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Network Structure of Financial Institutions in the Philippines: Insights on Corporate Control and Competition

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Abstract

This exploratory study is about understanding the structure of networks of financial institutions in the Philippines. The literature notes that the financial sector occupies a central position within corporate networks. More importantly, the significance of learning more deeply about the structure of connections that the financial sector has stems from its being an intermediate sector. The financial sector is such a crucial aspect because of its role in promoting efficiency in other economic sectors. In fact, this sector occupies a very special position of influence with respect to how the wealth of an economy is generated and allocated. Using the network lens, we examine the structure of interrelationships via ownership to draw insights related to corporate control, competition and financial sector development. Using data from the Philippine Stock Exchange on publicly listed financial companies and their networks, we distinguished subsidiary networks, ownership networks and networks created by board interlocks. We found that the subsidiary network of financial companies is a fragmented one and that the connections among members of a group are closely-knit. Subsidiary networks exhibit a hub and spoke structure with a parent company in the center and subsidiaries around it. This centralized structure is said to be used by investment companies for the purpose of pooling assets, cutting costs and improving efficiency. We likewise found that financial institutions diversify their portfolio by owning various companies not only in the financial sector but also in other sectors. This study found evidence of the interconnections among companies in the financial sector, and between financial companies and others. The networks formed via interlocks of BOD members and officers show that their connections have a high proportion of triples suggesting ease of reaching others within a short distance – a characteristic of small world phenomenon. The finding of an interconnected network, nearly one component network, also suggests that the extent of corporate control can be wide.

Keywords: financial networks, corporate control, competition, finance, ownership networks, subsidiary networks, board interlocks, Philippine financial sector, network structure, corporate governance, interlocking directorates, network analysis, network fragmentation

Network structure of financial institutions in the Philippines: Insights on corporate control and competition

Aubrey Tabuga, Mark Gerald Ruiz, Ramonette Serafica, and Madeleine Louise Baiño[1]

1. Introduction

1.1. Background

The Philippine Development Plan notes that "a vibrant and healthy financial sector is critical to ensuring a stable macroeconomy."[2] Although the financial system is described as one that remains sound and stable, there are challenges that must be addressed. These challenges include the persisting digital divide, lack of financial inclusion and financial markets that lag behind Southeast Asian neighbors. This paper seeks to illustrate broader contextual forces behind financial sector development and stability. The contextual factor of interest is the structure of networks of ownership in the financial sector.

In general, the Philippines' private sector is said to be characterized by concentrated ownership by a limited number of family shareholders (WB, 2001) and that "family-owned business groups are the dominant form of economic organization in the Philippines" (Dela Rama, 2010). Claessens, Djankov, and Lang (2000)[3] provide evidence that 17.1% of the value of listed corporate assets in the Philippines can be traced to the ultimate control of a single family. Indonesia has a similar situation at 16.6 percent of the total assets being controlled by a single family. The Philippines' case is comparable to that of Indonesia and Thailand where the largest ten families control half of the corporate assets in the study's sample firms. Economies such as Hong Kong and Korea have relatively less concentrated corporate sector with the largest ten families owning about one-third of the total assets of their sample firms. On the other hand, the case of Japan is different from these economies with family corporate control being insignificant. Improving the extent of competition in the economy is crucial in achieving broad-based economic development and faster poverty reduction. Using recent information, this paper seeks to probe into the extent of ownership and corporate control, and structure of ownership of business groups for purposes of gaining insights related to promoting competition.

Similarly, understanding the structure of the networks of financial institutions is crucial in policy discussions pertaining to its development and in achieving/maintaining financial stability. Financial sector development plays a significant role in economic development – promoting growth through "capital accumulation and technological progress by increasing the savings rate, mobilizing and pooling savings, producing information about investment, facilitating and encouraging the inflows of foreign capital, as well as optimizing the allocation of capital."[4] A stable financial system is also crucial in efficient allocation of resources, and in ascertaining and managing financial risks, among others. The financial sector is such a crucial aspect because of its role in promoting efficiency in other economic sectors (Sandoval and

[1] The authors wish to acknowledge the excellent research assistance of Bless Mondez and Junalyn Bayona. The usual disclaimer applies.
[2] PDP 2023-2028 p.231
[3] https://www.sciencedirect.com/science/article/abs/pii/S0304405X00000672
[4] https://www.worldbank.org/en/publication/gfdr/gfdr-2016/background/financial-development

Milo, 2018). By analyzing networks of the financial sector,[5] we can draw some insights that may have implications for the development of the financial sector and its stability more specifically and competition, more generally.

This paper uses publicly listed companies' information disclosed at the Philippine Stock Exchange (PSE). The approach used is systemic analysis via graph theory in drawing and analyzing the ownership networks. By using graph theory, network analysis provides objective parameters of connectedness and centrality. With a bird's eye view of the economic system which the network analysis can provide, policymakers can also become more aware of interconnections and key actors within the system. Ultimately, this paper aims to draw insights that can inform public policy formulation and discourse with respect to competition and risk management.

1.2. Objectives

This study aims to analyze the structure of firm networks of publicly listed financial companies in the Philippines via network science.

