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A Social Network Analysis of the Portuguese Connection in Panama Papers

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Abstract. *Panama Papers* refers to a recent scandal of fraudulent financial transactions. This paper presents an economic network analysis of Portuguese companies and individuals with connections to offshore companies. Using Social Network Analysis techniques was possible to characterize the level of connections, the number of communities and the actors that play a central role in the network. We were able to assess the Portuguese network and identify its central actors of the network, i.e., companies with high influence in the network, in which any eventual investigation of legal compliance by Portuguese authorities should be focused on.

1 Introduction

On April 2016, the International Consortium of Investigative Journalists (ICIJ) made available the *ICIJ Offshore* database, containing a huge set of documents known as Panama Papers. The *Panama Papers* are a set of 11.5 million document leaks from Panamanian law company "Mossack Fonseca", which provides information on approximately 360,000 businesses and individuals in more than 200 countries linked to offshore structures and covering a time period of nearly 40 years, from 1977 to 2016.

The *Panama Papers* detail financial information for more than 214K offshores. The scheme used brass plate companies in offshores locations, for tax evasion and sometimes even appearing associated with money laundering among other types of illegal activities. The recent economic and financial crisis in recent years, as well as the ethical issues raised in the use of this type of operations, reinforce the relevance of this theme to the world economy, questioning the paradigms and models of practices of the financial system. This work analyses the existing relationships between Portuguese companies referred in that scandal.

2 Related Literature

A literature review in the context of the present work on network association, aims to give a context about offshores schemes, tax havens and money laundering subjects. These are very important and sensitive themes in the fiscal

and economic literatures. It is not our intention to make a deep literature review in each one of it, instead, we will explain the importance of the scandal Panama Papers and their consequences (i.e.: ethics and moral) nowadays. Chronologically³, taxation is in fact one of the oldest and most elusive fiscal questions plaguing mankind, with various civilizations grappling with the questions in different ways. Particular philosophical breakthroughs in fiscal thinking were recorded among the Babylonians [3], the ancient Chinese [14], Judaic [12], Hindu [10], Roman [1], Islamic [7], and Mongol traditions [9]. Chohan [2] suggests that excessive taxation was often a unifier of resistance against authority, and the notion of hoarding and concealing wealth was almost universally characterized as act worthy of disdain. However, what is the motivation for concealing wealth? One reason is described by Kirchler [6]: *Taxes limit an individuals freedom to make autonomous decisions about his or her income. A person is likely to respond to restrictions on his or her own freedom or perceived restrictions by reactance if opposition is a promising means for re-establishing the initial situation. Reactance as a consequence of perceived limitation of freedom is likely to manifest itself through change of attitudes, tax morale, and tax behaviour.* Other authors, identified three categories of determinants for tax evasion: Demographic (age, gender, education and occupation status), Economic (income level, income source, marginal tax rates, sanctions and probability of detection) and Behavioral (complexity, fairness, revenue authority contact, compliant peers and ethics or tax morale [5, 11]). If the final goal of tax evasion is escape from pay taxes in their countries, what says the global competitiveness index about Portugal regarding taxes? As we can see in the below image, the main problem for doing business in Portugal is exactly the Tax Rates.

This is, probably, why the tax evasion is generally used to set illegal arrangements where liability to tax is hidden or ignored, i.e. the taxpayer pays less tax than he is legally obligated to pay by hiding income or information from the tax authorities [4]. Another illegal strategy is money laundering. Money laundering can be defined as the process of converting black money obtained from illicit sources such as narcotic trafficking, extortion, smuggling and the flesh trade, into legal money. Here, the original source of the money is concealed from the authorities [4]. Esomeme [4], reinforce the objective of money laundering is to allow criminals to access the profits of their illegal conduct by distancing themselves from it. This is where Mossack Fonseca get in. The Mossack Fonseca Company gives the opportunity to gamble against possible detection by the tax authority, by incorporating a legal entity in an offshore jurisdiction, or as it often called tax haven. These jurisdictions provide anonymity to the shareholder identities aside from charging no taxes. As mentioned in Omartian (2016), this anonymity - while not illegal in and of itself - gives the investor the opportunity to avoid reporting the asset or any income derived from it to his or her home countrys tax authority. An anonymous release of internal Mossack Fonseca data, reveals that current and former Heads of State of numerous countries, convicted criminals, entrepreneurs, including known Portuguese entrepreneurs, and countless

³ Here, we follow the master reference [2] and citations there.

