 6.9% of the owners of local firms, but 72% of all non-natural person owners. The percentage of upper nodes which are legal persons (*legal_persons*) is above 70% in the Netherlands and Kazakhstan, but is also higher than 60% in the United States, Sweden and Montenegro. This per se is not necessarily (or not only) a measure of ML risk, but indeed makes it more difficult to identify BOs. Not by

chance, the high prevalence of legal persons and legal arrangements increases the share of other ultimate beneficiaries (OUBs), i.e. the non-natural person owners for which it is not possible to identify any natural person or non-natural person on top.

Table 7 below reports the top 20 countries in terms of composite indicator of corporate opacity (*INDEX*), calculated, as said, as the average (normalized min-max on a 0-1 scale) of the five indicators listed in Table 2: (a) *Complexity;* (b) *Share_anomalies*; (c) *Legal_arrangements;* (d) *Lack_BO;* (e) *Legal_persons.*

Table 7 – Value and rank of corporate opacity index (INDEX)

Whole sample (133 countries)			***Sample >= 2000 (111 countries)***			***Sample >= 5000 (103 countries)***		
Rank	***Country***	***Value***	***Rank***	***Country***	***Value***	***Rank***	***Country***	***Value***
1	NL - Netherlands	1.00	**1**	NL - Netherlands	1.00	**1**	NL - Netherlands	1.00
2	AO - Angola	0.99	**2**	SE - Sweden	0.93	**2**	SE - Sweden	0.92
3	NA - Namibia	0.95	**3**	JP - Japan	0.86	**3**	JP - Japan	0.86
4	SE - Sweden	0.94	**4**	MH - Marshall Isl.	0.84	**4**	MH - Marshall Isl.	0.84
5	ZW - Zimbabwe	0.92	**5**	ID - Indonesia	0.84	**5**	ID - Indonesia	0.84
6	BB - Barbados	0.88	**6**	CA - Canada	0.83	**6**	CA - Canada	0.83
7	CW - Curaçao	0.85	**7**	BM - Bermuda	0.82	**7**	KY - Cayman Islands	0.79
8	JP - Japan	0.85	**8**	LR - Liberia	0.79	**8**	KZ - Kazakhstan	0.72
9	MH - Marshall Isl.	0.83	**9**	KY - Cayman Isl.	0.79	**9**	VG - British Virgin Isl.	0.64
10	HN - Honduras	0.83	**10**	KZ - Kazakhstan	0.73	**10**	US - United States	0.54
11	ID - Indonesia	0.83	**11**	TN - Tunisia	0.71	**11**	IR - Iran	0.52
12	CA - Canada	0.83	**12**	LK - Sri Lanka	0.66	**12**	MT - Malta	0.49
13	MM - Myanmar	0.82	**13**	VG - British Virgin Isl.	0.64	**13**	LU - Luxembourg	0.48
14	GI - Gibraltar	0.82	**14**	SC - Seychelles	0.64	**14**	ME - Montenegro	0.45
15	BS - Bahamas	0.81	**15**	PK - Pakistan	0.57	**15**	ZA - South Africa	0.43
16	BM - Bermuda	0.81	**16**	US - United States	0.55	**16**	MX - Mexico	0.42
17	MO - Macao	0.80	**17**	IR - Iran	0.52	**17**	CY - Cyprus	0.41
18	BW - Botswana	0.80	**18**	MT - Malta	0.49	**18**	PH - Philippines	0.40
19	MZ - Mozambique	0.79	**19**	LU - Luxembourg	0.48	**19**	PE - Peru	0.37
20	LR - Liberia	0.78	**20**	ME - Montenegro	0.45	**20**	IN - India	0.37

Source: Authors' elaboration of BvD/MA Orbis data

Corporate opacity and country characteristics

We analyze the relationship between the measures of corporate opacity above calculated and the following relevant contextual variables:

