

Network Topologies of Intermediaries in the Offshore World

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Abstract

Intermediaries form the crucial links enabling tax haven use, contributing significantly to global tax avoidance and inequality. While analyses often focus on demand-side factors, this thesis challenges such perspectives by asserting the critical importance of the supply-side network structure and intermediary agency for understanding and regulating offshore finance. Extending the network analysis of Chang et al. (2023) and drawing on Harrington's (2016) micro-sociological evidence, I analyze International Consortium of Investigative Journalists (ICIJ) leak data. Although ICIJ data has limitations for estimating the overall scale of avoidance, it permits robust generalization about intermediary roles within these complex networks. A novel agentic method is employed, enriching ICIJ data by incorporating publicly available online information about intermediaries' professional roles and affiliations.

This thesis presents four key propositions: 1) The overall network exhibits structural vulnerabilities concentrated around central intermediaries. 2) Intermediaries often display cultural or national specificity, catering to distinct clienteles. 3) Different intermediary types occupy distinct network positions and vary in systemic importance, measurable via network centrality. 4) Network structures are dynamic, adapting in response to regulation and financial innovation. This analysis provides critical insights into the architecture and potential regulatory chokepoints within tax haven networks, viewed through the lens of intermediary action.

Introduction & Motivation

1.1 Introduction

The central claim advanced throughout this thesis concerns the critical relevance of examining supply-side dynamics within the offshore financial system. Specifically, it argues that the role of intermediaries – the professional enablers and facilitators of offshore activity – is an incredibly relevant factor. The function and influence of the supply side – encompassing the specialized intermediaries and the specific services offered by various jurisdictions that actively enable and shape offshore activity – remains comparatively under-explored from an empirical standpoint. Building upon recent scholarship that increasingly highlights these supply dynamics (e.g., Laffitte 2024; Alstadsæter et al. 2019), this thesis seeks to extend and generalize insights from qualitative work, such as Harrington’s (2016) study of wealth managers, through a quantitative analysis drawing upon the extensive data revealed by the ICIJ leaks.

Primary literature this is building on (contextualising interest in the topic):

- Interest spurred on this by an interest in optimal taxation regimes esp. Saez (2002), and the work of Zucman & Saez (2019) on the optimal taxation of wealth.
- Overall approach from neoclassical public finance and economics. Lectures from Zucman’s overviews of tax evasion and avoidance in the modern economic literature has been the primary source. <https://gabriel-zucman.eu/publicecon/>
- Niche within Political Sociology through Brooke Harrington (2016)’s book and the method’s employed in her ethnography of wealth managers. Likewise the tentative work in Chang et al. (2023a and 2023b) on network structure. However, for the latter, they concentrate more on demand-strategies rather than the more interesting supply-side strategies that are the focus of this thesis.

1.2 Tax Avoidance at the Top of the Income Distribution

While considerable progress has arguably been made in curbing outright tax evasion, tax avoidance remains a substantial challenge, a point emphasized by commentators such as Stiglitz (cited in Alstadsæter et al., 2024). It introduces several clear inefficiencies into the economic system, including the generation of a distinct class and socially unoptimal rents accruing to the intermediaries who facilitate such schemes, the potential for poor allocation of resources as investment decisions are distorted by spurious incentives, and, beyond these economic inefficiencies, a range of normative concerns regarding fairness and the integrity of the tax system that inevitably accompany widespread tax avoidance.

A literature that has grown very prominent in the past two decades or so in A crucial distinction often highlighted is between income and wealth inequality. Income inequality can be somewhat ephemeral in nature; high-earners in one year may retire or experience income fluctuations in the next. Wealth, in contrast, tends to be more permanent, potentially distorting social outcomes over non-transient periods in a more meaningful way. Inordinate wealth accumulation (e.g. Harrington, 2016) has distorted social mobility (as explored in the work of Chetty) and been a key driver of overall inequality trends (e.g. Piketty’s main body of work).

With that said, from a (narrow and purely economic) point of view, whether tax avoidance quantifying is actually bad is unclear, so the normative desirability of it at aggregate is still in question. The precise behavioral effects of tax evasion and avoidance on incentives – such as the incentives to work, save, or invest – is not as clear as, for example, studying the effects of tax incentives on MNCs (where it seems generally negative, e.g. Puerto Rico tax credit study from Serrato, 2018; also Garrett & Serrato, 2019). A key complicating factor is the role of expectations; an individual’s behavior is likely highly dependent on their expectation of being able to successfully evade or avoid taxes in the future.

1.3 Limitations of Traditional Demand-Side Models

Traditionally, tax evasion and avoidance has been studied from the demand-side. The seminal Allingham-Sandmo (1972) good at explaining tax evasion decisions of the vast majority of the income distribution (Alstadsæter et al. 2019) performs poorly at the top of the distribution (ibid.) the Allingham-Sandmo (1972) model, provides a powerful and often empirically supported framework for understanding tax evasion decisions for the majority of taxpayers. This standard model typically portrays evasion as a individual and rational gamble, where individuals weigh the expected benefits of non-compliance against

the probability of detection and the severity of potential penalties (see also Yitzaki & Slemrod). However, under standard assumptions about risk aversion and the structure of penalties and audit probabilities, the model often predicts that wealthier individuals, facing potentially higher stakes and scrutiny, should be less inclined to evade taxes. Yet, empirical evidence, particularly from studies leveraging leaked data (e.g., Alstadsæter et al. 2019), suggests the opposite: offshore tax evasion appears highly concentrated among the ultra-wealthy. The comparative statics do not hold here.

Furthermore, traditional methods for empirically studying tax compliance, such as random audit studies (e.g., Kleven et al. 2011), also face limitations in capturing the full picture of high-end evasion. As highlighted by Alstadsæter et al. (2019), while random audits are invaluable for understanding compliance behavior regarding income streams typically subject to third-party reporting or easily verifiable through standard audits, they often fail to detect the sophisticated, cross-border evasion strategies frequently utilized by the wealthiest segment. Complex offshore structures, shell corporations, and opaque trust arrangements often fall outside the scope of conventional audit procedures, rendering this form of evasion largely invisible to standard demand-side enforcement tools.

This points towards a dynamic of a game of cat and mouse. Demand-side enforcement mechanisms, predicated on detecting and penalizing individual non-compliance, struggle to keep pace with the evolving and increasingly complex strategies developed to obscure wealth and income, often with the assistance of specialized intermediaries. Consequently, relying solely on demand-side models and traditional enforcement metrics provides an incomplete, and potentially misleading, understanding of the phenomenon, especially concerning the significant evasion occurring at the top of the distribution. This underscores the necessity of incorporating supply-side factors and network structures to actually understand these mechanisms enabling tax avoidance at the top of the income distribution.

1.4 The Supply-side: Intermediaries as Gatekeepers

To fully grasp the dynamics of offshore tax evasion and avoidance, it is crucial to clarify what constitutes the "supply-side" (used more-so metaphorically than stringently) in this context. Here, the supply-side refers specifically to the ecosystem of professional intermediaries – such as law firms, banks, trust companies, and specialized advisors – as well as the jurisdictions that provide the legal and regulatory frameworks enabling offshore financial activities. The central argument advanced in this thesis, building on insights from models like Alstadsæter et al. (2019) and qualitative work such as Harrington (2016), is that this supply-side dimension is far more relevant to scrutinize than often acknowledged, potentially offering more effective avenues for understanding and potentially curbing offshore practices compared to a sole focus on demand-side factors.

A primary reason for emphasizing the supply side relates to the concept of elasticity. It is argued here that the elasticity of supply of intermediaries is considerably higher, and therefore potentially more responsive to policy interventions, compared to the elasticity of demand from clients seeking offshore services. Several factors underpin this view:

First, the incentives structuring the behavior of intermediaries are arguably much more sensitive to changes in the regulatory or reputational environment. For these professionals and firms, the provision of offshore services is not merely an option but often a core component of their business model and career trajectory. Their professional existence and profitability are directly dependent on their continued ability to offer these specific services effectively and discreetly. Consequently, factors that threaten this ability – such as increased regulatory scrutiny, heightened enforcement risk, or significant reputational damage – can have a pronounced impact on their willingness and capacity to supply these services. In contrast, the demand for tax minimization or evasion among potential clients, driven by factors like high tax rates or a desire for secrecy, can be seen as a relatively persistent force. While demand might fluctuate, the fundamental desire among some wealthy individuals and corporations to reduce tax burdens is likely to remain, making demand potentially less elastic to targeted interventions than the specialized supply of enabling services.

Second, the micro-sociological account provided by Harrington (2016) and Hoang (2022) offers compelling reasons why intermediaries are so central. Her ethnographic work illuminates the deeply personal, trust-based relationships that often form between wealth managers and their elite clients. These relationships, built over time and predicated on discretion and expertise, are difficult to replace. Clients rely heavily on their chosen intermediaries not just for technical execution but also for navigating the complexities and risks of the offshore world. The non-substitutable nature of these trust-based relationships means that disrupting the intermediary side can significantly impact clients' access to and ability to maintain offshore structures, further highlighting the critical role of the supply-side actors.

Third, the structure of the market itself points towards the strategic importance of intermediaries. There often exists a many-to-one relationship between clients and intermediaries; that is, a relatively small number of specialized intermediary firms or key professionals service a large number of clients seeking offshore solutions. This concentration means that the intermediary sector represents a point of leverage. Regulatory actions or enforcement efforts focused on these key intermediary players could potentially have a cascading effect, impacting a wide network of clients far more efficiently than attempting to identify and pursue each individual client separately. This structural feature makes the intermediary supply-side particularly vulnerable, and thus relevant, from a regulatory perspective.

1.5 Research Gap: Understanding the *Network Structure* to Inform Intermediary Regulation

Considerable research, particularly micro-sociological accounts like Harrington's (2016) ethnography, provides rich insights into the dyadic relationships, motivations, and practices of individual wealth managers and their clients. Ethnography, as a methodology, certainly offers a powerful means of accessing and understanding micro-level dynamics that can illuminate macro-level phenomena or "megatrends,"; of "entering in" an otherwise abstract metanarrative (cf. Neely, 2021; Also Chung 2018(check up; misremeber?)) However, generalizing from these detailed qualitative studies to broader systemic patterns has not really been done.

A nascent thread of literature has begun to explore these structural aspects, often spurred by the availability of large-scale leaked data. Work such as Chang et al. (2023), alongside policy-oriented research emerging from bodies like the EU following disclosures such as the Panama Papers (e.g., research from 2017), represents initial steps in this direction. However, this line of inquiry remains limited thus far, often focusing on specific subsets of countries or actors. The analysis of the network structures inherent in the offshore world is still in a highly exploratory phase. Consequently, the potential held within detailed micro-data sources, such as the ICIJ leaks which map connections between entities, officers, and intermediaries on a vast scale, remains largely underexplored in terms of systematic structural analysis.

The work by Chang et al. (2023) on "Secrecy Strategies" provides a pertinent example. While their primary focus was on analyzing the demand strategies employed by global elites, their findings crucially demonstrate that these strategies are shaped by, and interact with, the supply landscape – the available intermediaries, jurisdictions, and the institutional context of the elites' home countries. Their research, therefore, implicitly highlights the importance of the supply structure by showing how it influences demand patterns, effectively linking the two sides of the market through observable strategic choices.

This points towards the specific research gap addressed herein: the need for a more systematic understanding of the network structure of the supply-side itself. While we have compelling accounts of individual intermediary roles and incentives, a comprehensive picture of how these intermediaries connect to each other, to different types of clients, across various jurisdictions, and through specific service offerings – essentially, the topology of the intermediary network – is lacking. Understanding this structure is potentially crucial for designing more effective regulation targeting these key players.

Therefore, the goal within this thesis is to contribute to bridging this gap, primarily through synthesis and systematization. Drawing upon the existing literature, including

the rich ethnographic accounts, the aim here is not necessarily to conduct a novel quantitative network analysis but rather to attempt to codify more generally and quantitatively on some of the more loosely defined observations about intermediaries and their roles. By viewing these observations through the conceptual lens of network structures and positions, the objective is to formulate more general propositions regarding intermediary behavior, influence, and potential vulnerabilities within the broader offshore system.