Entities		Intermediaries		Officers	
Countries	Rank	Countries	Rank	Countries	Rank
Hong Kong	1	Hong Kong	1	China	1
Switzerland	2	United Kingdom	2	Hong Kong	2
British Virgin Islands	3	United States	3	British Virgin Islands	3
Panama	4	Taiwan	4	Taiwan	4
Jersey	5	Switzerland	5	Jersey	5
Luxembourg	6	Singapore	6	Panama	6
United Kingdom	7	Bahamas	7	United Kingdom	7
Samoa	8	China	8	United States	8
Guernsey	9	Panama	9	Switzerland	9
United Arab Emirates	10	Indonesia	10	Russia	10
(...)	-	(...)	-	(...)	-
Portugal	74	Portugal	52	Portugal	63

Fig. 1. Worldwide ranking by company type

others have been implicated in dealings to avoid taxes in their original countries. These internal documents, known as The Panama Papers (2016) have caused an international uproar by raising legitimate concerns about the low level of transparency involved in the oversight of the finances of the 1% [2]. Table ?? shows the rank by type of company (entities or offshores, intermediaries and officers), with a special reference to the ranking of Portuguese, as a comparison present in the database. To analyse all these connections from and to Portugal, we will use social network analysis techniques with the goal to identify the main mentors of these schemas and how they related to each other.

3 Methodology

The process undertaken to analyse the Panama Papers network, performed the following steps:

- Data Extraction: Collection, familiarization and primary analysis of data made publicly available by ICIJ - The International Consortium of Investigative Journalists.
- Data Preparation: Using a SQL database tool, the information was modelled in order to return the data referring to national companies. The information was extracted to csv format files in order to be used in the Gephi software for the visualization and analysis of the network.
- Modelling: Building and analysing the network in Gephi [15] open source software. The best graphical representation of the network was selected after testing different network spatial visualization algorithms. Using a set of statistics made available by Gephi, a statistical analysis was performed both on the actors present in the network under analysis and on the network itself.

Data Extraction. The "ICIJ Offshore" database, presents the network of relationships between companies and individual people with offshore companies based in tax havens. Consists in a directed and unweighted network based on

commercial registration of all types of companies involved in the scandal and the existing relations type, which are:

- "director of" - referring to the person appointed to the company's management;
- "address" - through which was possible to establish the country origin of the company;
- "shareholder of" - if it holds a stake in an offshore company;
- "intermediary of" - if it mediates companies in access to offshores;
- "similar of" - if the company is related to another company, among other attributes.

The first version of the database was made available in June 2013, having since then been incorporated more sources and information. Most of the data was obtained through information leakage from law firm Mossack Fonseca. The original data was obtained through an anonymous source, by German reporters from the newspaper *Seddeutsche Zeitung*, who asked the collaboration of ICIJ to analyse the information. The mantle of secrecy that involves the relationship between companies located in tax havens and other entities was removed and the real owners of the companies and their country of origin identified. Once we were dealing with a database of information leakage and not supported by official business records, it has some inconsistencies and omissions. The information in the database focuses essentially on the following structures defined by ICIJ:

- "Entity (offshore)": company, trust or fund created in a low-tax, offshore jurisdiction by an agent;
- "Officer": person or company who plays a role in an offshore entity;
- "Intermediary": a go-between for someone seeking an offshore corporation and an offshore service provider - usually a law-firm or a middleman that asks an offshore service provider to create an offshore firm for a client;
- "Address": contact postal address as it appears in the original databases obtained by ICIJ.

The database is publicly available for download on the ICIJ consortium website, in a zip file with five *csv* files. One of the files, provides the relationships and the type of relationships existing between the different entities (companies or individuals) under analysis: "Entity", "Officer" and "Intermediary".

Data Preparation. The information was prepared in order to filter the data that involve Portuguese individuals or companies who are stakeholders or have some involvement in any type of relations. After creating the database and importing it, we select all the connections that reference the country Portugal, either in the origin or in the destination. The entities (companies or persons) are only identified with an ID code. In order to associate the companies/ persons and their country, the required information for the intended characterization was searched in each table (Entities, Intermediaries and Officers / Offshores) of these nodes. The results of these operations were exported to two *csv* files in order to facilitate the import and manipulation of the data in the Gephi tool.