- *Population:* population (average 2012-2021). Source: World Bank
- *GDP:* gross domestic product (average 2012-21) expressed in current international USD, converted by purchasing power parity (PPP) factor. Source: World Bank
- *Bank_credit:* domestic credit to private sector by banks (% GDP), average 2012-2021. This can be read (as in Riccardi, 2022) as a measure of financial specialization of a country. Source: World Bank
- *Corp_tax_rate:* level of statutory corporate income tax rate, inclusive of sub-central government corporate income tax rate. Year 2021. Source: OECD
- *Rule_law:* level of rule of law, percentile rank (0-100, where 100 = max rule of law), average 2012-2021. This captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Source: World Bank WGI
- *Control_corruption:* level of control of corruption, percentile rank (0-100, where 100 = max control of corruption), average 2012-2021. Source: World Bank WGI

Table 8 – Spearman's correlation between corporate opacity indicators and contextual variables

	Complexity	*Share_ anomalies*	*Legal_ arrangement*	*Legal_ persons*	*Lack_BO*	*Population*	*Control_ corruption*	*Rule_law*	*Corp_tax _rate*	*GDP*	*Bank_ credit*
Complexity	1										
Share_anomalies	0.7012**	1									
Legal_arrangements	0.9176**	0.7100**	1								
Legal_persons	0.8512**	0.5456**	0.8147**	1							
Lack_BO	0.6565**	0.3932**	0.6435**	0.9201**	1						
Population	0.0335	0.1637	0.117	0.0617	0.0568	1					
Control_corruption	0.5524**	0.2629*	0.4882**	0.3795**	0.2144	-0.2654*	1				
Rule_law	0.5248**	0.2698*	0.4882**	0.3362**	0.1644	-0.2805*	0.9575**	1			
Corp_tax_rate	0.2604*	0.3722**	0.3167**	0.1454	0.0429	0.5006**	0.0296	0.0231	1		
GDP	0.2387*	0.2866*	0.3107**	0.1787	0.1053	0.9001**	0.0604	0.0465	0.4294**	1	
Bank_credit	0.3565**	0.2306*	0.3746**	0.203	0.0842	-0.0206	0.6603**	0.7223**	0.1253	0.2302*	1

Note: ** significant at .99; * significant at .95. Correlation calculated among the 103 countries having at least 5000 firms with ownership data

Countries showing higher degree of corporate opacity (as measured through our indicators, except *lack_BO*) generally show higher control of corruption and rule of law (Table 8). Also positive (but weaker) correlation can be observed between three indicators and *bank_credit:* higher levels of complexity, of shareholding anomalies and higher prevalence of legal arrangements are found in jurisdictions characterized by a greater size of the financial sector as % of GDP. No or weak correlation can be observed with country population and GDP, while a positive correlation can be seen between three indicators and (statutory) corporate tax rate – although one may expect the opposite.

Table 9 below reports average values of the contextual variables across three clusters of countries grouped according to their value of the composite indicator of corporate opacity (INDEX).[15] Again, significant differences can be observed for *Rule_law, Control_corruption* and *Bank_credit* but not for the rest. When clustering the other indexes (on whole sample and on sample >=2000), results appear even less significant.

Table 9 – Average values of contextual variables by cluster of corporate opacity index

	Corporate opacity Index value		
Contextual variable	**HIGH**	**MEDIUM**	**LOW**
Population (million)	78.5	113.0	55.1
GDP (billion)	1,950	2,020	1,080
Bank_credit	88.7%	72.7%	72.3%
Corp_tax_rate	23.9%	23.9%	20.3%
Rule_law	75.2	68.2	63.1
Control_corruption	77.2	63.9	60.2

Note: the three clusters are calculated using k-means hierarchical clustering applied on INDEX_5000, which is the composite indicator of corporate opacity for those countries having at least 5000 firms with ownership data

Corporate opacity indicators and FATF evaluations of BO transparency regimes

Figure 2a below shows the correlation matrix (Spearman's) among the aforementioned opacity indicators with the scores stemming from FATF mutual evaluations of IO5, R.24, and R.25 (and their average, *BO_mean*). Also, we compute the average score attributed by FATF in relation to the 11 Immediate Outcome – IOs (*Effectiveness_mean*), the 40 FATF Recommendations (*Compliance_mean*), and the average between the latter two (*FATF_mean*).[16] While the opacity indicators, as said, show high correlation among themselves, the

[15] The three clusters are calculated using k-means hierarchical clustering applied on INDEX_5000, which is the composite indicator of corporate opacity for those countries having at least 5000 firms with ownership data.