1.6 RQ: What role do offshore intermediaries play in networks of high-end tax avoidance?

1.7 Roadmap of the Thesis.

Having gone through what motivates the pursuit of this question and situate this thesis, will proceed to the bulk of the paper. First, outline the key concepts and theories I will draw on, then moving on to outline the key propositions this paper will seek to set forth about the role of intermediaries. Then, a brief section will cover the data sources.

Theory

2.1 A Note on Philosophy of Science and Methodological Approach

In line with perspectives advocating for methodological pluralism and the use of qualitative insights for broader theory development (e.g., George & Bennett, 2005), this thesis leverages Harrington's findings for concept formation and hypothesis generation - effectively using her work as a theory-building step. Her work helps define the "intermediary" phenomenon and suggests the importance of factors like trust and expertise, which likely underpin the network structures we observe. This thesis then seeks to assess the generalizability and structural manifestations of these insights across a large dataset, moving from micro-level understanding to macro/meso-level patterns. The objective, therefore, explicitly shifts from *verstehen* to identifying and analyzing recurrent structural patterns within the network as revealed by the ICIJ Offshore Leaks Database *and assuming we can generalise these structures* (more on that later under the methods section).

2.2 Conceptual foundations

This section outlines the necessary conceptual foundations that precede the concrete propositions asserted later in the thesis. These concepts presented here as being analytically requisite for the propositions developed in the subsequent section (2.2).

2.2.1 Global Wealth Chains and the Role of Intermediaries

To understand the significance of the intermediaries central to this thesis – the professional advisors, lawyers, accountants, and wealth managers operating within the offshore financial system – it is helpful to adopt an analytical framework that explicitly centers their role. The overall motivation for focusing on these actors stems from the "Global Wealth Chains" (GWC) approach.

As articulated by Seabrooke & Wigan (2014), this approach offers a distinct perspective compared to analyses focused on global value chains. They argue that: "While actors

in value chains share an interest in transparency and coordination, those in wealth chains thrive on rendering movements through the chain opaque. Wealth chains hide, obscure and relocate wealth to the extent that they break loose from the location of value creation and heighten inequality." Adopting this GWC lens necessitates an explicit focus on the intermediaries and professionals. These are the actors who develop and deploy the sophisticated financial and legal innovations required to sustain and manage the complex structures used to hold individual wealth offshore, often obscuring its origins and ownership.

Further elaborating on the socio-legal dynamics underpinning these chains, Seabrooke & Wigan (2022) emphasize the significance of socially constructed legal meaning. They write: "What is significant here is accepted legal assertions,. This happens within interpretative communities, where agreements on legal affordances are secured." The intermediaries operate within these communities, shaping and interpreting the boundaries of legal possibility. Seabrooke & Wigan (2022) also connect this to broader social valuations, noting that "An important element is that within such communities wealth confers honor, where the accrual and transfer of wealth without productive effort is held in high esteem (Veblen, 1899)."

Borrowing from the typology proposed in Seabrooke & Wigan (2022), the networks involving the intermediaries examined in this thesis align closely with their definition of "relational wealth chains." These are characterized as follows: "Relational wealth chains involve the exchange of complex tacit information, requiring high levels of explicit coordination. Strong trust relationships managed by prestige and status interactions make switching costs high." This description of relational wealth chains, emphasizing tacit knowledge, trust, coordination, and high switching costs due to the personal nature of the relationships, is highly with the ethnographic work of Harrington (2016) and how she outlines the structure and dynamics of the networks between wealth managers and their elite clients. This connection is also drawn by Seabrooke & Wigan (2022) themselves, who cite Harrington (2015) alongside related work by Beaverstock & Hall (2016) and de Carvalho & Seabrooke (2016) as evidence supporting the characteristics of relational wealth chains.

Furthermore, a developing body of literature situated within this GWC approach is examining how these professionals actively shape and navigate existing regulatory landscapes (e.g., Christen, 2021; Christensen & Seabrooke). This underscores the analytical purchase of the GWC framework for understanding the pivotal role of intermediaries not just as passive facilitators, but as active agents within the offshore system.

2.2.2 Weaponised Interdependence

The goal here is to outline the theoretical basis for viewing intermediaries not just as facilitators, but as potential points of leverage or vulnerability within the offshore system, thereby informing regulatory strategies.

A lens for such an analysis is provided by the concept of "weaponised interdependence," as developed by Farrell & Newman (2019). Their core argument posits that globalization, far from simply flattening the world or diminishing state power, has often created highly specific network topographies. These global networks—whether in finance, technology, or supply chains—are frequently characterized by asymmetric structures. Power, in this view, does not dissipate but rather concentrates at key hubs or 'chokepoints' within these networks. States or actors who control these chokepoints gain significant leverage over others who depend on access to the network, potentially allowing them to 'weaponize' this interdependence for strategic gain.

This logic of weaponised interdependence has been applied directly to the domain of global tax policy by Christensen (2024). He argues that states have often failed to fully harness the potential regulatory power they could wield by strategically targeting chokepoints within the networks facilitating tax avoidance and evasion. Among the key institutions Christensen (2024) identifies as potential chokepoints relevant to global tax policy are precisely the expert intermediaries – the lawyers, accountants, wealth managers, and corporate service providers – who are central to this thesis. Their specialized knowledge and gatekeeping function position them as critical nodes whose disruption could have widespread effects.

This perspective aligns with and provides a theoretical underpinning for findings across various studies highlighting the importance and potential vulnerability of the intermediary supply-side. Research emphasizing the role of intermediaries (e.g., Harrington 2016; Alstadsæter et al. 2019) implicitly points to their structural significance. For instance, Harrington's (2016) focus on trust-based relationships suggests that disrupting these specific intermediary nodes can create significant friction. Alstadsæter et al.'s (2019) supply-side explanation for high-end evasion similarly underscores the crucial role of these facilitators. More explicitly, recent work analyzing the network structures revealed by leaks, such as Chang et al. (2023), demonstrates the analytical purchase of focusing on these networks. While their specific study examined network structures to understand the effectiveness of sanction regimes against oligarchs, the underlying approach – analyzing network vulnerabilities by focusing on intermediary connections – is directly applicable to the broader question of regulating the offshore system for tax purposes.

All in all, understanding the network structure, particularly the role of intermediaries as potential chokepoints, reinforces the idea that the current state of offshore finance and associated tax evasion is, as Saez & Zucman (2019) argue in a related context, a

continued choice shaped by policy and enforcement priorities, rather than an immutable fact of nature.

2.2.3 Network Theory as a Lens for Understanding Illicit networks

To further contextualize the approach taken in this thesis, it is useful to briefly elaborate on how network studies have previously been employed to explore the structure and dynamics of analogous social and economic systems. The application of network analysis provides powerful tools for understanding complex relational patterns, information flows, and vulnerabilities within various types of networks, including those operating in clandestine or illicit domains.

The foundational work in social network analysis, such as Granovetter's (1973) seminal paper on the "strength of weak ties," laid the groundwork for understanding how network structures facilitate crucial processes like information diffusion and resource access. While initially focused on phenomena like job searching, these core insights into how different types of ties (strong vs. weak) and different network positions (e.g., bridges) shape outcomes have proven broadly applicable. Understanding the topology of connections is essential for identifying critical links, potential weaknesses, and influential actors within any network system. This foundational understanding extends to the analysis of illicit networks, where mapping relationships can reveal operational structures and vulnerabilities.

One of the prominent examples demonstrating the application of network analysis to understand illicit operations is the work of Morselli (2009). By examining specific cases, such as the CAVIAR network involved in cross-border drug smuggling, Morselli illustrates how network science concepts (like centrality measures, brokerage roles, and structural holes) can be used to dissect the organizational structure of criminal enterprises. Such analyses move beyond individual actors to understand the relational patterns that enable the illicit activity, potentially identifying key players or structural weaknesses that could be targeted for disruption.

More directly relevant to the subject matter and data source of this thesis, recent studies have begun applying network analysis to the large-scale datasets released by the ICIJ. Chang et al. (2023), for instance, utilized network methodologies on ICIJ data to specifically examine the effectiveness of sanction regimes against oligarchs, analyzing how their embeddedness within offshore networks influenced outcomes. Similarly, related work by the same authors ("Complex Systems of Secrecy," Chang et al. 2023) employed network perspectives to explore patterns related to the types of offshore instruments demanded by elites, linking structural features to strategic choices. These studies exemplify how network analysis can yield substantive insights from the complex relational data contained

within the ICIJ leaks, demonstrating its utility for exploring the offshore financial system.

The general principles and analytical techniques drawn upon in such studies are well-established within the broader field of network science, with standard references like Newman's (2010/2018) textbook providing comprehensive overviews of the underlying theory and methodologies. While this thesis may focus more on synthesis and proposition-building informed by network concepts rather than complex quantitative modeling, drawing upon this established body of work provides a robust conceptual and methodological grounding for analyzing the structure and significance of intermediary networks in offshore finance.

2.2.4 A Typology of Intermediaries and Their Role

To proceed with an analysis centered on the supply-side, it is essential to clarify conceptually what exactly is meant by an "intermediary" within the context of offshore finance. These actors play diverse roles in facilitating the creation, maintenance, and utilization of offshore structures. While specific studies, such as Harrington (2016), provide deep insights into the practices of particular intermediary types like wealth managers, a broader classification is useful for systematic analysis.

These are all what Hoang (2022) would call the "small spiders", the "High net worth individuals" rather than the "Ultra-High net worth individuals" sitting at the top of the food chain. Anything uncovered, in this respect is extremely limited, because they are able to further obfuscate their position.

For this purpose, this thesis builds upon the typology developed in a 2017 EU report examining the role of advisors and intermediaries as revealed in the Panama Papers. This framework, grounded in empirical observation of a major leak, categorizes intermediaries based on their primary area of expertise and function within the offshore ecosystem. Adopting this typology serves a dual purpose: it provides conceptual clarity for the subsequent discussion and offers a practical schema for efforts to classify the varied intermediary actors identified within the ICIJ dataset, thereby enriching the data for structural analysis.

Based on the EU (2017) framework, we can distinguish the following core types of intermediaries:

- **Tax Experts:** These intermediaries focus primarily on the tax implications of offshore structures. Their core function involves advising clients on tax planning strategies to minimize liabilities (potentially crossing into evasion) and ensuring compliance through the preparation of necessary tax documentation across relevant jurisdictions. This group can include accountants, auditors, and specialized tax advisors, whose advice may vary in aggressiveness.

- **Legal Experts:** This category encompasses professionals providing expertise on the legal design, establishment, and enforcement of offshore structures. Key activities include structuring entities to navigate or exploit laws in multiple jurisdictions, handling incorporation (often via licensed entities), drafting legal documents, arranging nominee services, and providing formal legal opinions or representation. This group includes regulated lawyers, who often have exclusive rights for certain actions like court representation, and potentially notaries involved in document formalization.
- **Administrators:** The primary role of administrators is the ongoing operational maintenance and financial record-keeping of offshore entities. This includes preparing financial accounts, potentially handling tax returns (overlapping with Tax Experts), managing day-to-day administrative tasks, and sometimes auditing accounts (though auditors require independence). Accountants often fall into this category, focusing on financial recording and reporting.
- **Investment Advisors:** Distinct from those setting up the structure, investment advisors focus on managing the assets held within the offshore entity. Their core function is to develop strategies for wealth preservation or growth using the financial instruments (or other assets like property, art, etc.) owned by the offshore structure. Their role is centered on asset management rather than the legal or tax architecture itself.

This typology provides a decent conceptual grounding for analyzing the distinct roles and potential influence of different supply-side actors within the offshore financial network.