Specifically, the objectives are:

- To understand the structure of networks of these financial companies in a graphical illustration and graph theory, showing extent of clustering (if any) and sectoral attributes of the nodes (firms/companies);
- To provide descriptive properties of the networks commonly used in network science;
- To examine links, direct and indirect, if any, between competitors and to understand the nature of the companies that act as intermediaries; and
- To draw policy insights for purposes of enhancing competition and public policy.

2. Methodology

2.1. Conceptual framework

Through network analysis, the connections of and among corporations are drawn and analyzed – giving a visual illustration of the economic system. The concept of networking/relations among corporations in this study is limited to ownership – subsidiary links and shareholder links. To construct the ownership networks, the relationship between firms is illustrated by means of *nxn* binary adjacency matrices A and B, with the following elements:

$$a_{i,j} = \begin{cases} 1 & if\ the\ j-th\ company\ is\ a\ subsidiary\ of\ or\ owned\ by\ the\ i-th\ company \\ 0 & otherwise \end{cases}$$

By analyzing the structure of network ownership illustrated in graph a, we aim to understand the extent of corporate control among financial institutions and beyond. The network graph, a, comes in various iterations depending on the strength of ownership links. We examined

[5] This effort is part of a larger initiative to understand the structure of networks of PSE-listed companies.

subsidiary networks (which we consider as the stronger ownership ties) versus broader ownership network (with the addition of links involving lower shares of ownerships) to understand network structure, bridging or betweenness roles, and central actors among others.

Aside from graph A, we want to supplement it by examining the extent to which board members produce links between companies. To construct this network, the relationship between firms is illustrated by means of binary adjacency matrix b, with the following elements:

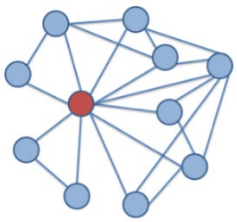
$$b_{i,j} = \begin{cases} 1 & if\ \ j-th\ company\ shares\ a\ member\ of\ the\ BOD/\ officer\ with\ i-th\ company \\ 0 & otherwise \end{cases}$$

In graph b, a link is drawn between company *i* and company *j* if there is a natural person who sits in the BOD or serves as officer in both companies. A board member that is from two companies is likely to decide on decisions that benefit both companies. We draw links between such companies and examine the network of links to gain insights about the network structure's implications on competition.

Using graph theory, the analysis will provide the following network characteristics – density (which shows connectedness of nodes within a network) which is simply the proportion of actual ties and possible number of ties. It also provides measures of centrality such as degree and betweenness (for identification of players with strategic positions within the network, and peripheral actors (corporations that are least integrated within the system).

Degree, the simplest measure of network centrality, is a measure of one node's direct connections. In raw form, this number represents the total number of nodes directly connected to the node of interest, called ego. The higher the degree, the more connected one is, the greater the potential for influencing other nodes. In Figure 1, the sum of the nodes (colored light blue) directly connected to the red-colored node is its degree, in this case, 10. The degree can also be broken down into in-degree and out-degree in networks that are directed. The in-degree measures the incoming links to a node while the out-degree measures the outgoing links from a node.

Figure 1. Illustration of degree centrality



Source: https://compjournalism.com/p-58/

An important aspect is the ego network analysis (first and second levels) for a deeper understanding of the extent of reach in corporate control. The ego network is simply made up of the ego and its alters or the entities connected to it via one step which is a direct connection. This is the first level. The second level or level 2.0 would be first level ego network plus the alters of the ego's alters. This provides the reach of the ego via indirect links (with pathlength of 2).

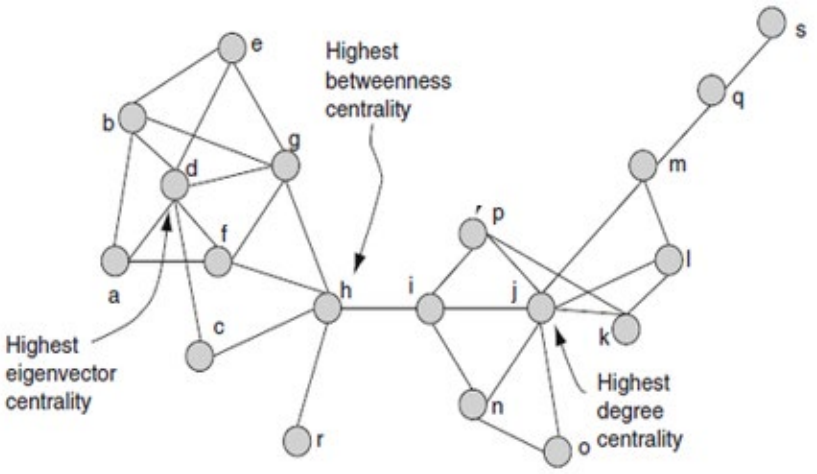
Another important centrality measure is betweenness. This is a measure of brokering capacity or tendency. It is a measure of how often a particular node is situated along the shortest path between two other nodes. A node with a high betweenness score is a highly strategic node within the network (Figure 2). It not only has the power to influence but also has a large potential for controlling, disrupting and filtering flows within the system. With the ability to threaten the network, it can make other nodes less efficient. The removal of a node with very high betweenness score will interrupt network interactions the most. To compute for betweenness centrality, take every pair of the network and count how many times a node lies between the shortest paths (geodesic distance) between the two nodes of the pair.[6][7] This is normalized by dividing this number with the number of possible ties.