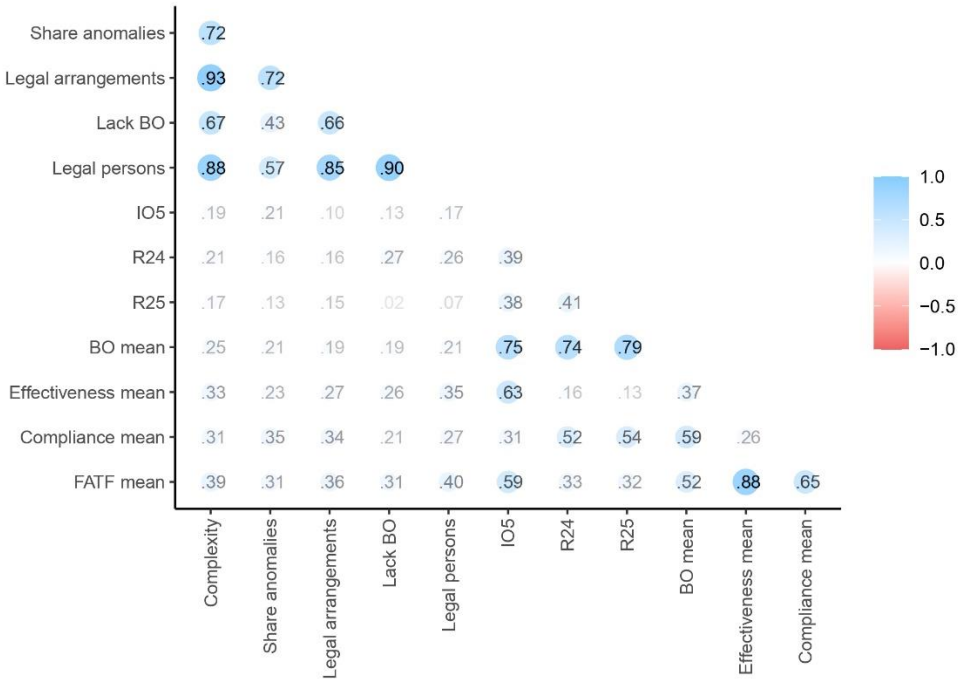
[16] The operationalization is the same adopted for IO5, R.24 and R.25, where 100% means fully 'Compliant' or 'High Effectiveness' and 0% means 'Not compliant' or 'Low effectiveness'.

correlation with FATF scores is weaker, but still positive. In other words, countries which, according to FATF, have the highest Technical Compliance and Effectiveness in the area of BO transparency, show slightly higher levels of opacity according to the five indicators here presented. The correlation is higher with the country ranks related to Recommendation 24 and *BO_mean*, while for Recommendation 25 and IO5 is weaker and not always significant. It is instead positive and significant with FATF scores on all IOs (*Effectiveness_mean),* all Recommendations (*Compliance_mean*), and their average scores (*FATF_mean*). Similar results (Table 2b) are obtained when looking at the composite indicator of corporate opacity (*INDEX*), in all its specifications, i.e. on the whole sample, on the sample of countries with more than 2000 and 5000 firms with ownership data.[17]

In the same vein, it would be useful to look at average levels of corporate opacity indicators for the four clusters of countries classified according to their level of BO transparency as assessed by FATF (*BO_mean*), which was illustrated in Table 1. Figure 3 below shows the average values of the five opacity indicators across the four FATF clusters.[18] Generally speaking – but surprisingly - the level of corporate opacity increases with the level of BO transparency as assessed by FATF. This is more evident for some indicators. For example, the level of shareholding anomalies is more than 5 times higher for jurisdictions which are well judged by FATF on IO5, R.24 and R.25 than those which are badly judged. The prevalence of legal arrangements is about 20 times higher. The level of complexity is more than 1.5 times higher.