2.2.5 Secrecy Strategies: Financial Instruments and Legal Innovations

Goal: Understanding the different financial instruments they use and how they can be innovated on, and used for different purposes. (Mainly Lafitte, 2024; Chang et al. 2023)

Most important type, Bearer instruments:

Harrington (2016) writes of Bearer instruments as follows: *In addition, a few offshore jurisdictions allow the use of “bearer shares,” which are a way of issuing corporate stock without specifying a particular owner. Rather, the owner of a bearer share is literally whoever happens to be holding the stock certificate at any moment in time. This provides strong privacy protections, because as long as one does not have the shares in hand, one can say truthfully under oath, “I do not own that firm.” And if any officers of the firm are ever questioned about its ownership, they can also truthfully say, “I don’t know who owns the company, because bearer shares were issued.” In other words, bearer shares make it impossible to know who owns a company, and that makes it impossible to assign legal responsibility for any taxes, fines, or debts the company incurs.*

2.3 Propositions

PLACEHOLDER

Data and Methodology

Data and Methodology

This section details the data sources and methodological approaches employed in this thesis. It begins by describing the primary data source, the ICIJ Offshore Leaks Database (Section 4.1), and the external datasets used for contextualization (Section 4.2). Subsequently, it introduces a novel methodology utilizing agentic AI to enrich intermediary classification (Section 4.3), outlines the general analytical methodologies applied (Section 4.4), and finally comments on the use of LLMs in the thesis preparation (Section 4.5).

4.1 The ICIJ Offshore Leaks Database

The empirical core of this thesis rests upon the International Consortium of Investigative Journalists (ICIJ) Offshore Leaks Database. This resource serves as the primary data source, acting as a valuable, albeit imperfect, "proxy" for the opaque universe of offshore finance (cf. EU, 2017). The general idea underpinning its use here is that while any direct numerical estimates derived solely from the leaks (e.g., total wealth hidden) will surely be biased due to the data's inherent incompleteness, the qualitative nature of the interactions captured within the data – the patterns of relationships between clients, intermediaries, and jurisdictions – appears more reliable for understanding the structure and dynamics of the offshore system.

The use of the ICIJ Offshore Leaks Database for this type of research is increasingly established. For example, Alstadsæter et al. (2019), Londoño-Vélez & Ávila-Mahecha (2021), and Chang et al. (2023a; 2023b).

Some direct network analysis, but not much. Most relevant for our purposes is the work of Chang et al. (2023a; 2023b), as well as a more direct network study (Kejriwal & Dang, 2020) looking at the usual properties networks exhibit. They note:

"It was really unusual. The degree of fragmentation is something I have never seen before," said Kejriwal. "I'm not aware of any other network that has this kind of fragmentation."

To describe the ICIJ data in detail, insights from Kejriwal & Dang (2020) are valuable:

"However, precisely because the collection maps out a global system, the Panama Papers also present us with a golden opportunity to study the flow of information² between firms, individuals and intermediaries. From a scientific perspective, the Panama Papers represent a complex system, with entities that range from individuals to companies, many of which serve a specific purpose based on where in the world they are based, to a variety of relationships. Studying the structural properties of this complex system using applied networks science has the potential to reveal interesting trends about how such systems operate across geographies and economies."

4.1.1 Data Structure and Content

The core datasets loaded for this analysis include:

- **nodes-entities.csv**: Information on offshore companies, trusts, foundations.
- **nodes-officers.csv**: Details on individuals or companies acting in official capacities (directors, shareholders, beneficiaries).
- **nodes-intermediaries.csv**: Data on firms or individuals facilitating the creation and management of offshore structures.
- **nodes-addresses.csv**: Physical address information linked to other nodes.
- **nodes-others.csv**: Nodes not fitting the primary categories.
- **relationships.csv**: The edge list defining connections between nodes, including the type of relationship.

The ICIJ data constitutes a multi-modal and multi-relational graph. This often involved dealing with it at various levels of abstraction and breaking down its dimensionality. For example, most network algorithms, which are typically built for traditional adjacency matrix operations, cannot directly handle multi-relational graphs (in this case, a tetrapartite graph composed of addresses, entities, officers, and intermediaries!). Therefore, it is often necessary to switch between different representations of the data. These representations range from granular edge lists with the full ontology of the data model to those "squashed" down into a format representable as a single adjacency matrix (i.e., an edge list with only a single type of source and end node).

A usual trick for dealing with bipartite graphs is projecting it down by connecting two nodes if they share a common node type that one wants to eliminate. For example, for getting rid of address node type, relations like the following would be transformed as such:

Intermediary1 – Address – Intermediary2 \rightarrow Intermediary1 – Intermediary2

This process can be done iteratively on all node types that one wants to eliminate:

Intermediary1 – Entity – Address – Officer – Intermediary2 → Intermediary1 – Intermediary2

And from here, traditional network algorithms calculating the likes of eigenvector centrality etc. can be applied.

Whenever moving between the different representations of the graph, this will be made clear in the empirical section.

Note: ICIJ data is in principle directed, but in practice this is not especially important. Here, it is treated solely as an undirected graph.

Key characteristics of the data utilized include:

- **Intermediaries:**
 - Country associated with them
 - Relation to entities
- **Entities:**
 - Country associated
 - Jurisdiction incorporated in
 - Bearer instruments attached

4.1.2 Temporal Overview of Incorporations

An overview of the incorporation dates for entities within the ICIJ data provides context on the temporal scope of the observed activities. Figure 4.1 illustrates this distribution.

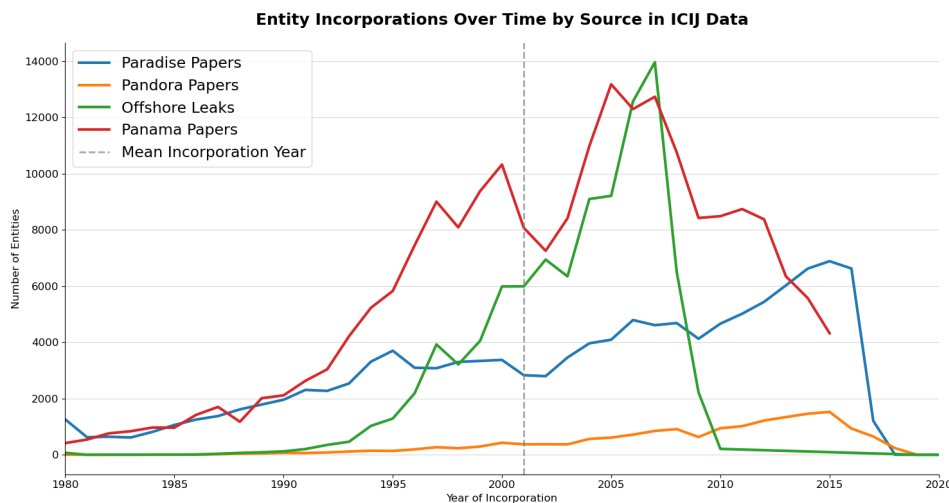


Figure 4.1: Overview of Entity Incorporations Over Time from ICIJ Data

4.2 External Data Sources

To contextualize the patterns observed within the ICIJ data, several external data sources are employed.

4.2.1 Background of Other Data Sources

The following external data sources are used to connect with and enrich the ICIJ data:

- **Laffitte Legal Technologies Data (HTHD):** This dataset (Laffitte, 2024) is used for connecting historical legal framework changes to entities and their structuring.
- **VDem (Varieties of Democracy) Data:** This provides country-level variables for the jurisdictions associated with entities and intermediaries.
- **Intermediary Type Enrichment:** As detailed in Section 4.3, an agentic AI approach is used to classify intermediaries based on scraped data.

A key resource is the Historical Tax Havens Database (HTHD) developed by Laffitte (2024). This dataset documents the historical evolution of "offshore legal architecture," tracking the adoption of specific legal technologies (e.g., banking secrecy, IBCs) across tax havens over time. This dataset will be utilized to explore whether specific patterns observed in the ICIJ data – such as the prevalence of certain offshore instruments or shifts in intermediary activity – align temporally with the historical innovations documented in the HTHD.

The World Justice Project (WJP) Rule of Law Index provides comprehensive country-level metrics on governance. Its specific use is to investigate potential correlations between the home country's rule of law environment and the patterns of specialization or network positioning observed among the intermediaries serving clients from that country.

VDEM (Varieties of Democracy) Regime Type Data will be used exactly analogously.

Data from the World Inequality Database (WID), specifically metrics on wealth inequality at the country level, will also be incorporated. This serves primarily to see if we can confirm some of the comparative statics Alstadsæter and Zucman derive, trying to verify whether there's anything to their supply-side model.

4.3 Using Agentic AI to Scrape Data on Intermediaries

A significant challenge in utilizing the ICIJ data for the purposes of this thesis is that intermediaries are often classified generically within the database. To analyze the specific

roles and potential influence of different types of intermediaries, as outlined in the typology adapted from the EU (2017) paper (see Section 2.1.4), a more granular classification is required. To achieve this classification at scale, an approach employing agentic AI is utilized.

The core idea is to use an AI agent loop to automate the process of gathering information about and classifying the intermediaries listed in the ICIJ data. The basic workflow is illustrated in Figure 4.2.

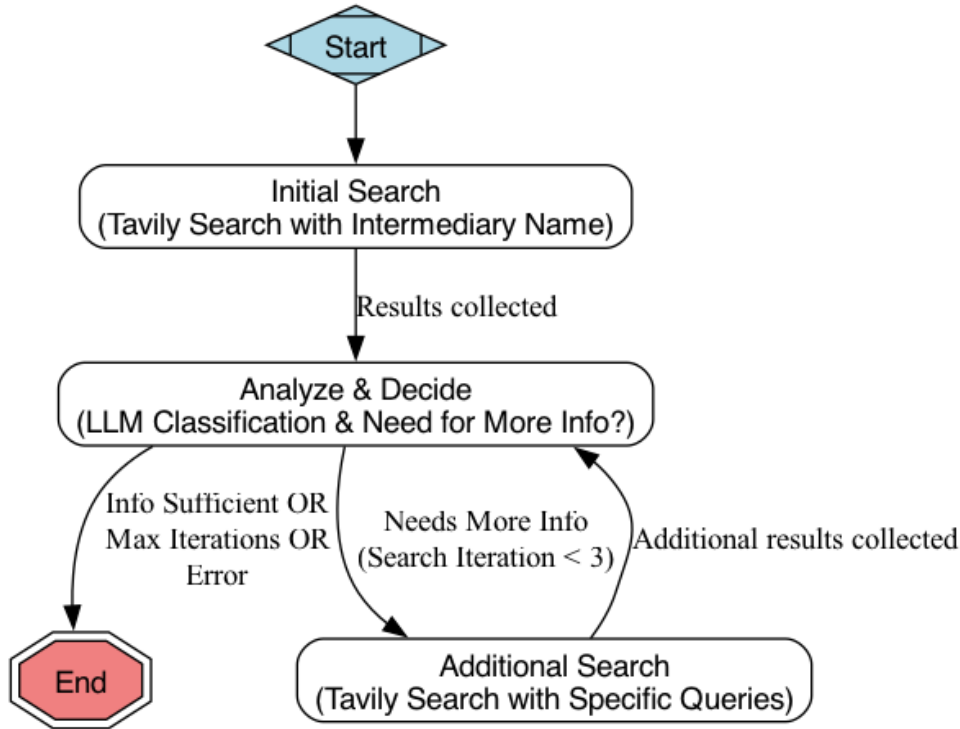


Figure 4.2: Agent Setup for Intermediary Classification

In brief, the process involves an AI agent orchestrating online searches for each intermediary identified in the ICIJ data. It begins with generic searches, reads and interprets the initial results, and then formulates more specific search queries based on the information discovered or identified as lacking. This iterative process involves up to three search queries per intermediary, scouring the top 15 most relevant web results identified through query-result embedding similarity using the Tavily Search API (though the tool is relatively generic and its specific choice is not critical to the methodology). This effectively replaces the time-consuming need for manual searching of the intermediaries.

Based on the information gathered, the AI agent then classifies the intermediary according to the EU (2017) typology (Tax Expert, Legal Expert, Administrator, Investment Advisor), adding a few additional relevant fields (e.g., specific job title). Crucially, the agent also provides a confidence score for its classification judgment, allowing for filtering or weighting in subsequent analyses.