The betweenness centrality score[8] of a node n ∈ N, where N is the set of all nodes in the network is:

$$\text{Betweenness (n)} = \sum_{i \neq n \neq j \in N} \frac{a_{i,j}(n)}{a_{ij}}$$

where $a_{i,j}$is the total number of paths between nodes *i* and *j*; and is $a_{i,j}(n)$ is the number of paths between the pair that pass-through node *n*.

Figure 2. Illustration of a node with high betweenness centrality.



Source: https://informationmatters.org/2021/08/social-network-analysis-part-2/

There are also important parameters like transitivity coefficient that examine the extent of clustering because it provides the proportion of triples among all possible triples (the tendency that the friend of my friend is also my friend). These help in measuring the extent of close business groups.

The network analysis is enriched by examining the extent of companies' control within the sector and in other sectors. To examine indirect links among financial institutions that may have implications for competition policy, we analyzed the ego networks of competitors. To provide a visual representation of the network(s) and analyzed objective network parameters,

[6] https://www.sscnet.ucla.edu/soc/faculty/mcfarland/soc112/cent-ans.htm
[7] https://symbio6.nl/en/blog/analysis/betweenness-centrality
[8] https://www.sciencedirect.com/topics/computer-science/betweenness-centrality

the linkages among companies are collated and mapped via UCINET software package.

The systems mapping is conducted via UCINET NetDraw. The software package UCINET provides objective network parameters such as density, cliques, and centrality scores. Density quantifies the extent of connections that exist relative to all possible connections within the network. A high-density network suggests a robust interconnectivity where many potential relationships are realized, indicating a closely-knit structure.

Cliques represent subsets within the network where every member has direct connections to all others in the subset. This configuration highlights groups of nodes that are more tightly interconnected with each other than with nodes outside the group, often revealing cohesive clusters or communities within the larger network. Centrality measures within the network assess the relative importance or influence of individual nodes. Degree centrality counts the number of direct connections a node possesses, while betweenness centrality identifies nodes crucial for maintaining the shortest paths between others. Closeness centrality measures how quickly a node can access all others, and eigenvector centrality gauges influence, considering the connections of a node's neighbors. These measures collectively provide a nuanced understanding of node prominence and network dynamics, essential for comprehending network behavior and strategic interventions in financial systems. In this analysis, we will be describing graph properties of whole network structure – that is including all those in the dataset, as well as components or clusters of companies linked through ownership.

2.2. Data

This study utilized information from company profiles and documents at the Philippine Stock Exchange website (www.pse.com.ph). Such profiles provide data on company name, sector, subsector, name(s) of parent companies, subsidiaries, affiliates, associates, and joint owners. Other information such as financial data, names of individual and company shareholders, members of the board of directors and officers are provided under Annual Reports (ARs), Public Ownership Reports (POR) and SEC (Securities and Exchange Commission) forms that have been completed and disclosed by the company to the PSE. All companies listed under the PSE (July 2023 to January 2024) were included in the analysis.[9] To triangulate and verify information collected from the PSE, the team collected information from official websites of the companies of interest to ensure the completeness of their ownership networks.

The scope of the data is limited to publicly listed companies. Nevertheless, it reflects the situation of 70%[10] of BSP's Top 20 Universal and Commercial Banks and 45%[11] of BSP's Top 20 Thrift Banks. Their network attributes can be used to characterize a significant segment of the financial sector.

From the PORs and ARs of the public companies, different links are seen and as identified by the reporting entities to describe their connection to related parties. In assembling the data for this study, links were narrowed to 7 terms commonly used by the companies: principal/substantial stockholders, stockholders, subsidiary, associate, affiliate, joint venture, and fund manager.

[9] The original planned data sources are SEC company filings. However, due to difficulty of getting data from SEC, the team decided to use PSE data instead. Company disclosures such as the public ownership reports and stockholder data as of December 31, 2023, were then obtained.
[10] Ranking of Universal and Commercial Bank Group as to Total Assets as of December 30, 2023.
[11] Ranking of Thrift Bank Group as to Total Assets as of December 30, 2023.

- *Principal stockholders* are listed in the PORs as those with substantial shares of stock, defined as directly or indirectly being the beneficial owner of 10 percent or more of any class of any security of a company, satisfying the requirements of subsection 17.2 of the Securities Regulation Code (PSE-Guidelines in Determining Public Ownership of Listed Companies). Included here are immediate parent and ultimate parent[12] of companies of interest.