Modelling. The results of the two previous phases it is a new dataset with Portuguese companies and their relationship with other entities from other countries. After importing this data to Gephi, it was possible to apply algorithms for network spatial visualization and to apply a set of statistical analyses both on the actors present in the network under analysis and on the network itself. The results of this analysis are presented in next chapter.

4 Network Analysis

In a preliminary assessment of the information provided by the database, we were able to identify a total of 409 offshores, 44 intermediaries and 603 officers, related to Portugal. Within the 409 offshores identified the most prevalent offshores jurisdictions, by order of importance, were the British Virgin Islands, Panama, Niue and Bahamas. A total of 243 offshores are directly linked to Portugal, with prevalent jurisdictions in Panama, British Virgin Islands, Niue and Bahamas (by order of importance) while the remaining 166 are linked to foreign countries, but used by Portuguese intermediaries and officers. We were also able to identify a total of 313 foreign officers which used Portuguese companies, namely offshores entities linked to Portugal or Portuguese intermediaries.

Which communities in the network? Concerning the spatial network analysis, the algorithm **Force Atlas 2** returned the best spatial visualization with more dispersed groups and more space around the nodes, providing a clearer understanding of the network. Immediately it was possible to identify clusters (groups of nodes densely connected and distinct from other groups, in which a certain actor plays a central role) and bridges (links that connect different groups of nodes). The Figure 3 displays the final graph of the network, and it is possible to clearly visualize Entities (offshores) linking to a large number of Officers and the Intermediaries linking to Entities (offshores). Colours represent companies types.

Analysing the network level measures, it is possible to assess a low global connectivity, translated by an Average Degree measure of 2,575, which indicates a small number of connections between the nodes in the network, and with a Diameter measure of 2, which implies that the shortest path between any two nodes of the network is set with only two connections. The very low value obtained in the Density measure 0,003, reinforces the characteristic of a highly-dispersed network. Using algorithms to assess connected components, we observe only 160 weakly (each node can be reached from every other node by following) connected components from a total of 908 strongly (each node can reach every other node by following directed edges). The Modularity score of the network is 0.75, a clear indication that the network is composed by modules, e.g. communities.

Modularity measure aims to identify the nodes that are more densely connected together than to the rest of the network, describing the network structure, i.e., how the network is compartmentalized into sub-networks. The parameters of this community detection algorithm, which uses a heuristic method based on

Offshore jurisdiction	Nr.	Intermediary country	Nr.	Officer country	Nr.
Virgin Islands, Briti:	164	Portugal	39	Portugal	290
Panama	78	Ecuador	1	Virgin Islands, Briti:	19
Niue	57	Guernsey;United K	1	Luxembourg	15
Bahamas	52	Switzerland	1	Bahamas	13
Samoa	15	Not identified	2	Switzerland	10
Seychelles	11	Total	44	Angola	9
Hong Kong	9			Jersey	6
Cyprus	5			Hong Kong	3
Nevada	4			Mozambique	2
Malta	2			Panama	2
Cook Islands	1			Paraguay	2
Wyoming	1			United States	2
Not identified	10			Argentina	1
Total	409			Brazil	1
				Isle of Man	1
				Liberia	1
				Samoa	1
				Spain	1
				Not identified	224
				Total	603