There are a few obvious limitations associated with this approach that warrant dis-

cussion:

- The "Small Spiders" Problem. Kimberly Kay Hoang notes of one of the ultra-wealthy board directors she interviews, that despite the entities he was behind were revealed in the Panama Papers, nothing traces back to him. Instead, a group of "fall guys", as she terms them, are the ones that fall victim to the public's search-light. Those that have public profiles skew the bias towards the less illicit people involved even stronger.
- Temporal Misalignment: A primary concern is that all online searches are conducted based on information available today, whereas the ICIJ data pertains to activities that may have occurred years or even decades prior. This introduces two potential issues:
 1. The process might be biased towards identifying intermediaries who are still active or have a significant online presence currently.
 2. It implicitly assumes that the role an intermediary plays today (as reflected online) is equivalent to the role they played at the time relevant to the ICIJ data.

Addressing the Limitations: While these issues are real, they are not prohibitive for their use in this thesis.

1. Regarding the first point (bias towards current intermediaries), this primarily impacts the coverage or statistical power of the classification – we may only be able to confidently classify a subset (e.g., 50%) of all intermediaries. This is acceptable, provided the unclassifiable intermediaries are not systematically different in ways that correlate with the research questions. The issue becomes problematic only if there is a systematic bias in identifiability across types (e.g., if it is inherently much harder to find information online about legal experts compared to tax experts due to differing needs for discretion or public visibility). The significant threat here is the bias in who provides public information - it will only be the intermediaries whose activities are not inherently illegal. A bias towards, in a sense, the least dangerous intermediaries as those being revealed.
2. Regarding the second point (role stability), the assumption that roles remain consistent is arguably less problematic. Given the highly specialized nature of functions like tax advisory, legal structuring, administration, and investment management within the offshore context, and the considerable barriers to entry (qualifications, reputation, networks) for each, frequent switching between these core roles by individuals or firms seems relatively unlikely.

In my view, it is the only pragmatically feasible method to do this given the constraints of this thesis.

4.4 Analytical Methodologies

This section outlines the core analytical techniques applied to the processed data. This includes concepts from network theory for characterizing the structure of the ICIJ data, unsupervised learning methods for pattern discovery, and statistical tests for assessing the significance of findings.

4.4.1 Network Analysis Concepts

The analysis of the ICIJ data leverages several concepts from network theory to understand its structural properties. As highlighted by previous research (e.g., Kejriwal & Dang, 2020; Chang et al., 2023a, 2023b), network science provides a powerful lens for this type of inquiry. Key concepts employed include:

- **Overall data model:** As described in Section 4.1.1, considering the multi-modal nature of the graph and projections thereof.
- **Centrality scores and in-betweenness:** To identify key actors and relational importance within the network.
- **Louvain community detection:** To uncover clusters or communities of closely related nodes.
- **Power-law distribution:** To examine the distribution of node degrees and other network properties.
- **Density of a graph:** To measure the general level of connectedness in the network or its components.
- **(Entropy):** As a measure of network information or randomness, where applicable.

4.4.2 Unsupervised Learning and Association Analysis

To discover patterns and relationships within the data without pre-defined target labels, unsupervised learning techniques are employed, with a particular focus on association analysis.

- This approach relies on a **non-parametric notion** of pattern discovery.
- It aims at **discovering patterns of high density** or co-occurrence.

- **Lift scores** will be used to quantify the strength of associations found, indicating how much more likely two items (e.g., use of a specific jurisdiction and a type of intermediary) are to appear together than expected by chance.

4.4.3 Testing Significance of Results

To ensure the robustness of the findings, appropriate statistical tests are utilized:

- **Fisher’s exact test**: Employed where applicable, particularly for categorical data and contingency tables. This is ideal for association analysis results and for dummy variables, such as whether entities are connected to bearer instruments.
- **Mann-Whitney U test**: A non-parametric test used for comparing continuous variables between two independent groups when the data is not normally distributed.
- **Two-sample Kolmogorov-Smirnov test**: Used for comparing the distributions of continuous variables from two samples, again a non-parametric choice.

4.4.4 Multiple Hypothesis Testing

Given that this research involves exploring multiple patterns and relationships, it is crucial to address the issue of multiple hypothesis testing.

- The conventional Type I error rate of 5% ($p < 0.05$) can become inflated when multiple tests are performed, leading to a higher chance of false positives.
- The **Bonferroni correction** is considered, although it is known for being highly conservative.
- The **Benjamini-Hochberg procedure** may be a more suitable alternative to control the False Discovery Rate (FDR), offering a better balance between power and error control. However, given the exploratory nature of this work, which can be likened to a data mining exercise, a conservative approach (like Bonferroni) might be preferred to minimize false positives over maximizing statistical power. The choice of method will be justified based on the specific context of the analyses.

4.5 Use of LLMs in the Broader Paper

LLMs have also been used to polish the text of this thesis and used for idea generation.

Used Google Gemini models mainly, with the seed configured to 42:

- gemini-2.5-pro-preview-05-06

- gemini-2.5-pro-experimental-03-25

Empirical Analysis

5.0.1 Overview of the Dataset

The dataset reveals a highly concentrated landscape of offshore activities. This concentration is particularly stark when examining the jurisdictions of incorporation, where a mere 15 countries account for approximately 98% of all incorporated entities.

Concentration of Relevant Elements

Figure 5.1 provides a visual overview of this geographical concentration.

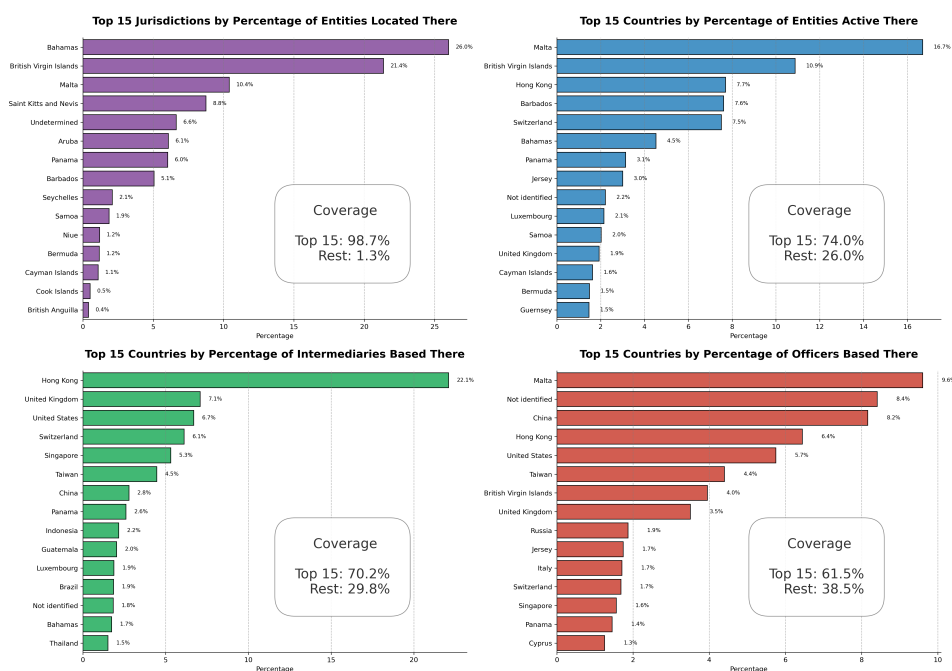


Figure 5.1: Geographical Concentration of Entities and Intermediaries

Degree Distribution of Intermediaries

A recurring theme within this analysis is the prevalence of power-law-like distributions. This is evident in the degree distribution of intermediaries (Figure 5.2), which indicates that a small number of intermediaries are connected to a large number of entities, while

most intermediaries have few connections. A formal comparison between a power-law and a log-normal distribution for the intermediary degree data yields a log-likelihood ratio $R = 57.0287$ with a p -value < 0.0001 , suggesting a better fit for the power-law model or at least a heavy-tailed distribution. This characteristic underpins much of the thesis.

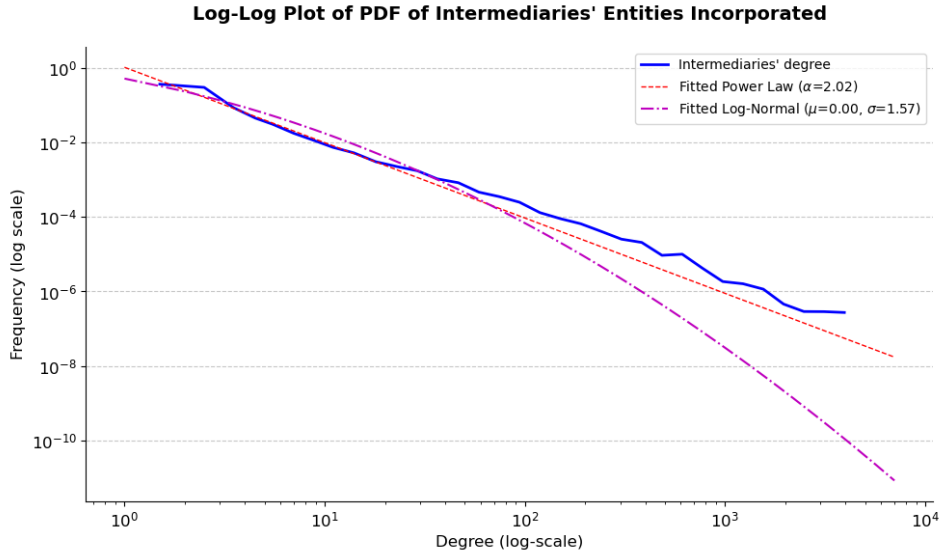


Figure 5.2: Degree Distribution of Intermediaries and Power-Law Fit

5.0.2 Geographical Specialisation

This section delves into the geographical patterns of intermediaries, examining their client locations and the jurisdictions they utilize for incorporation.

Intermediary Specialisation at the Country Level

When intermediaries are aggregated at the country level, distinct patterns emerge, as illustrated in Figures ?? through ?. Intermediaries demonstrate a strong proclivity for serving clients from their own country. However, their choice of incorporation jurisdictions is more diverse. The entropy of jurisdictions used for incorporation by a country's intermediaries is significantly higher than the entropy of the countries where their clients' entities have their main activity (Figure 5.3). This suggests that while client bases are often geographically focused, the selection of incorporation jurisdictions is more globally dispersed, albeit concentrated within a relatively small number of preferred offshore jurisdictions.

A two-sample Kolmogorov-Smirnov test formally confirms that the distributions of client country entropy and incorporation jurisdiction entropy are significantly different.