- Shares of stock held by other entities other than the principals were categorized as *stockholders*. Shareholding information was obtained and compiled from the PORs as well as the top ten entities from the disclosed list of top 100 stockholders. Construction of data in previous literature used 20, 10, and 5 percent holding as the threshold (Claessens et al 2000; and La Porta et al 1999). In the context of this study, the authors initially used one percent as the lowest cut-off. One, this allows for a richer sample and secondly, this study has interest in knowing the reach and relative positions of included entities through the various indicators used in analyzing the network. Furthermore, disclosed principal or substantial stockholders reported to have less than one percent ownership was retained in the data. This is due to their inclusion and recognition by the disclosing entity that they are indeed among its principal/ substantial stockholders who own 10 percent or more, as defined above.

- *Subsidiaries* are entities controlled by a parent company. Furthermore, a company will have control over a subsidiary if it has rights to "variable returns from its involvement with the investee and has the ability to affect those returns through its power over the investee" (IASB (2014a), IFRS 10). In many cases, entities that are more than 50 percent owned by the egos are considered subsidiaries.

- *Associates* are entities over which the investor has significant influence, but which are neither subsidiaries nor interests in a joint venture. International Accounting Standards define significant influence as the "power to participate in the financial and operating policy decisions of the investee but is not control nor joint control of those policies" (IFRS (2017), IAS 28).

- An *affiliate* link between companies can be established when a company has a minority shareholding in another, but it may also be by way of common principals or being under common control (CFI, n.d.; PSE Consolidated listing and disclosure rules, April 2024).

- Links through *joint ventures* are when two or more entities pool their resources and jointly control the undertaking of a business or economic activity. More formally, it is defined as a joint arrangement whereby the parties that have joint control of the arrangement have rights to the net assets of the arrangement (IASB (2014b), IFRS 11).

- Lastly, *fund managers* are engaged in "managing the daily operations of an investment company in the investment, administration and accounting of fund assets and the monitoring of the activities of third-party service such as custodian, transfer agent, and distributors" (SEC (2017), IRR of the Investment Company Act). Being the fund manager may involve a management fee (e.g. Philequity mutual funds under Vantage Equities, Inc.). Although the fund manager may not necessarily carry ownership of the

[12] Defined as an entity that controls one or more entities directly or indirectly through one or more intermediaries (IFRS 10; and PSE Consolidated listing and disclosure rules, April 2024)

fund, the objective or purpose of the funds are operationally achieved through the fund manager; thus, may wield some command in the performance and the resulting yields of the investments.

As the compiled data comes from the reports of said companies, the richness of the data may only be as much as the information disclosed by the listed entities.

3. Review of Related Literature

3.1. Firm ownership and control

Examining ownership and control entails a consideration of the different possible structures that market players or corporate entities may be configured in. Issues such as market competition may come into play in scenarios where eminent firms may even affect market outcomes depending on the extent or role in the industry. A distinction used in literature is common and cross ownership. The former pertains to shareholders that are external to the industry. Cross ownership on the other hand refers to firms holding shares in other firms within the same industry (Huse et al 2022). Other literature that delves more about diversification strategies of corporations involve evidence of unrelated diversification (or also conglomerate diversification), and related diversification (or also concentric diversification) (Gutierrez and Rodriguez 2013, Pratyaksa et al 2015). In any of these, a person, family, or conglomerate with considerable reach already in the economy has, in the first place, gained the corresponding shareholding and control to make such strategic moves. For example, Koike (1993) identifies four means by which Ayala Corporation controls its subsidiaries and affiliates. The first is by appointing directors to these firms to represent the Ayala group's interests. The second is appointing professional managers other than the lead directors to assume the position of president in a given company. Another is appointing comptrollers concurrently serving as CFOs in subsidiaries/ affiliates to maintain control over financial affairs and accounts. Lastly, the parent company, having substantial holding, acts just like managing agents and controls all aspects of the company's affairs (p.457). Certainly, control presents an integral aspect of ownership networks. It has aided the gradual building of such structures and linkages. Moreover, “firm affiliation with a business group or family-controlled group is assumed to capture information on owners with more control rights than ownership rights with the help of cross-holdings and pyramid structure” (Patalinghug, 2016, p.2).

Given the probable vast shareholding links, especially for PLCs, it may be unnecessary to include absolutely all shareholders in analyzing the network of firms if the aim is to identify the key and influential entities with substantial control. It might therefore be of significance to determine a benchmark or cutoff among the top shareholders to use, as the varying (e.g. 5, 10, or 20 percent) shareholding may give different results that could also stress how concentrated the control is (Claessens et al 2000). Moreover, the prevailing policies on public ownership and possibly even disclosure requirements may need to be considered as well. Previous literature used 20 percent of outstanding shares as the benchmark for representing effective control (La Porta et al 1999). This pertains to going beyond just immediate control and having to weave through ownership structures and cross-holdings. Claessens et al (2000) separates effective ownership and control of firms in East Asia by way of cash-flow rights and voting rights of shareholders with control of over 5 percent of the votes. The yielded results uncover low

separation of ownership and control in the Philippines[13], despite control not necessarily corresponding to a member of the controlling family being the CEO, chairman, or vice chairman. With respect to compensation, literature states that at the 20 percent of voting rights benchmark for effective control, there exists evidence that CEOs in interlocked firms have significantly higher salaries than those who are not interlocked (Hallock 1997). Not only could this be due to the executive's involvement in various corporate entities and having the accorded financial interests, but it may also signify the importance and possibly immense control that highly interlocked directors and family groups have in the economy. Furthermore, still worth noting are concerns on accuracy in disclosed information on ownership. Increased and timely disclosure would provide a better picture and reduce information asymmetry (Unite and Sullivan 2000). This would also open opportunities to foster transparency and further understand the extent of control. Patalinghug (2016, p.17) noted that "future research should document how diversified business groups employ pyramid structure, dual-class shares, and ownership concentration to maintain corporate control".