Fig. 2. Descriptive statistics on types of company and respective linked country

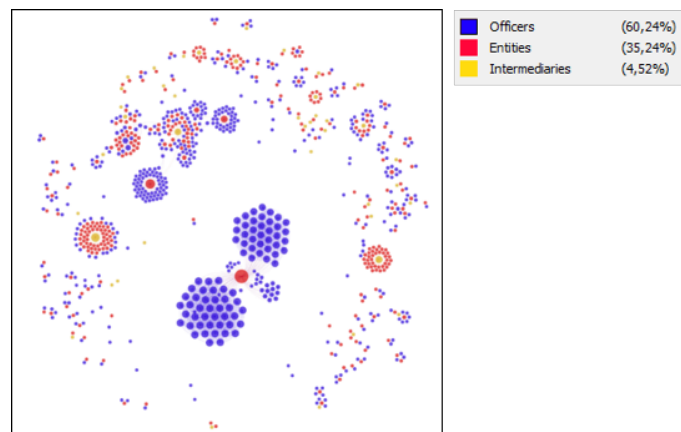


Fig. 3. Network graph obtained using "Force Atlas 2" layout algorithm

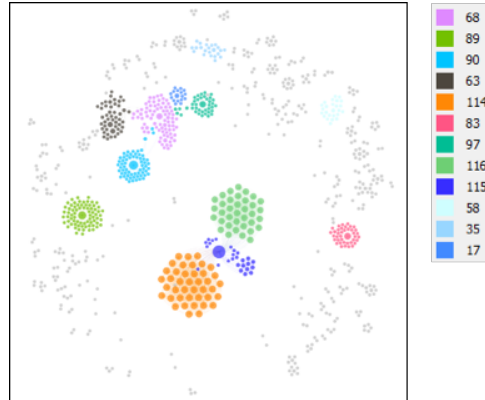


Fig. 4. Modularity identified communities

modularity optimization, were set to produce the best community decomposition, using edge weights, a resolution set to 1.0, and randomizing the algorithm to achieve higher modularity scores. We were able to identify 12 main communities out of a total of 165 communities identified, as shown in the Figure 4. Subtitle corresponds to communities ID. These communities will be referenced in the next analysis.

The top 12 biggest communities have a total of 513 nodes, which represents 56% of all connections. Community 68 is the largest one with 80 nodes, the second largest is community 89 with 74 nodes, followed by community 90 with 64 nodes. In communities 68, 97, 17 and 90 (see Figure 5) it is possible to identify several officers, intermediaries and entities (offshores) associated to Espirito Santo Group. Through the officer Espirito Santo Resources Limited, a bridge is established with the community 90, centred around the offshore EuroAmerican Finance Corporation Inc.. This community is mainly characterized for several non-identified officers (The Bearer)⁴ which held a participation in the offshore and by several officers related to Espirito Santo Group, namely, the officers Espirito Santo Irmos, Sociedade Gestora de Participa es Sociais, SA, Espirito Santo B.V.I. Participation Limited, Espirito Santo Industrial (Portugal), and Monteiro de Barros Sociedade Gestora de Participa es Sociais, SA.

The communities 114, 115 and 116 (see Figure 6) are made up exclusively by officers, all of which are linked to the entity Selected Capital Opportunity Limited (offshore) present in community 115; this entity is the bridge that links the three communities. The officers present in communities 114 and 116, have very similar names, **B-XX-Marquis...**⁵, which configures a fictitious name for the person or company who owns it.

⁴ Companies held by bearer shares, the ownership is determined by who holds the share certificates, often not registered, providing a high level of secrecy.

⁵ These companies are created by an intermediary, providing the person or company a high level of secrecy.



Fig. 5. Espirito Santo Group related communities (17, 68, 90, 97)

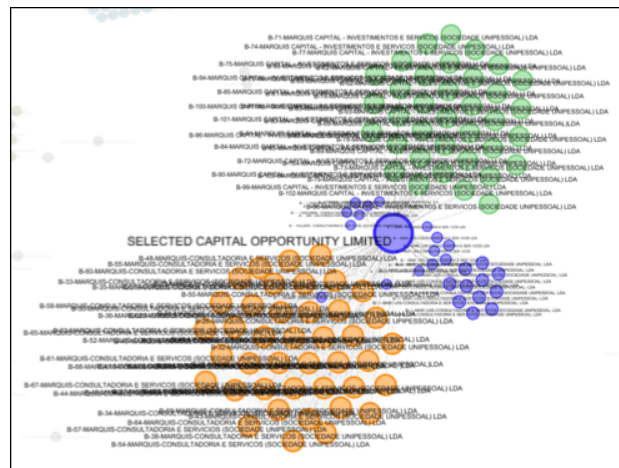


Fig. 6. Communities 114, 115 and 116

In community 63 it is possible to identify several entities (offshores) associated to Escom Group (majority shareholder is Espirito Santo Group), linked to the officers Mr. Luis Miguel de Oliveira Horta e Costa and Mr. Pedro Manuel de Castro Simes Ferreira Neto, who held executive management positions in this group. The Figure 7 show the overall picture of the community 63, and in detail, the connection between several Escom entities (offshores, in red) and the officers previously mentioned (in blue). The entity (offshore) ESIAM Espirito Santo International Asset Management Limited establishes a bridge between communities 63 and 68, where several officers, intermediaries and entities (offshores) were associated to Espirito Santo Group. The remaining communities are centred in