The figure also shows the amount of ownership links with foreign jurisdictions (*foreign_exposure*), and of exposure to countries included in FATF grey-listed and blacklisted countries (*FATF_GLBL* and *FATF_GLBL_foreign*), as described in Table 3. Here the patterns are not clear as above, and would deserve further investigation.

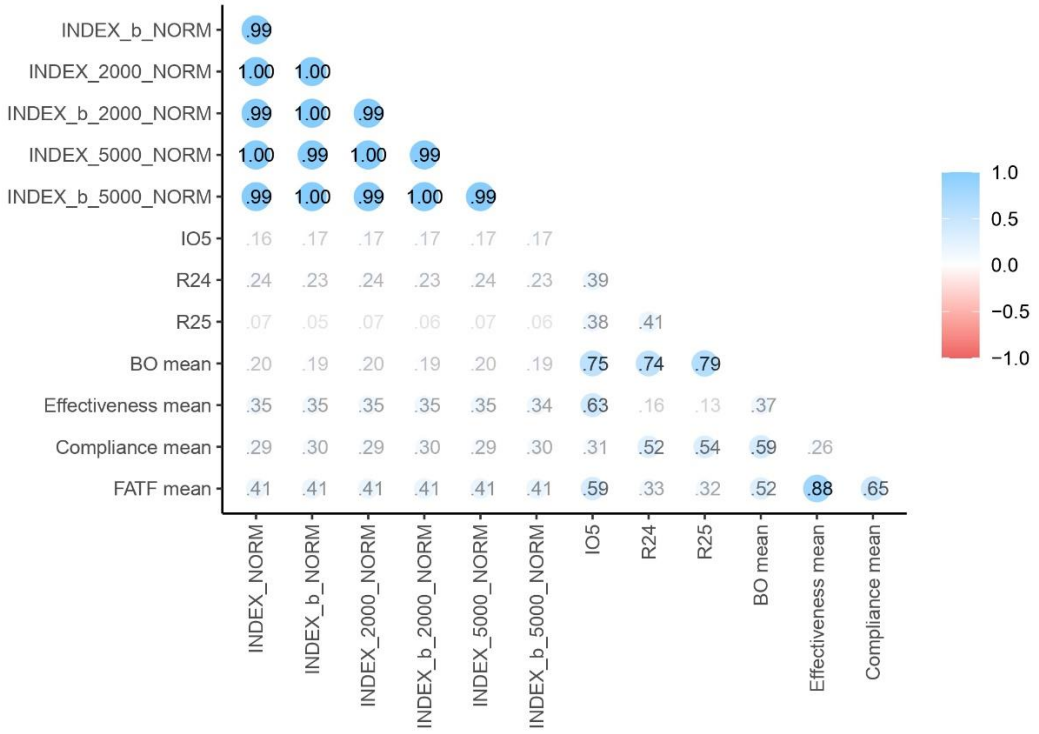
Figure 2a – Spearman's Correlation matrix between opacity indicators and FATF scores



[17] All *INDEX_b* specifications refer to indexes calculated without including the *Legal_persons* indicator.