While delving into conglomerate and family group control does bring into light the expansion of business and economic activities, this also poses a threat to competition, especially if existing policies seem to gravitate in favor of the well-endowed. According to Patalinghug (2016, p.6), "the rise of oligopolistic structures in some industries is not necessarily due to government-linked or government-favored business groups, but it can also be attributed to government policies that intentionally or unintentionally provided fiscal incentives favorable to big businesses or implemented regulatory rules that can only be complied by big businesses. Furthermore, policy-induced entry barriers are reinforced by a lack of competition policy in the country". Other factors may also be recognized to have played a part in determining ownership structures and control among corporations in the Philippines. Strategies among large corporations across industries could be varied, but the proliferation of unrelated diversification in large business groups may be due to government policies (deregulation in the 1990s, privatization in the 1990s to 2000s, and PPPs in the 2010s), the growth of capital and financial markets, and the innate strategic competencies of the business groups in their sectors (Gutierrez and Rodriguez 2013).

3.2. Analysis of networks of companies

To analyze indicators and locations of control, other studies focus on interlocking directorates (that is when one company's director sits on the board of directors of multiple companies) in corporations. One of the earliest inquiries was conducted within the context of investigating corporate concentration, see Pujo Report (US Congress, 1913). It is noted that investment banks and other companies "would place representatives on the boards of corporations they controlled" (Mizruchi & Bunting, 1981, p.476). More recently, in Mahdi et al (2012), the concept of interlock was used to examine how companies relate to each other. Interlocking directorates were also used to examine the networks of companies listed in their National Stock Exchange (NSE) in India. Another study (Chen, Wang and Lin, 2014) examined the connections that directors have such as that if two directors serve on at least one common board, they are said to be directly connected.

A previous work of Allen (1974) looks at interlocking directorates from the perspective of the

[13] In terms of shares, SEC Memorandum Circular No. 15 s. 2019 defines beneficial owner on the basis of a natural person(s) owning, direct, indirect, or through a chain of ownership, at least 25 percent of the voting rights, voting shares or capital of the corporation. Furthermore, ultimate effective control may be achieved through direct or indirect ownership of at least 25 percent of the voting shares or capital of the company, or otherwise has or shares voting power. Other descriptions to determine these pertain mostly to control such as in electing a majority of the board, in management or policies, strategic decisions, etc.

interorganizational elite cooptation theory. From the largest 200 nonfinancial and 50 financial corporations in terms of assets of the years 1935 and 1970, the study finds evidence that the size of a corporation is related to the number of interlocks, and that financial corporations generally have more interlocks than nonfinancial corporations. It also finds a negative relationship between the dependence of corporations on external debt and the frequency of financial interlocking. Such associations among directors across firms could be due to resource dependence, which pertains to firms obtaining resources from their environment (Shrader et al 1991) and could also be fundamentally due to associated expectation of higher (or lower) profits in the presence (or absence) of successful interlocks (Burt 1978). It should be noted that existing concerns on its negative impact in terms of control, anticompetitive behavior, and the like may be expected and must not be discounted. Nonetheless, interlocking directors can potentially provide for some incentives and benefits that would make for better corporate governance, better compensation, horizontal and vertical coordination, market coherence, influence and control (Carroll et al, 2011; Szalacha, 2011; He and Huang; 2017). However, there exists concerns on its negative impact in terms of control, anticompetitive behavior, and the like.

In the Philippines, an early work (but not done via network analysis) on interlocks by Doherty (1982) shows that 1,132 directors were interlocked across 453 companies in 1980. The study highlighted the role of banks in corporate networks. According to the study, all investment houses in 1980 are controlled by at least one and at most three banks. The same is observed for the 27 largest financing companies and 36 largest insurance companies. More importantly, all banks are seen to being closely interlocked with one another (p. 7). This is complemented by the assessment of Lamberte (1989) and Tan (1993), highlighting interlocking directorates, especially for banks that may have an inclination to engage more in certain sectors or may be in setting interest rates favoring the associated companies, in the discussion of issues that the financial system of the Philippines faced before. Loans accommodated by directors, officers, stockholders, and related interests (DOSRI) also contributed adversely to the financial sector. Furthermore, the 1988 data used by Tan (1993) reveals that the large banks, apart from being interlocked with hundreds of companies across various sectors, are also either interlocked and/ or conglomerated with companies in industries with high concentration.