An illustrative example is Cyprus (Figure 5.4), which is well-documented for its strong links to Russia. While Russia is generally underrepresented in the broader dataset, entities

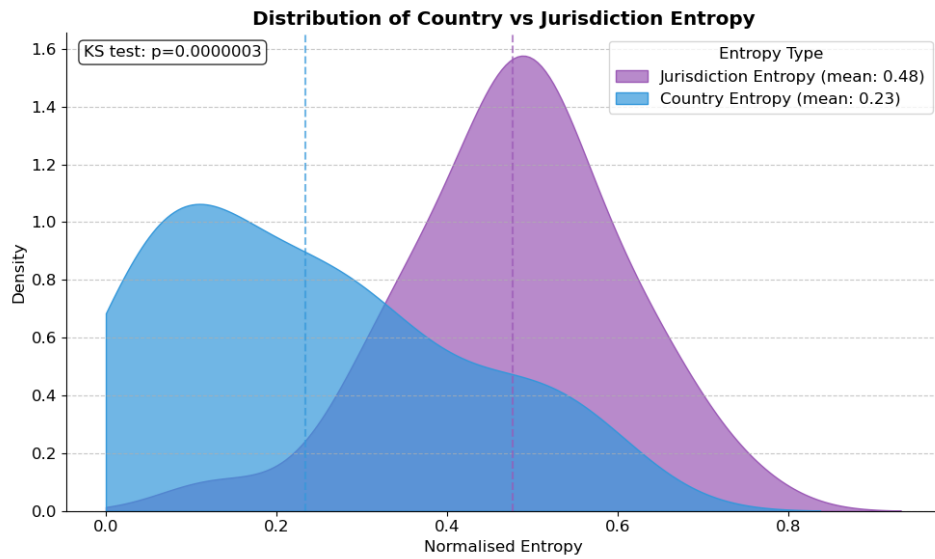
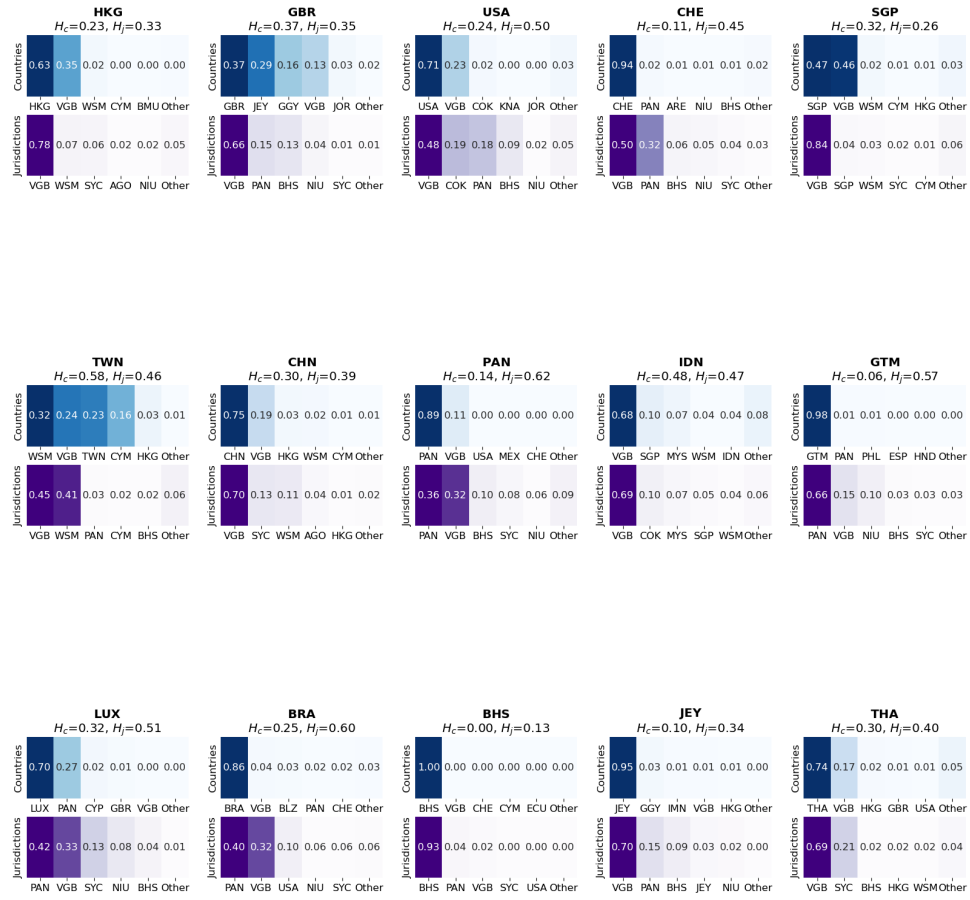


Figure 5.3: Distribution of Entropy for Client Countries vs. Incorporation Jurisdictions at the Country Level of Intermediaries

incorporated by Cypriot intermediaries show a significant Russian presence, with 12% of such entities linked to Russia. This highlights a high lift for the Cyprus-Russia connection. Such specific high-lift pairs could be targets for further investigation, though that falls outside the scope of this thesis.

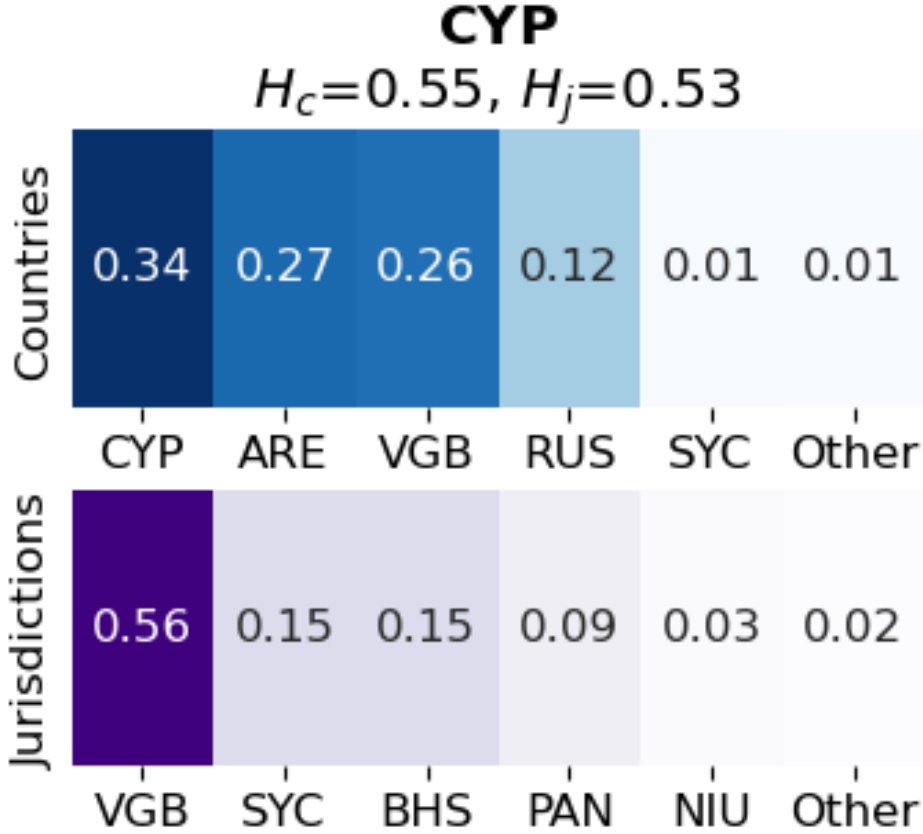


Figure 5.4: Client and Incorporation Jurisdiction Heatmap for Cyprus-based Intermediaries

Network of Countries Served by Intermediaries

While intermediaries at the country level show specialisation, particularly in their client bases, this section examines the specific clusters of countries served by individual intermediaries. At the intermediary level, clientele also tends to be highly concentrated in one or two countries, as shown in Figure 5.5. Interestingly, even as intermediaries grow larger (i.e., serve more clients), there is a very low correlation between the number of clients served and the number of distinct countries their clients originate from.

To explore these relationships further, a network of countries was constructed. In this network, two countries (nodes) are connected if an intermediary serves clients (entities) in both. The resulting full country network consists of 121 nodes and 2716 edges. Key summary statistics for this network are presented in Table 5.1.

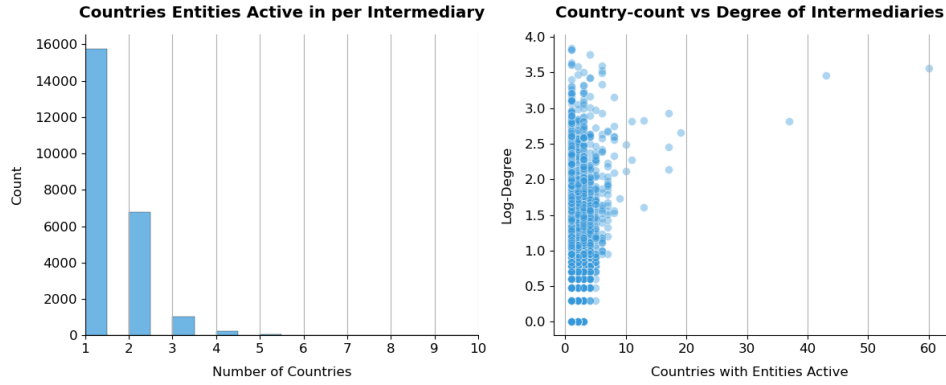


Figure 5.5: Distribution of the Number of Countries Served per Intermediary

Table 5.1: Summary Statistics for the Full Country Co-Service Network

Metric	Value
Number of Nodes	121
Number of Edges	2716
Network Density	0.3741
Average Degree	44.89
Average Clustering Coefficient	0.7728

Visualising such dense graphs is challenging. Therefore, to identify the most important connections, the network was filtered using association analysis, as shown in Figure 5.6. Edges are displayed only if they meet a support threshold (representing at least 0.008 of all intermediaries' country-pair connections) and a lift score of 1.5 or higher. This ensures that the visualized connections are not only frequent but also represent associations stronger than expected by chance. The resulting filtered network, or "backbone," thus highlights the most robust and significant co-service relationships. (The filtered graph presented features 14 clearly identifiable nodes: USA, BMU, CHN, HKG, CYM, VGB, SGP, TWN, MYS, COK, IDN, PAN, SYC, BHS, with WSM likely being the 15th implicitly).

The nodes in the network visualization are coloured in two ways: first, by communities identified using the Louvain method; and second, by regime type (VDem data). This was to explore whether regime type influences intermediary operations, though it appears less significant than other factors.

Interpretation of the Filtered Country Network Structure The filtered network (Figure 5.6) reveals a sparse yet highly structured set of relationships. A central core of interconnected nodes is evident, particularly involving VGB (British Virgin Islands), CYM (Cayman Islands), SGP (Singapore), and their links to HKG (Hong Kong) and BMU (Bermuda).

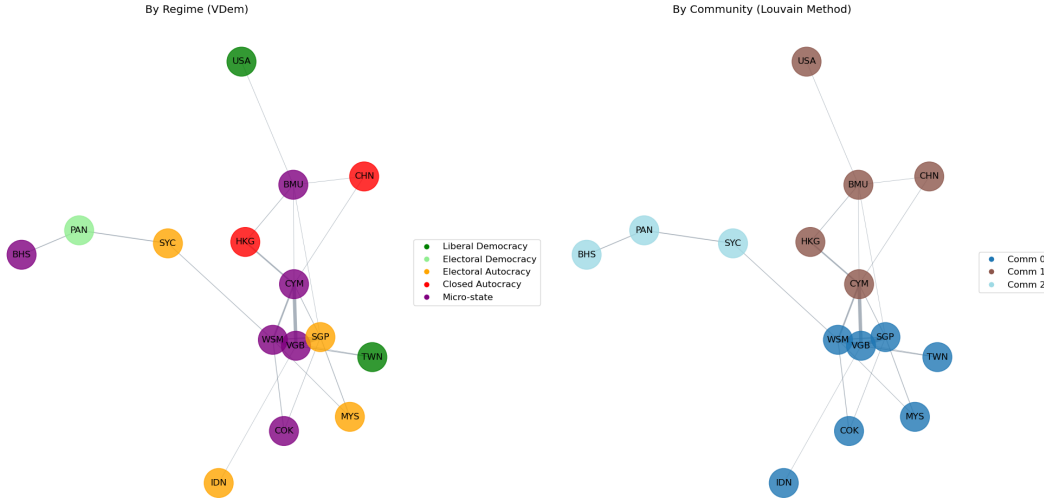


Figure 5.6: Filtered Network of Co-Served Countries, Coloured by Louvain Community and Regime Type. Edges shown have support ≥ 0.008 and lift ≥ 1.5 .

When coloured by regime type, no clear large-scale clustering emerges. The central cluster itself includes Micro-states (VGB, CYM, BMU), Closed Autocracies (HKG), and Electoral Autocracies (SGP). Liberal Democracies like USA and TWN (Taiwan) are present but connect to nodes of different regime types. This visual evidence supports the notion that regime type is not a primary driver of these strong co-service relationships.

The Louvain community detection method reveals data-driven groupings:

- **Community 0 (Dark Blue):** The largest, featuring VGB, SGP, CYM, TWN, MYS, IDN, COK (and likely WSM). This highlights strong ties between several offshore financial centers, key Asian economies, and Taiwan.
- **Community 1 (Brown):** Comprises USA, BMU, CHN, HKG, linking major economies with Bermuda.
- **Community 2 (Light Blue):** A smaller community of PAN, SYC, BHS.

Most nodes in this backbone are connected within 2-3 steps.

Centrality in the Country Network Centrality metrics for the full 121-node network (see Appendix Tables ?? and ??) identify key players. **VGB (British Virgin Islands)** is dominant with the highest betweenness and eigenvector centrality. The **USA** ranks second in both, linked to BMU in the filtered graph's Community 1. **HKG & CHN** also feature prominently in Community 1. Numerous **Micro-states** (BMU, BHS, CYM) show high centrality. **SGP (Singapore)** is another key, highly central node. High centrality in the full network generally translates to a significant structural role in this filtered backbone.