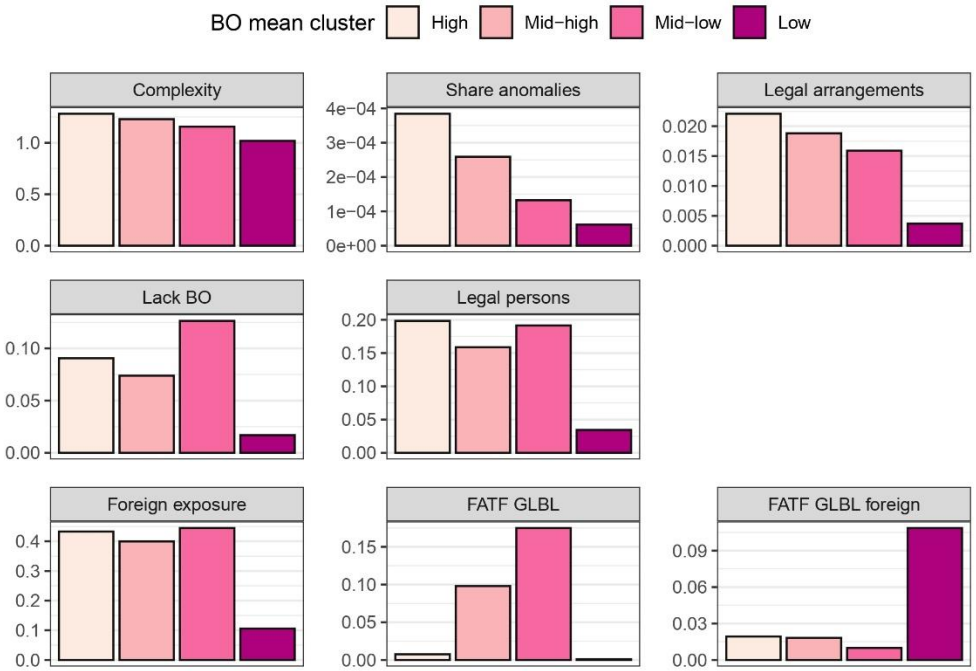
[18] The Figure reports the values for the sample including countries with at least 5000 firms with ownership data.

Figure 2b – Spearman's Correlation matrix between corporate opacity index and FATF scores



Source: Authors' elaboration of BvD/MA Orbis and FATF data

Figure 3 – Corporate opacity indicators and FATF scores on BO transparency



Source: Authors' elaboration of BvD/MA Orbis and FATF data

5. DISCUSSION AND CONCLUSIONS

The analysis above illustrated represents the first large-scale investigation of corporate ownership patterns across firms worldwide. Albeit preliminary, it offers some interesting findings about how corporate opacity distributes across countries and sectors, and about the challenges in measuring it.

How to interpret corporate opacity scores in the light of FATF judgments?

First, one may expect higher values of corporate opacity for those countries which receive negative judgments by FATF on their BO transparency requirements, but the analysis instead does not confirm this hypothesis - and it even reveals the opposite. How to explain this result? A possible interpretation is that the two sets of metrics – the five indicators developed by this paper, and the FATF assessment scores – measure two different things. Indeed technical compliance, as stressed by many authors (see above), is a *statutory assessment*: the FATF judges whether a country has implemented a certain regulation and to what extent this regulation complies with FATF recommendations (in this case, R.24 and R.25). This has nothing to do with measuring *actual risk*. The two measures can be absolutely unrelated. Or one can even assume a form of causality: when a country detects higher risks, it can introduce stricter rules, and therefore can demonstrate greater compliance. This may explain the direction of the correlation observed in this paper.

This is true, but only to a certain extent. In 2013, FATF has introduced the *effectiveness* concept, which has become the second pillar (or, in order of importance, at least according to FATF statements, the first) on which countries are assessed. The FATF defines effectiveness as *"the extent to which the defined outcomes are achieved"* (FATF, 2013, p. 15). In the specific domain of BO transparency, and therefore looking at Immediate Outcome 5, effectiveness means that *"information on their [i.e. firms'] beneficial ownership is available to competent authorities without impediments"* (text of IO5). An effective system in this area is the one in which measures are in place, among other things, to *"make legal persons and arrangements sufficiently transparent"* (FATF, 2023, p. 110). How is it possible that jurisdictions judged as 'effective' allow significant fractions of firms to have owners just below the BO disclosure threshold? Or to be controlled by legal arrangements behind which it is not possible to trace natural persons? And what about the high levels of unjustified complexity of the ownership structure? Or the presence of numerous circular ownership schemes? Aren't all these in fact *"impediments"* (in FATF wording) to the capacity of competent authorities to easily identify beneficial owners?