More recently, networks of boards of directors of Philippines Stock Exchange-listed companies have been examined by Saw and Manasan (2019). This study found that “most companies and directors are connected to each other, with only a few being isolated.” It also noted that most directors are multi-sectoral. A similar analysis was conducted for female members of boards within Philippines’ government financial institutions with the purpose of analyzing women’s connectedness (Bugayong, Sadicon, and Katigbak, 2022). The study found that while women directors are connected with the rest, the length of paths involved are longer than those of their male counterparts. Lastly, Yu (2022) uses a bipartite network to analyze the interlock in 251 publicly listed companies in the Philippines. The study resulted in 90 percent of firms being connected. In addition, the study highlighted the control held by holding firms in the economy. This paper adds to this body of knowledge by using more recent data. In addition, it exploits both ownership networks of companies and networks that are formed from the interlock of board members and officers.

3.3. Networks and company performance

Markarian et al (2007) looked at the effects of board interlocks between firms in industrial and financial sectors as well as associated characteristics for listed Italian firms in 2001. The study

finds that the number of board interlocks with banks is positively associated with current year return on assets for industrial firms. However, the interlocks are negatively associated with the return on equity for banks. Such results could see industrial companies reaping the benefits of expedited financing but may incite potential harm to financial sector performance.

According to Pratyaksa et al (2015), data from publicly listed non-financial firms in the Philippines from 2004 to 2013 shows that there is a 43 percent and 56 percent discounting effect on average excess value, using sales multiples and asset multiples respectively, when conglomerates diversify into another industry. This means that the value of a firm operated as a whole suffers from a loss in book value and is worth less than the sum of its segments when operating as separate firms. However, the literature also shows that presence of a supermajority (two-thirds of ownership) and effective control of a corporate family group (either by 50 percent or more ownership or direct relation between a firm's officers) yields a premium effect. Emphasis, however, must be put on the fact that the data used excluded financial firms, noting accounting classification issues with respect to the excess value methodology. On the other hand, Patalinghug (2016) examined the differences in performance between firms affiliated with business groups and firms not affiliated with business groups using data of 224 firms from Business World's top 1,000 corporations covering 1996-2013. The analysis shows that firm affiliation with business groups is insignificant with respect to profitability, but also sees that it negatively affects firm value. It should be noted that profitability was defined as the ratio of net income to total assets, while firm value pertains to stock market returns.

3.4. Analyzing competition behaviors via network analysis (effects of cross or common ownership on competition)

Literature is divided on the effect of common and partial ownership on competition in the economy. Still, the formation of corporate elites is organized around board interlocks (Allen, 1978). From within the individual organizations, managerial power and power of ownership are conflicting, but are seen to reinforce each other in institutional capitalism (Windolf and Beyer, 1996). In some viewpoints, common ownership is seen to strengthen governance, but the amount of ownership or extent that would warrant concerns on market competition may still be in question (Edmans et al 2014, 2018 and O'Brien 2017). This may indicate that in general, increases in managerial power and increase in amount of common ownership may be seen to improve governance and eventually may result in better earnings or performance in organizations being controlled, but may also increase the market share and control in a way that would lead to reduced competition. Furthermore, He and Huang (2017) states that in analyzing institutional blockholders (defined in the study as those with at least 5 percent of the company's outstanding shares) among firms in the United States from 1980 to 2014, cross-ownership is associated with higher market share growth, and that explicit (within-industry joint ventures, strategic alliances, and within-industry acquisitions) and implicit market coordination can lead to beneficial outcomes. Although this may benefit the incumbents or existing firms, it could shield off competition and may not provide as much benefit for new firms to enter the market.

Effects on competition though may also differ on the amount of ownership of the company and if shares held would thereafter provide for control. Significant shareholdings in partial ownership in a competitor and full control possibly after a merger may have implications on market competition, specifically in determining prices and quantities (Salop and O'Brien 2000). This is because these firms would otherwise be competing in the absence of a decision (i.e. merger or acquisition) that would provide control and higher market share, especially in a

way that could dictate the market. Moreover, interlocks (considering the possible misuse of power) and common ownership of competing firms may be associated with welfare reducing effects in terms of higher prices and with heightened market concentration as a result of reduced competition (Szalacha 2011, Azar et al 2018, Shy and Stenbacka 2019, and Leigh and Triggs 2021).

Network analyses can also be useful in understanding competition behaviors. Network analysis has been used to examine indirect links between companies that have a similar type of business "which may facilitate collusion or anti-competition behaviors" (Mahdi et al 2012, p.272). This is consistent with Alley (1997) which state that collusion exists in the Japanese domestic automobile industry. In the Indian paper, network analysis was used to illustrate the existence of "small world structure in the Indian corporate field" (Sankar et al 2015, p. 113). The small world phenomenon happens when it "is possible to go between two firms or two directors by a small number of hops across the networks" (p. 119). The study likewise observed the presence of elite groups through the analysis. Similar method of analysis was used to examine dynamics in the concentration of elite groups as an outcome of a regulation that aimed to curb the influence of elite in corporate networks in India (see Aggarwal, et al 2020). The policy of interest is the provision of limit to the number of directorships held by a single director. Using data from 2008 to 2016, the study was able to cover the pre- and post-enactment of the regulation. The analysis showed that the regulation reduced the concentration of elite control as shown by changes in the degree (a measure of centrality) distribution. However, the study also found that ranks within the network in terms of connectedness were persistent. Understanding the structure of corporate networks lends insights that may be useful for policy making purposes. Cardenas (2012) found two types of corporate networks. One type consists of cohesive corporate networks based on unification, centralization and strength ties; and another type is comprised of dispersed corporate networks characterized by fragmentation, decentralization and single ties.