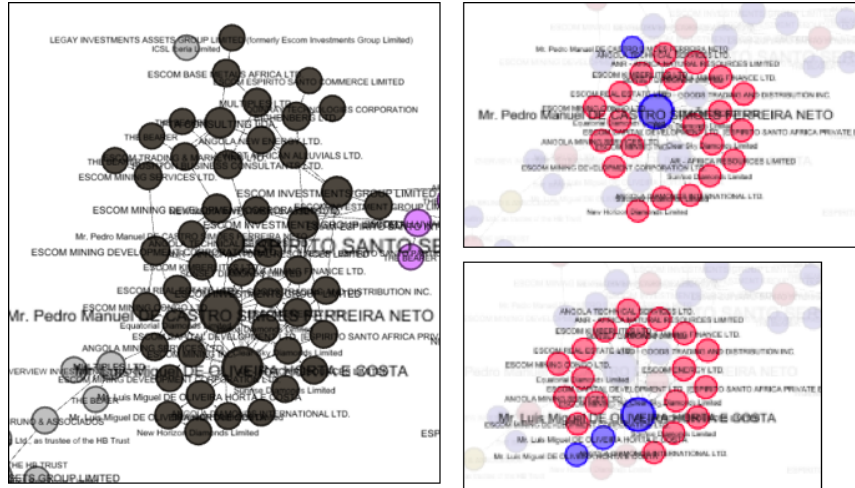


Fig. 7. Community 63 Escom Group

intermediaries mainly established in Madeira Island tax haven in Portugal, who are linked to offshore service providers.

Who are the central players? To further analyse the role of the nodes in the network, centrality measures were used. Figure 8 show the output of those measures. The larger the node size, the more central it is according to respective centrality measure. Colours represents companies types (Entities (Offshores) in red, Intermediaries in yellow and Officers in blue). The use of this measures will allow to identify companies with high influence in the network and the existence of bridges. Therefore, to break any irregularity for example, legal authorities should focus on these companies.

Popularity. The Degree centrality measure the popularity of nodes. It is based on the amount of existing connections, regardless the type of connection (in or out degree), meaning that the more connections a node has, more important (central) is its role in the network. Besides the featured officers previously identified in community 63, we highlight the entities Selected Capital Opportunity Limited and Euroamerican Finance Incorporation Inc. from communities 115 and 90, respectively, and the intermediaries Startrade Management Lda., Tallantyre Consultants, Espirito Santo Resources Limited, from communities 89, 83 and 68, respectively.

Bridges. High betweenness individuals are often critical to collaboration across different groups. They act as bridges between groups. Analysing Betweenness measure which translates the frequency that a node appears in the shortest path between nodes, it is possible to observe the importance of the officers (individuals) Mr. Pedro Manuel de Castro Simes Ferreira Neto and Mr. Lus Miguel de Oliveira Horta e Costa from community 63.