Are these really measures of corporate opacity?

A second objection would be that the indicators developed by this paper are not measures of *opacity*, but of something else. For example, some may argue that high ownership complexity can be the result of some sort of corporate disorganization. Byzantine ownership graphs can be the result of unruly M&A processes and of the lack of good consultants able to trim down and rationalize the business structure. Other argue that complexity depends on the sectors in which firms operate: in capital-intensive industries such as the pharmaceutical or the energy one, complexity may be higher due to the greater prevalence of foreign investors and of holding companies. As a result, those countries which have a higher exposure towards these industries can show on average higher complexity scores. But here some indicators of complexity (*complexity_peers*) are also calculated, for each firm, by taking into account the peers of similar size and active in the same sector, in order to detect *anomalous* (or unjustified) complexity.

The analysis of the correlation between corporate opacity indicators and contextual variables do not reveal always clear patterns: the level of corporate opacity is slightly higher for countries which show higher financial specialization (measured through the volume of bank credit as % of GDP), which may suggest a role of these jurisdictions as financial hubs. However, one may expect also a negative correlation with corporate tax rate, which instead is weakly positive or not significant although it can be questioned whether the chosen measure (the *statutory* rate provided by OECD) is fully appropriate for gaining an actual picture of the corporate tax

level in a country. Correlation is positive between corporate opacity and the level of control of corruption and rule of law, as assessed by World Bank's WGI. Again, one could expect here the opposite behavior, because lack of corporate transparency is usually associated to higher levels of corruption, 'state capture' and misallocation of public funds for private gain, or at least an instrument to carry out corruptive or collusive schemes (see, among others, van der Does de Willebois et al., 2011). However, it is also true that, from a pure ML risk perspective, several scholars demonstrated that the countries which are particularly attractive for laundering dirty funds are those which offer good chance to conceal the illicit origin of the money but at the same time are stable, have good rule of law and, ceteris paribus, low levels of corruption (see among others Riccardi, 2022).

For sure, it would be necessary, to combine ownership opacity metrics with other red-flags. For example, if a firm is controlled through an anomalously complex structure, and, at the same time, does show accounting patterns of fictitious economic activity (e.g. high variance of assets or turnover with low or null cash flows, odd figures or rounding), then it is more likely that those ownership patterns are symptomatic of higher financial crime risk. Calculating more nuanced indicators at micro level, and then aggregating them at country level, could help better detecting actual ML risks.

How can opacity indicators be employed for understanding and assessing country ML risks?

Recommendation 24, especially it its new formulation, heavily stresses the need that countries shall assess the risks related to the misuse of their legal persons/legal arrangements for designing more effective and appropriate mitigating measures. Specific legal person-oriented risk assessment exercises should be undertaken at the national level, or this topic shall be addressed by the already available ML/TF National Risk Assessment (NRAs) reports. However, according to FATF mutual evaluations, most countries either do not perform risk assessment, or they base their evaluations only on few anecdotal case studies.