3.5. Network parameters as indicators of influence

In the formation of the network comes the discussion of influence, whether in holding positions on different boards, or in ownership by shareholding that corresponds to voting rights. In high-earning corporations, well-compensated CEOs (in terms of aggregate income) are associated with more power (Allen, 1981). This can also be seen in corporate networks, especially for key players with significant influence. In the Philippines, literature states that the top ten shareholders already represent about 73 percent of the total ownership and that domestic family business groups possess control for the 75 of the 196 listed companies (Unite and Sullivan 2000). Furthermore, increases in ownership by members of the board as well as company size are seen to be positively associated with share prices (Ferrer and Banderlipe 2012). However, it should be noted that another side of ownership is minority shareholding. Minor shareholders will benefit from investing in a company if it performs well. On the contrary, when reduced gains and benefits are experienced, issues on control may arise not only among the controlling shareholders but also between those with substantive holding and those who do not (Cayanan 2019).

Network analyses have been used to identify influential sectors by examining centrality. In an early work by Hopkins (1964), he concluded that centrality and influence have a high correlation of 0.82. Most study utilize the degree centrality as indicator of influence. The argument for such states that the more connections one company has the greater its influence. Such a measure has been criticized however because of its weaknesses such as putting equal

weights on the links or inability to determine direction of influence. Because of this, other more recent studies utilized more sophisticated network parameters such as clustering coefficients and eigenvector centrality. In a study involving publicly held corporations in Kuwait, it was found that financial companies have the highest clustering coefficients, a parameter of network connectedness, and therefore the most influential actor in the network (Mahdi, Almajid, Safar, Riquelme, and Torabi, 2012). This has similarity with the Indian case examined by Sankar et al (2015) where the most central actors are from the finance or legal profession as shown by their high eigenvector centrality. These findings are consistent with those from studies done at the turn of the twentieth century (Mizruchi & Bunting, 1981 citing Dooley, 1969, Levine, 1972, Bearden et al., 1975, among others). In view of this, this paper focuses on the financial sector and examines its network structure and key players.

3.6. Measures of Corporate Concentration within Network Analysis Lens

Mizruchi and Bunting (1981) employed different measures of influence in the network of corporations. With consideration that the Bonacich centrality index does not differentiate the types of interlocks, the study extends the index to strength of ties and strength of ties weighted for directionality. The latter proved to yield the soundest results, highlighting the importance of corporations that controlled railroads in the United States during the year 1904 and their dependence on financial corporations. Takes (2016) discusses centrality measures (degree centrality, closeness centrality, betweenness centrality, and eigenvector centrality) and proposed centrality persistence in global and national corporate networks. Using data from 400,000 firms from ORBIS, the paper finds that the 34 largest national networks are relatively more connected than the global network. Firm prominence (proxied by revenue) also finds an association with centrality.

A possible scenario in market concentration is for firms in the market to co-operate where a collective action is taken among firms with the prospect of benefiting from such a structure, sub-grouping into cliques. This is a configuration where presence of reciprocal relationships is seen among companies in the network. Because of the interest among firms in shareholding in each other, there may not be much incentive for a competitive environment in the market. If one firm considers an action that somehow adversely affects another firm, it would not be in the interest of that firm due to shareholding dependence with one another. Results from past literature show that formation of cliques are more likely observed when high concentration of ownership among enterprises exist (Windolf and Beyer 1996). On other literature using network analysis, Yao et al (2019) analyzed the network for nodes of shareholders and companies in Turkey and Netherlands. Identifying 13 different types of shareholders, the study shows that banks have the highest degree (number of edges connected to a node), being invested in a lot of the other shareholders. Percolation analysis shows that the role of banks in the economy is significant, in such a way that removing banks breaks up the largest connected component. Banks also have high investor assortativity, diversity of shareholder types, closeness centrality and the highest average betweenness and highest maximum betweenness. For detection of communities within the shareholders, those in the families type of shareholder have a preference to share control with other families, while industrial companies have more varying types of investors.

An ownership network was established in Engel et al (2021) using information among different types of shareholders from ORBIS. The main network is characterized to have very low density, while centrality measures such as in-degree, out-degree, in-strength, out-strength,

eigenvector, and closeness showed high heterogeneity at node level. The paper determines quite the concentration in the economy, with the control of numerous firms within the hands of relatively few shareholders. In other studies, Andrikopoulos et al (2019) uses a social network analysis to examine the data on corporations in the shipping industry, in which it is found that connected companies may make the conduct of operations more efficient, with lower costs and less conflict leading to incentives within the industry to continue. The study also revealed the highly ranked directors and executives in terms of degree, betweenness, closeness, and eigenvector. Moreover, interlocks were seen to have a positive relationship with board size, financial leverage, profitability, and asset returns.