Significant Country Associations Lift scores from association analysis (Appendix Table ??) reveal strong pairings (visualized in Figure 5.6 for lift ≥ 1.5). Key findings include:

- Strong **Micro-state synergies** (e.g., VGB-CYM lift 1.91; CYM-BMU lift 13.47).
- A critical **USA-BMU-China/HKG nexus** (Comm 1): CHN-BMU (lift 15.28) and USA-BMU (lift 4.92) suggest Bermuda as a major intermediary hub for these powers.
- Robust **Asian connections** (e.g., SGP-MYS lift 5.27) and Singapore's links to Micro-states.
- A distinct **PAN-SYC-BHS nexus** (Comm 2).
- Crucially, high lift values are common **across different regime types**, reinforcing that factors beyond regime similarity (e.g., specialized services, legal systems) drive these strong ties.

Network of Jurisdictions Used by Intermediaries

Shifting focus to incorporation locations, this section analyzes the network of jurisdictions intermediaries use. The full jurisdiction network has 41 nodes and 347 edges (Summary statistics in Table 5.2). Figure 5.7 shows the distribution of jurisdictions used per intermediary.

Table 5.2: Summary Statistics for the Full Jurisdiction Co-Usage Network

Metric	Value
Number of Nodes	41
Number of Edges	347
Network Density	0.4232
Average Degree	16.93
Average Clustering Coefficient	0.8155

Figure 5.8 presents a filtered "backbone" of co-usage patterns. Nodes are coloured by legal technology (Laffitte dataset) and Louvain communities. (The image shows 16 identifiable nodes: CRI, SGP, CYP, GBR, BLZ, AGO, HKG, CYM, COK, MYS, BHS, SYC, PAN, NIU, WSM, USA).

Interpretation of the Filtered Jurisdiction Network Structure The filtered jurisdiction network shows a central, densely connected core (BHS, SYC, AGO, WSM, NIU, PAN, USA, HKG). Coloured by legal technology, the central cluster is dominated by jurisdictions offering "**Dual-Purpose**" legal technologies. This strongly supports the

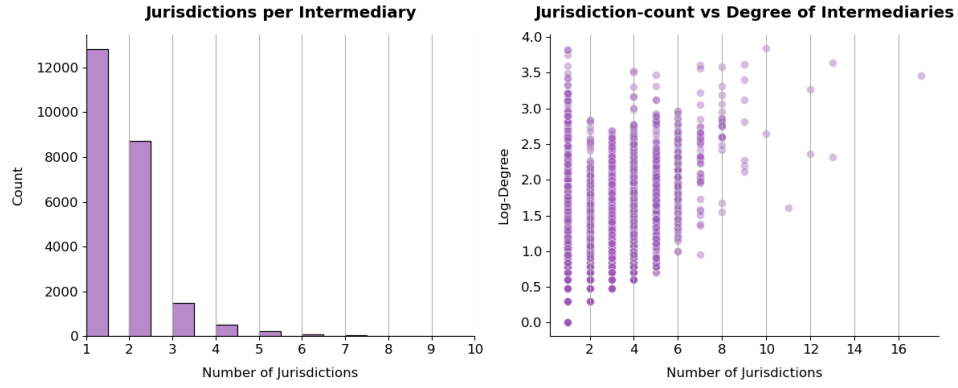


Figure 5.7: Distribution of the Number of Jurisdictions Used per Intermediary

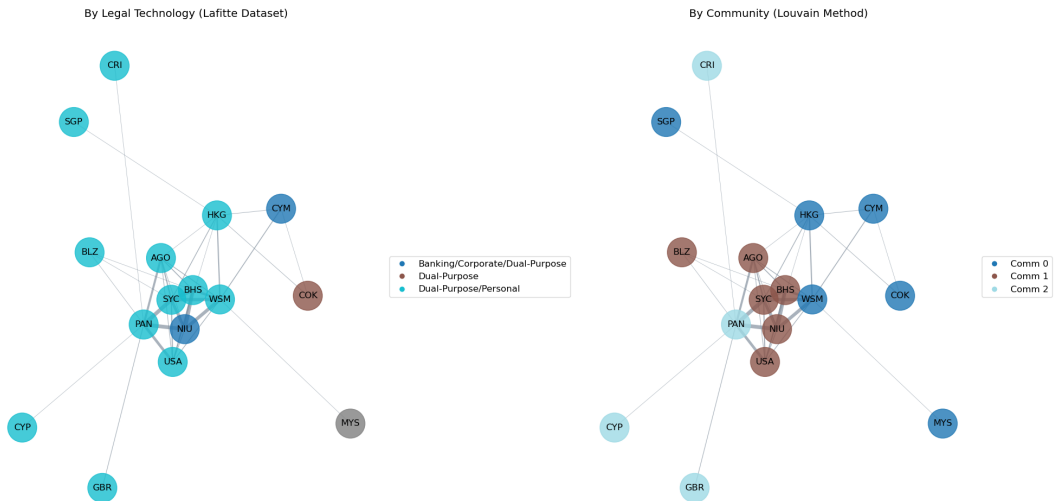


Figure 5.8: Filtered Network of Co-Used Jurisdictions, Coloured by Legal Technology and Louvain Community

observation that central jurisdictions in this network tend to offer flexible, dual-purpose structures.

Louvain community detection identifies:

- **Community 1 (Brown):** Largest and most central (USA, PAN, NIU, BHS, SYC, AGO, WSM), largely "Dual-Purpose" jurisdictions.
- **Community 0 (Dark Blue):** HKG, CYM, COK, combining "Banking/Corporate/Dual-Purpose" with "Dual-Purpose/Personal".
- **Community 2 (Light Blue):** More peripheral (SGP, CRI, CYP, GBR, BLZ, MYS).

Centrality in the Jurisdiction Network Centrality metrics for the full 41-jurisdiction network (Appendix Tables ?? and ??) are revealing. **VGB (British Virgin Islands)** ranks #1 in both betweenness and eigenvector centrality but is strikingly absent from the filtered graph. This implies its connections, while numerous, might not individually meet the high support/lift thresholds for this specific backbone view, or the visualization was capped. **BHS (Bahamas)** and **PAN (Panama)** are 2nd and 3rd in centrality and visibly central in the filtered graph. **HKG** and **CYM** are also highly central and core to Comm 0. Most other top-ranked jurisdictions align with the backbone, with VGB being the main exception.

Significant Jurisdiction Associations Association analysis (Appendix Table ??) highlights strong co-usage:

- The dominant **Community 1 ("Dual-Purpose" hubs)** shows very high mutual lift (e.g., BHS-NIU lift 4.64; NIU-WSM lift 5.33), with NIU as a critical connector.
- **Community 0 (financial centers):** HKG-CYM (lift 5.82).
- Exceptional **cross-community lift**: AGO-BLZ (lift 20.41), suggesting specific niche relationships.
- High-lift associations often pair jurisdictions with **similar legal technology profiles**, but also occur between those with different profiles (e.g., WSM-CYM), indicating synergies drive co-usage.
- Peripheral jurisdictions (Comm 2) can have **extremely high lift values** in specific pairings (e.g., GBR-CRI lift 57.3; JEY-GGY lift 197!), pointing to highly specialized niches.

5.0.3 Functional Specialisation of Intermediaries

This section shifts from geography to the functional roles of intermediaries, exploring if a typology (e.g., EU, 2017; personalised advice vs. aid in incorporation) emerges. This analysis uses a classified random sample, as top-degree intermediaries aren't representative of the whole population (Figure 5.9). The filtering of this sample is detailed in the Appendix (Figure 5.10).

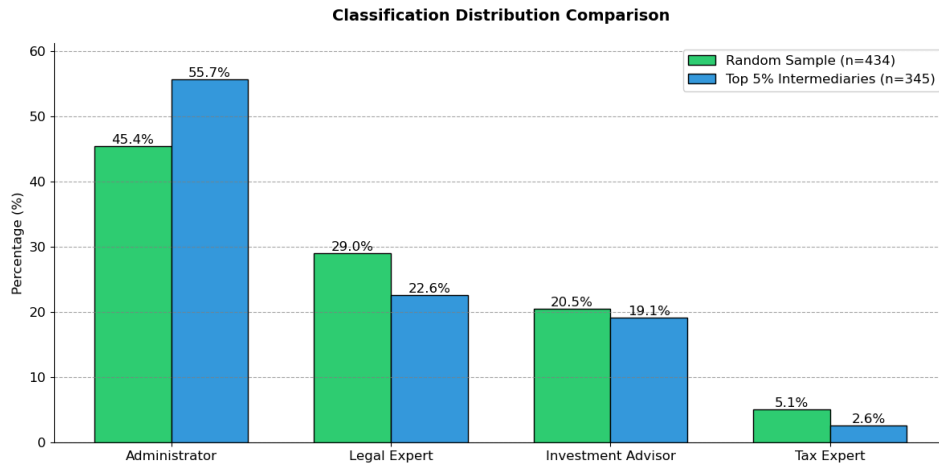


Figure 5.9: Distribution of Intermediary Classifications

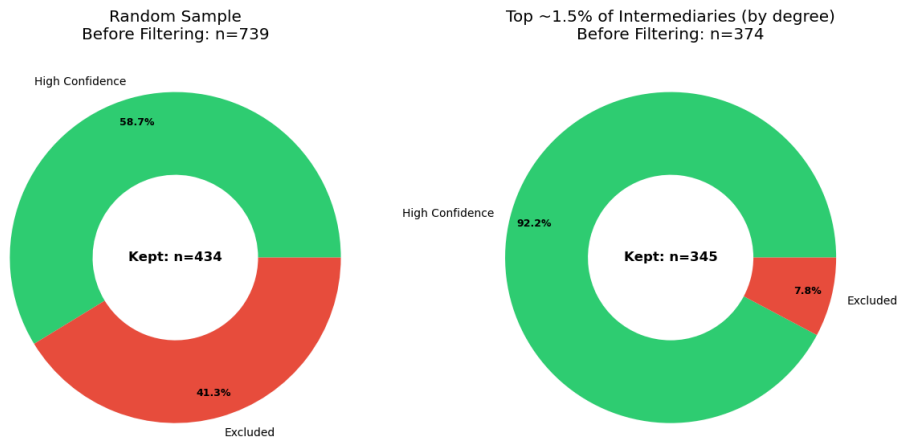


Figure 5.10: Filtering Process of the Enriched Random Sample for Functional Classification

Different Levels of Connectivity: Personalised Advice vs. Aid in Incorporation

A key differentiator is the number of entities incorporated. Administrators and legal experts appear more in top-degree intermediaries than tax experts/investment advisors. Figure 5.11 shows the CDF of degrees by classification.

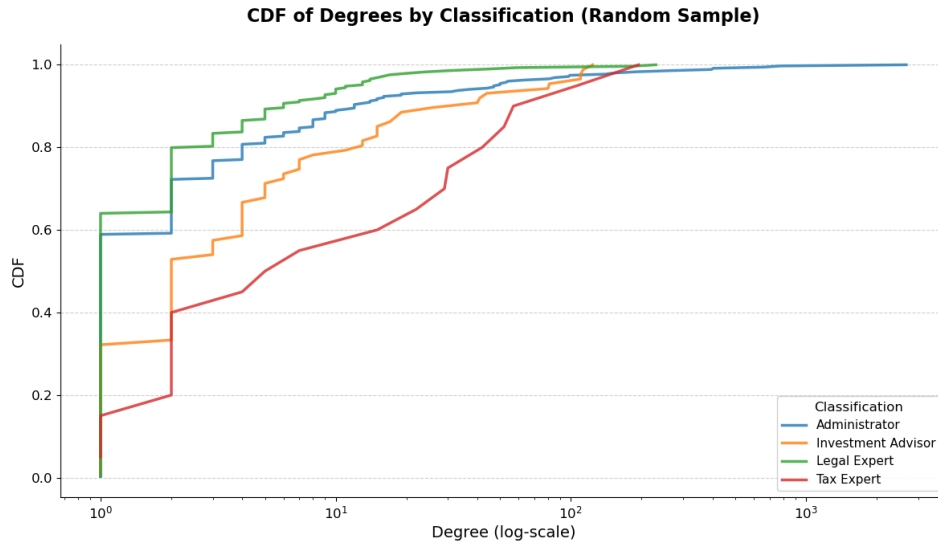


Figure 5.11: CDF of Degrees by Intermediary Classification (Random Sample)

Two-sample KS-tests (Bonferroni corrected for 6 pairs) found significant differences in degree distributions for 4 pairs. 'Tax Experts' and 'Investment Advisors' were not significantly different, nor were 'Legal Experts' and 'Administrators'. However, cross-group comparisons (e.g., 'Tax Experts' vs. 'Legal Experts') were all significant. This makes sense as the non-significant pairs are functionally more similar.