For example, let's look at FATF evaluations of two countries, Algeria and Mozambique. They both received from FATF the lowest score (Not Compliant) for R.24 and R.25, and the lowest score (Low Effectiveness) for IO5. But in fact according to our corporate opacity indicators they show very different patterns: Mozambique ranks 19th out of 133 countries (see Table 7), while Algeria has the lowest corporate opacity risk score in the dataset. Nevertheless, the judgments received by FATF in terms of their (in)capacity to detect risk were quite similar. For Algeria: *"Algerian authorities did not identify, assess, and understand the vulnerabilities of legal persons and the extent to which legal persons created in the country can be or are being misused for ML/TF"* (MENA FATF, 2023, p. 110). As a result, the FATF Regional Body recommended: *"Algeria should assess the risks of abusing legal persons for ML/TF to determine how legal persons are abused and identify the level of risks facing them, as well as the type of legal person and activity that is being misused or mostly misused for ML/TF".* In Mozambique (MER was published in 2021), the FATF left similar recommendations: *"Conduct a comprehensive assessment of ML/TF risks to all types of legal persons including foundations and associations created in Mozambique to enable dentification of legal persons likely to be abused and misused for ML/TF purposes. Use the results to build awareness on ML/TF risks associated with legal persons created in Mozambique"* (ESAAMLG, 2021, p. 113). How to conduct this assessment? Especially considering that, at least according to our measures, they have a very different corporate structure environment, very different levels of corporate opacity – and therefore potentially very different levels of risk?

The FATF should suggest more concretely to countries a variety of indicators and data to be taken into account in this exercises.[19] This paper has developed some metrics which may be employed in these internal risk assessments, and which can provide more solid empirical support for the evaluation exercise. Also, the

[19] Also the World Bank has drafted a handbook for legal persons risk assessment, which however is not always based on objective and easy-to-replicate proxies.

adoption of objective indicators may help FATF assessors to evaluate more easily countries and carry out comparative analyses across space and time.

Opacity indicators and AML mitigation policies: improving (and moving beyond) BO registries

This paper suggests that, especially while waiting for a full set of BO information to be deployed through BO registries, it is necessary to move beyond *who* controls/owns a company to look at *how* ownership deploys and take place. In other words, the paper suggests that BO registries alone would not be sufficient for achieving BO transparency in a country, or at least to ascertain the level of BO transparency.

We also suggest that certain improvements to BO registries can be implemented. For example, the minimum information contained in BO registries on name/surname of BOs should be supplemented by other information regarding the structure of the corporate network entailed, the distribution of shares, the jurisdictions involved, and others. Also, basic automatic controls may be employed, e.g. at the company registry, for detecting when certain patterns are present whenever a registrant files its information to the repository. This can raise automatic alerts to competent authorities. For example, automatic check on shares distribution could be implemented so as to identify owners of shares just below the BO disclosure threshold, so as to require to firms and their BOs to justify their choice.

Supporting with empirical evidence the design of AML policies

Expanding empirical measures of corporate opacity can help to design more effective policies, or to carry out more solid ex-ante policy evaluations. For example, some civil society actors, such as Tax Justice Network, suggest that governments should consider to prohibit complex corporate structures, or at least should require firms to justify why they have a certain complex structure. Before envisaging such an aggressive measure, it would be necessary to understand the extent of this phenomenon, how it distributes across countries and sectors, and what would be the impact should such a policy be implemented. This paper contributes in this direction. Generally speaking, there is room to strengthen the empirical support to AML policies, AML evaluations by national and international organizations (first of all FATF) on BO transparency – and eventually the 'greylisting' and 'blacklisting' processes.

Limitations and next steps

The paper employs the best dataset which could be used today for an analysis of corporate ownership worldwide, Bvd/MA Orbis. However, this dataset is not exempt from biases and limitations which may affect the results of the analysis, or at least their interpretation. First, it is not always clear to what extent the firms in the countries included in Orbis represent the universe or rather a sample of the locally incorporated firms; in the latter case, how the sampling was designed. Secondly, it is not always possible to understand whether lack of ownership information is due to local company law requirements, or to lack of agreements between Bvd/MA and local corporate registries. These limitations are particularly relevant in smaller jurisdictions, or when the amount of firms is low – reason why in this paper we often focused on those countries having at least 5000 firms with ownership data. Future follow-up analyses should better investigate these patterns, and gaps, although the coverage of Bvd/MA Orbis is rapidly increasing, and although, in the future, official company registers and BO registers will expand their accessibility and new data providers will emerge.

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