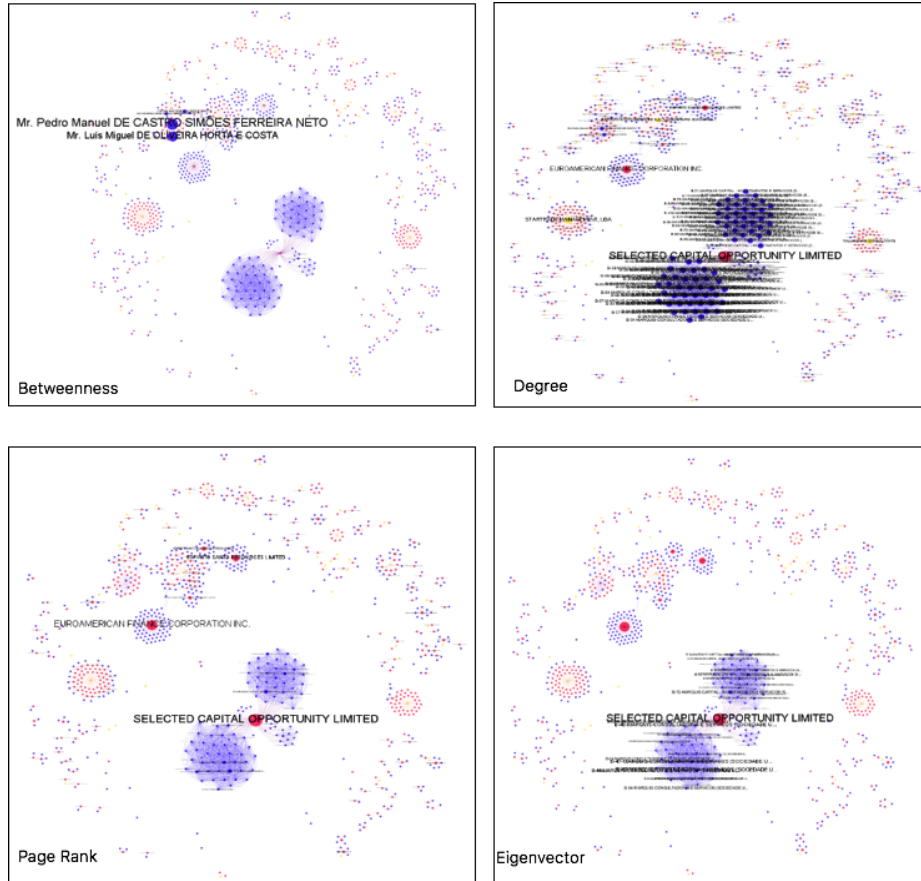


Fig. 8. Centrality measures Betweenness, Degree, Page Rank and Eigenvector centrality. Red dots represent the nodes with higher value of corresponding the centrality

The intermediary Espirito Santo Resources Limited is the main bridge in whole network, connecting four communities, namely 63, 68, 90 and 97. If we remove this intermediary, probably there will not exist any remaining connection among offshore (in red), breaking any irregularity that might exist. The entity (offshore) Selected Capital Opportunity Limited plays also a central role in the network, connecting three communities 114, 115 and 116. These three communities are formed by densely connected officers with similar designations, namely Marquis Capital Investimentos e Servios (Sociedade Unipessoal) Lda and Marquis Consultoria e Servios (Sociedade Unipessoal) Lda), with slight variations in their designation (ex: B-60-Marquis Consultoria e Servios (Sociedade Unipessoal) Lda, B-33- Marquis Consultoria e Servios (Sociedade Unipessoal) Lda, B-71-Marquis Capital Investimentos e Servios (Sociedade Unipessoal) Lda, B-

90-Marquis Capital Investimentos e Servios (Sociedade Unipessoal) Lda), as already mentioned before.

Central Nodes. PageRank and Eigenvector centrality measures identify nodes that are linked to other important nodes, therefore assessing the relevance of the connection with another centrals nodes, and not by the existing number of connections. The higher the value of these measures, the higher the importance of the node, showing how well is connected to other important nodes in the network. High eigenvector centrality individuals are leaders of the network. They are often public figures with many connections to other high-profile individuals. Analysing the PageRank measure, we identify four entities (offshores), Selected Capital Opportunity Limited, Euroamerican Finance Incorporation Inc., Espirito Santo Resources Limited, and Espirito Santo B.V.I. Participation Limited. The Eigenvector measure identified once again the entity (offshore) Selected Capital Opportunity Limited, and several officers in communities 97, 114 and 115, already mentioned before.

5 Conclusions

In this paper, we analyse the relations between Portuguese companies involved in the recent Panama Papers scandal. Most of the activities are related to the use of shell companies located in tax havens (offshores) for tax evasion and sometimes even associated with money laundering among other types of illegal activities. We analyse the network involving Portuguese companies, whatever its juridical nature (entities (offshores), intermediaries and officers (companies and individuals)). We identified a total of 409 offshores, 44 intermediaries and 603 officers, related to Portugal; 243 offshores are directly linked to Portugal, while the remaining are linked to foreign countries, but used by Portuguese intermediaries and officers. The most prevalent offshores jurisdictions were identified in the British Virgin Islands, Panama, Niue and Bahamas. We were also able to identify a total of 313 foreign officers which used Portuguese companies, namely offshores entities linked to Portugal or Portuguese intermediaries. We were able to assess the Portuguese network and identify the central actors of the network, i.e., companies with high influence in the network, in which any eventual investigation of legal compliance by Portuguese authorities should be focused on. The Portuguese network is essentially characterized by a low connectivity, with a reduced number of clusters and actors playing a central role in the network.

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