Different Activities: Instruments and Service Offerings

Intermediary activities are compared using five metrics:

1. Entropy of incorporation jurisdictions.
2. Entropy of client countries.
3. Entropy of regimes of countries they incorporate in.
4. Entropy of legal technologies in jurisdictions they incorporate in.
5. Use of bearer instruments (binary).

Figure 5.12 shows average values by classification.

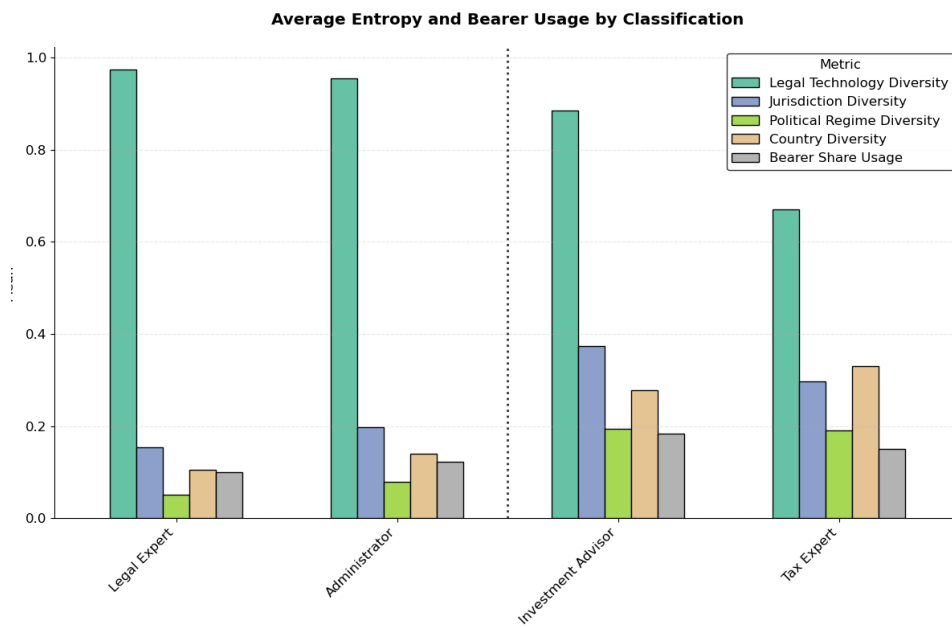


Figure 5.12: Average Entropy Measures and Bearer Instrument Usage by Intermediary Classification

Discussion

Results from country network

Micro-states as Critical Hubs, Not Just Peripheries: The analysis (both centrality and the filtered graph) consistently shows that Micro-states (VGB, BMU, CYM, etc.) are not just passive recipients but act as essential, highly-connected nodes in the global intermediary network. VGB's top centrality and BMU's role in linking USA and China are striking.

Regime Type is Secondary for Strongest Links: The initial hypothesis that intermediaries specialize along regime lines is not supported by this "backbone" network. The Louvain communities are heterogeneous in regime type, and many of the highest-lift associations bridge countries with different political systems. This suggests that "relational capital" and specialization are built around other commonalities (e.g., financial niches, legal frameworks, tax environments).

Discovery of Specific, Powerful Triads/Clusters: The USA-BMU-CHN/HKG (Comm 1) cluster is a major finding, indicating that Bermuda is a key jurisdiction for intermediaries navigating between these global economic giants. The very high lift values (especially CHN-BMU) point to highly specialized, non-random behaviors. The VGB/CYM/WSM-SGP (part of Comm 0) cluster shows a strong Asia-Offshore link.

Effectiveness of Network Filtering: The chosen support and lift thresholds effectively cut through the noise of a dense full network to reveal a meaningful "backbone" of the most significant co-service relationships, allowing for clearer interpretation of underlying structures and key players.

Data-Driven Communities Reveal Operational Logic: The Louvain communities provide a more insightful grouping than regime types, suggesting that intermediaries organize their operations around distinct, albeit internally diverse, networks of countries. These communities likely represent different types of financial service ecosystems or historical/economic pathways.

Synthesis from Jurisdiction Network

Emergence of a "Dual-Purpose" Core: A significant cluster of jurisdictions, primarily within Louvain Community 1 (BHS, NIU, WSM, SYC, PAN, USA), is heavily utilized in tandem by intermediaries. Many of these are characterized by offering flexible

"Dual-Purpose" legal technologies. NIU, in particular, shows up as a key connector with extremely high-lift associations.

VGB's Puzzling Absence from the Visual Backbone: The most central and frequently used jurisdiction overall (VGB) is not present in this filtered graph. This is a major finding, suggesting that its centrality stems from a vast number of connections that, individually, might not all meet the stringent lift/support criteria of this "backbone" view, or that the strongest co-incorporation patterns favor other hubs. This implies that sheer volume of use (VGB) and strongest paired usage (e.g., BHS-NIU) can highlight different aspects of the network.

Highly Specific and Powerful Pairings: The analysis reveals extremely high lift scores for certain jurisdiction pairs (e.g., AGO-BLZ, GBR-CRI, JEY-GGY), indicating very strong, non-random preferences by intermediaries. These point to specialized niches where using specific combinations of jurisdictions is a common strategy.

Distinct Communities of Practice: The Louvain communities effectively partition the network into groups of jurisdictions that are frequently used together by the same intermediaries, more so than grouping by legal technology alone.

Comm 1 (Brown) is the "Dual-Purpose" engine room.

Comm 0 (Dark Blue) clusters key financial centers like HKG and CYM with COK.

Comm 2 (Light Blue) groups other important jurisdictions that have strong, specific links even if they appear less central in this particular visual.

Legal Technologies as a Feature, Not a Definitive Grouping Principle: While jurisdictions in the core often offer "Dual-Purpose" technologies, the Louvain communities show that operational groupings are more nuanced. Intermediaries combine jurisdictions based on a range of factors beyond just the primary legal technology type, likely including specific use-cases, costs, reputation, and existing intermediary expertise spanning those locations.

Conclusion

Appendix

A.1 Country Network Centrality and Associations

Table 3 lists the top 10 countries by betweenness centrality and Table 4 by eigenvector centrality in the full co-service network. Table 5 details significant country associations.

Table A.1: Top 10 Countries by Betweenness Centrality in the Full Co-Service Network (excluding XXX)

Node	Betweenness	Eigenvalue	Appearances	Regime
VGB	0.18	0.14	6285	Micro-state
USA	0.053	0.13	1042	Liberal Democracy
CHE	0.039	0.13	1545	Liberal Democracy
GBR	0.028	0.13	1258	Liberal Democracy
MUS	0.024	0.13	139	Liberal Democracy
BHS	0.021	0.13	489	Micro-state
BMU	0.020	0.13	103	Micro-state
PAN	0.020	0.096	1203	Electoral Democracy
SGP	0.019	0.13	578	Electoral Autocracy
URY	0.017	0.031	318	Liberal Democracy

Table A.2: Top 10 Countries by Eigenvector Centrality in the Full Co-Service Network (excluding XXX)

Node	Eigenvalue	Betweenness	Appearances	Regime
VGB	0.14	0.18	6285	Micro-state
USA	0.13	0.053	1042	Liberal Democracy
GBR	0.13	0.028	1258	Liberal Democracy
HKG	0.13	0.016	2865	Closed Autocracy
JEY	0.13	0.013	390	Micro-state
CHN	0.13	0.0085	320	Closed Autocracy
CAN	0.13	0.0088	195	Liberal Democracy
BHS	0.13	0.021	489	Micro-state
SGP	0.13	0.019	578	Electoral Autocracy
CYM	0.13	0.012	363	Micro-state

Table A.3: Significant Country Associations in Co-Service Network (Bonferroni Corrected $p < 6.89 \times 10^{-6}$)

	u	v	u_regime	v_regime	support	lift	p_value
76	VGB	WSM	Micro-state	Micro-state	0.017	1.87	7.24e-46
498	WSM	CYM	Micro-state	Micro-state	0.0035	6.78	1.34e-45
105	VGB	CYM	Micro-state	Micro-state	0.0076	1.91	9.58e-23
775	CHN	BMU	Closed Autoc-racy	Micro-state	0.00088	15.3	3.36e-19
2405	CYM	BMU	Micro-state	Micro-state	0.00088	13.5	4.46e-18
2032	SGP	MYS	Electoral Autoc-racy	Electoral Autoc-racy	0.0016	5.27	5.66e-17
102	VGB	SGP	Micro-state	Electoral Autoc-racy	0.010	1.60	9.75e-17
351	PAN	SYC	Electoral Democracy	Electoral Autoc-racy	0.0020	3.89	8.08e-16
501	WSM	COK	Micro-state	Micro-state	0.0015	4.84	1.57e-15
496	WSM	SGP	Micro-state	Electoral Autoc-racy	0.0025	3.04	1.89e-14
2044	SGP	BMU	Electoral Autoc-racy	Micro-state	0.00083	8.06	5.07e-13
488	WSM	SYC	Micro-state	Electoral Autoc-racy	0.0014	4.14	2.36e-12
2033	SGP	CYM	Electoral Autoc-racy	Micro-state	0.0014	3.89	1.75e-11
2035	SGP	COK	Electoral Autoc-racy	Micro-state	0.0010	4.63	2.23e-10
1190	USA	BMU	Liberal Democracy	Micro-state	0.00092	4.92	4.62e-10
497	WSM	TWN	Micro-state	Liberal Democracy	0.00083	5.48	5.27e-10
768	CHN	CYM	Closed Autoc-racy	Micro-state	0.00096	4.75	8.31e-10
2034	SGP	MUS	Electoral Autoc-racy	Liberal Democracy	0.00071	5.07	4.46e-08
419	JEY	BMU	Micro-state	Micro-state	0.00050	7.16	1.17e-07
642	HKG	CYM	Closed Autoc-racy	Micro-state	0.0032	1.75	6.61e-07
650	HKG	BMU	Closed Autoc-racy	Micro-state	0.0013	2.52	6.83e-07
502	WSM	MYS	Micro-state	Electoral Autoc-racy	0.0012	2.75	1.54e-06
2039	SGP	TWN	Electoral Autoc-racy	Liberal Democracy	0.00054	5.04	1.85e-06
2307	AUS	IRL	Liberal Democracy	Liberal Democracy	0.00021	22.0	3.25e-06

A.2 Jurisdiction Network Centrality and Associations

Table 6 shows the top 10 jurisdictions by betweenness centrality and Table 7 by eigenvector centrality in the full co-usage network. Significant jurisdiction associations are detailed in Table 8.

Table A.4: Top 10 Jurisdictions by Betweenness Centrality in the Full Co-Usage Network (excluding XXX)

Node	Betweenness	Eigenvalue	Appearances	Jurisdiction Legal Technology
VGB	0.20	0.26	13533	Dual-Purpose/Personal
BHS	0.084	0.26	2099	Banking/Corporate/Dual-Purpose/Other Technologies/Personal
PAN	0.060	0.25	6533	Banking/Corporate/Dual-Purpose
HKG	0.058	0.24	625	Banking/Corporate/Other Technologies
CYM	0.048	0.21	290	Banking/Corporate/Dual-Purpose
WSM	0.027	0.20	1352	Dual-Purpose/Personal
USA	0.019	0.23	387	None
COK	0.018	0.12	954	Banking/Corporate/Dual-Purpose/Personal
CYP	0.017	0.22	45	Banking/Corporate/Dual-Purpose
SGP	0.013	0.19	355	Banking/Other Technologies

Table A.5: Top 10 Jurisdictions by Eigenvector Centrality in the Full Co-Usage Network (excluding XXX)

Node	Eigenvalue	Betweenness	Appearances	Jurisdiction Legal Technology
VGB	0.26	0.20	13533	Dual-Purpose/Personal
BHS	0.26	0.084	2099	Banking/Corporate/Dual-Purpose/Other Technologies/Personal
PAN	0.25	0.060	6533	Banking/Corporate/Dual-Purpose
HKG	0.24	0.058	625	Banking/Corporate/Other Technologies
USA	0.23	0.019	387	None
CYP	0.22	0.017	45	Banking/Corporate/Dual-Purpose
CYM	0.21	0.048	290	Banking/Corporate/Dual-Purpose
WSM	0.20	0.027	1352	Dual-Purpose/Personal
JEY	0.20	0.011	28	Dual-Purpose/Other Technologies
SGP	0.19	0.013	355	Banking/Other Technologies

Table A.6: Significant Jurisdiction Associations in Co-Usage Network (Bonferroni Corrected $p < 6.10 \times 10^{-5}$)

	u	v	u_legal_technology	v_legal_technology	support	lift	p_value
72	BHS	NIU	Bnk/Corp/Dual/Oth Tech/Pers	Dual-Purpose	0.016	4.6	1.80e-165
108	NIU	WSM	Dual-Purpose	Dual-Purpose/Personal	0.012	5.3	9.68e-134
106	NIU	SYC	Dual-Purpose	Dual-Purpose/Personal	0.010	4.1	1.89e-85
122	SYC	WSM	Dual-Purpose/Personal	Dual-Purpose/Personal	0.011	3.3	4.50e-73
3	PAN	SYC	Bnk/Corp/Dual-Purpose	Dual-Purpose/Personal	0.027	1.6	2.50e-49
73	BHS	SYC	Bnk/Corp/Dual/Oth Tech/Pers	Dual-Purpose/Personal	0.013	2.3	2.62e-48
123	SYC	AGO	Dual-Purpose/Personal	None	0.0043	4.6	2.20e-40
4	PAN	USA	Bnk/Corp/Dual-Purpose	None	0.0095	2.2	1.33e-39
121	SYC	USA	Dual-Purpose/Personal	None	0.0041	4.2	9.61e-36
143	USA	AGO	None	None	0.0021	8.6	1.49e-32
2	PAN	NIU	Bnk/Corp/Dual-Purpose	Dual-Purpose	0.018	1.6	1.88e-32
174	WSM	CYM	Dual-Purpose/Personal	Bnk/Corp/Dual-Purpose	0.0031	4.6	1.31e-29
1	PAN	BHS	Bnk/Corp/Dual-Purpose	Bnk/Corp/Dual/Oth Tech/Pers	0.033	1.4	3.87e-29
74	BHS	USA	Bnk/Corp/Dual/Oth Tech/Pers	None	0.0042	3.0	1.33e-23
162	WSM	HKG	Dual-Purpose/Personal	Bnk/Corp/Oth Tech	0.0043	2.9	4.59e-23
204	HKG	CYM	Bnk/Corp/Oth Tech	Bnk/Corp/Dual-Purpose	0.0018	5.8	3.16e-21
107	NIU	USA	Dual-Purpose	None	0.0025	3.9	1.05e-19
6	PAN	AGO	Bnk/Corp/Dual-Purpose	None	0.0074	1.8	3.80e-18
163	WSM	AGO	Dual-Purpose/Personal	None	0.0027	3.2	1.30e-16
140	USA	WSM	None	Dual-Purpose/Personal	0.0026	2.8	8.95e-14
7	PAN	GBR	Bnk/Corp/Dual-Purpose	None	0.0023	2.4	1.50e-13
76	BHS	AGO	Bnk/Corp/Dual/Oth Tech/Pers	None	0.0032	2.4	3.06e-13
128	SYC	BLZ	Dual-Purpose/Personal	Bnk/Corp/Dual-Purpose/Pers	0.00092	6.0	3.06e-12
75	BHS	WSM	Bnk/Corp/Dual/Oth Tech/Pers	Dual-Purpose/Personal	0.0080	1.6	3.94e-12
10	PAN	CRI	Bnk/Corp/Dual-Purpose	None	0.0011	3.1	7.44e-11
109	NIU	AGO	Dual-Purpose	None	0.0017	2.8	2.41e-09
81	BHS	BLZ	Bnk/Corp/Dual/Oth Tech/Pers	Bnk/Corp/Dual-Purpose/Pers	0.00083	3.7	1.18e-07
34	VGB	NIU	Dual-Purpose/Personal	Dual-Purpose	0.025	1.1	4.69e-07
9	PAN	CYP	Bnk/Corp/Dual-Purpose	Bnk/Corp/Dual-Purpose	0.0012	2.3	9.42e-07
207	HKG	SGP	Bnk/Corp/Oth Tech	Bnk/Oth Tech	0.0011	2.8	2.53e-06
125	SYC	HKG	Dual-Purpose/Personal	Bnk/Corp/Oth Tech	0.0028	1.8	3.98e-06

A.3 Classification of Intermediaries

To instruct the AI agent on how to perform the classification and the specific structure of the information to return, the following prompt template is utilized. This prompt defines the categories, provides keywords for guidance, and specifies the desired output fields. The agent's output for each intermediary is a structured data record, typically resembling a JSON object or a Python dictionary, which includes the fields detailed in the prompt.

Classification Prompt

The core prompt provided to the AI agent for classification is as follows (where `{intermediary_name}` and `{log_summary_for_classification}` are dynamically inserted):

Classify the intermediary: `{intermediary_name}`

Based **only** on the information gathered in the following search log.
`{log_summary_for_classification}`

Classify this intermediary into ONE of these categories based on their likely primary role in offshore activities:

- Tax Expert: Focuses on tax planning, compliance, advisory. Keywords: tax advisory, international tax, tax compliance, tax returns, transfer pricing, VAT, tax structuring.
- Legal Expert: Focuses on legal structuring, compliance, incorporation, representation. Keywords: legal services, corporate law, entity formation, incorporation, contracts, litigation, legal opinions, regulatory compliance, M&A legal, lawyer, attorney, solicitor.
- Administrator: Focuses on accounting, auditing, financial reporting, company administration. Keywords: accounting, bookkeeping, audit, financial statements, reporting, company secretarial, payroll, administration services, domiciliation, accountant, auditor.
- Investment Advisor: Focuses on managing financial assets and investments. Keywords: investment management, wealth management, asset management, portfolio management, financial planning, investment strategy, securities, funds, financial advisor.

Provide a structured classification including:

- classification (Enum: Tax Expert, Legal Expert, Administrator, Investment Advisor)
- role_muddled (bool: true if the role seems mixed or unclear)
- role_muddled_reasoning (str: explanation if role_muddled is true)

- `is_individual` (bool: based on the name and findings, is this likely a person?)
- `job_title` (str: inferred job title if possible, e.g., "Lawyer", "Accountant", "Director", or "Unknown")
- `confidence` (Enum: Low, High - Use Low if evidence is sparse, contradictory, or confidence in the source/relevance is low)
- `justification` (str: detailed reasoning for the classification, referencing the search log)
- `key_evidence` (list[str]: specific snippets or findings from the search results supporting the classification)

Analyze the content of the search results carefully. Prioritize information directly describing the intermediary's services or professional role.

Examples of Dynamic Search and Structured Output

The agent's search process is dynamic. It begins with a general query (the intermediary's name) and, based on the retrieved information's relevance and completeness, may formulate up to two additional, more specific queries. For instance, if initial results for a company are vague, subsequent queries might include terms like "services offered" or "business activity." The classification is then made based on the entirety of the gathered search logs.

Sometimes it's just not possible to find anything useful, hence the confidence section. Any cases where 'confidence' is low, they are excluded from the analysis sections.

The output for each intermediary is a structured record. While the 'key_evidence' field in the prompt requests specific snippets, for comprehensiveness in these examples, it contains the full, somewhat verbose, search log detailing each iteration of the dynamic search process.

The following examples illustrate this process and the resulting structured output, taken directly from the enrichment process. The first provides an example of where it's impossible to find clear information linked to the intermediary resulting in low confidence, while the second is a clear case of a legal expert.

Example 1: OPULENT OPAL HOLDINGS LIMITED

Dynamic Search Summary:

- **Iteration 0 Query:** 'OPULENT OPAL HOLDINGS LIMITED'
- **Findings:** Results were ambiguous, pointing to "OPULENT OPAL CONSTRUCTION LIMITED," a subsidiary link to "Opal Holdings Pte Ltd" (itself a subsidiary

of CapitaLand, suggesting a holding structure), and unrelated products (paint, home decor).

- **Iteration 1 Query:** ‘OPULENT OPAL HOLDINGS LIMITED primary business activities’
- **Findings:** Retrieved general information on Bank Secrecy Act compliance for businesses, potentially triggered by "holdings," and another mention of the CapitaLand subsidiary link.
- **Iteration 2 Query:** ‘OPULENT OPAL HOLDINGS LIMITED services offered’
- **Findings:** Largely irrelevant results (gemstones, furniture), again highlighting the difficulty in pinpointing specific services for this entity.

Structured Output (Simplified Representation):

- **intermediary_name:** OPULENT OPAL HOLDINGS LIMITED
- **classification:** Administrator
- **confidence:** Low
- **role_muddled:** True
- **role_muddled_reasoning:** "The role is muddled as the search results are ambiguous and could indicate construction, holding company activities, or other possibilities. There is no clear indication of their primary business activities."
- **is_individual:** False
- **job_title:** Unknown
- **justification:** "The search results provide limited information about OPULENT OPAL HOLDINGS LIMITED. One result mentions 'OPULENT OPAL CONSTRUCTION LIMITED' which suggests involvement in construction, potentially as a specialty trade contractor. Another result indicates that 'Opal Holdings Pte Ltd' is a subsidiary of CapitaLand, implying a holding company structure. The lack of direct evidence about their services or role leads to a low confidence classification as an administrator, potentially involved in company administration or holding activities."
- **key_evidence (Full Search Log):** (Content of the JSON-like string representing the three search iterations and their results, as provided in the original example, would be detailed here. For brevity, it is summarized above and omitted in this representation.)

Example 2: Cheo Yeoh & Associates**Dynamic Search Summary:**

- **Iteration 0 Query:** ‘Cheo Yeoh & Associates’
- **Findings:** Immediately yielded relevant results identifying the entity as "CHEO YEOH & ASSOCIATES LLC," a Singapore-based company providing legal services, with details on its registration and directors.
- **Iteration 1 Query:** ‘Cheo Yeoh & Associates services’
- **Findings:** Reinforced the legal nature, with results like "Cheo Yeoh & Associates provides legal services" and official listings specifying "LEGAL ACTIVITIES."
- **Iteration 2 Query:** ‘Cheo Yeoh & Associates client testimonials’ (or similar refinement if needed)
- **Findings:** Could uncover legal case mentions, lawyer profiles, or further business directory listings, solidifying its role. (The provided log indicates successful identification primarily from the first two iterations).

Structured Output (Simplified Representation):

- **intermediary_name:** Cheo Yeoh & Associates
- **classification:** Legal Expert
- **confidence:** High
- **role_muddled:** False
- **role_muddled_reasoning:** (Empty or N/A)
- **is_individual:** False
- **job_title:** Lawyer (Implicitly, as a law firm)
- **justification:** "Cheo Yeoh & Associates LLC provides legal services in Singapore. The company’s principal activity is LEGAL ACTIVITIES (EXCLUDING ONLINE MARKETPLACES). Johnny Cheo is a Director at the firm. The firm has been operating for 23 years. The search results consistently point to legal services."
- **key_evidence (Full Search Log):** (Content of the JSON-like string representing the search iterations and their results, as provided in the original example, would be detailed here. For brevity, it is summarized above and omitted in this representation.)