Literature also specifies a bipartite network method to analyze the network of companies. Battison et al (2004) also used the concept of a lobby, defined as a subset of directors of a board that also serves in another corporate board (p. 347). The clustering coefficient for the director network is about 0.9 and about 0.35 for the board network. Site-betweenness distribution seems to trend in an exponential decay manner and is seen to have a positive relationship with connectivity degree. The average nearest neighbor degree of nodes for director networks and board network are slightly increasing with positive assortativity coefficients. Summing the various results, the study finds that the networks are small world, assortative, and highly clustered. Moreover, about 35 percent of companies in the US in 1999 and 63 percent of companies in Italy during 2002 have a lobby size of at least two. Carvalho and Ribeiro (2019) looked at the Brazilian stock market, wherein the generated network included 1,742 nodes. 41.7 percent were giant components that were described to have "low density, high modularity and medium path". The study also identified three central shareholders, while the firms in the financial sector, holdings, private equity companies, and funds are observed to be important connectors in the network.

3.7. Network characteristics of financial companies

The literature illustrates the importance and central role of financial corporations in a network during the 20th century especially with respect to dependence and access to resources. Beardens et al (1975), from a network of the 1,131 largest US corporations in 1962 to 1973, describes the unique position of banks to be more stable than others, and states that it also reflects their role as links between other highly central companies. Focusing on strong ties further amplified their centrality. While financial institutions remain to the regarded with respect to dependence and access to resource, innovations in the study of networks have further qualified their network characteristics. Trends seen over the years, such as possible changes in the primary purpose of a business, and the emergence of new conglomerates, have also affected the ownership networks.

Financial companies exhibit distinctive network characteristics with their interconnectedness and their strategic interactions with other entities. Engel et al (2021) used the bow-tie structure to split an ownership network into components, specifically IN, largest strongly connected component (LSCC), OUT, Tube, OUT-Tendril, and IN- and OUT-Tendrils, that pertain to groups with specific structures of interactions. Firms in the financial sector have a significant role in the LSCC or the set of closely interconnected firms, as well as the IN component or nodes connected to the LSCC through incoming edges. The study also shows a positive correlation between centrality measures and financial indicators, specifically total assets, equity, and revenues.

On other literature, Carvalho and Ribeiro (2019), using data of the publicly listed Brazilian companies, sees that more than half of the identified major shareholders of the giant component are financial firms. Financial firms are seen as key intermediaries in the network. Notably, Blackrock was the second most central considering PageRank, degree, intermediation, and proximity. According to Yu (2022), the corporate board network generated from the public companies in the Philippines shows that those in the financial sector exhibited connectivity in terms of shortest path length, and eccentricity, but not in terms of clustering coefficient and neighborhood connectivity. Centrality measures for financial companies also yielded high betweenness.

This paper is similar to these studies in terms of its approach of using graph theory to exemplify connections within and involving the financial sector. The focus on such a sector emanates from the important, even central, role of the financial sector in the economy. Using more recent data, we examine the extent of corporate control of financial companies via two approaches – 1) subsidiary links and other ownership links and 2) links that come from sharing BOD members.

4. Profile of financial companies

Table 1 below provides brief information on the companies of interest. Thirty (30) companies are listed at the PSE under the Financials sector composed of 17 banks and 13 other financial institutions (OFIs hereafter). It should be noted that although listed under the said sector, there are among the OFIs that operate as a holdings company, namely, Bright Kindle Resources and Investments Inc. (BKR), Dominion Holdings, Inc. (DHI), First Abacus Financial Holdings Corporation (FAF[14]), Ferronoux Holdings, Inc. (FERRO), Medco Holdings, Inc. (MED[15]), Manulife Financial Corporation (MFC), Sun Life Financial Inc. (SLF), and Vantage Equities, Inc. (V). Two entities domiciled in Canada are MFC and SLF. Moreover, Filipino Fund, Inc. (FFI) is listed as a closed-end equity investment company according to the SEC list of registered investment companies as of December 31, 2023. Of the 17 under the subsector of banks, 13 have a universal bank status, 3 thrift banks (Citystate Savings Bank, Inc. (CSB), Philippine Business Bank (PBB), and Philippine Savings Bank (PSB)), and one actually being non-bank—NextGenesis Corporation (NXGEN), a holding company, which used to be AsiaTrust Development Bank and had operated as a private development bank. The table below also shows BDO Unibank Inc. (BDO) topping the list in terms of total assets among the banks, followed by Metropolitan Bank & Trust Company (MBT). The 30 financial companies listed were used to characterize the networks of financial companies in the country representing 70 percent[16] of the Central Bank's Top 20 Universal and Commercial Banks and 45 percent[17] of the Top 20 Thrift Banks.

[14] Financial holding company
[15] Investment holding company.
[16] Ranking of Universal and Commercial Bank Group as to Total Assets as of December 30, 2023.
[17] Ranking of Thrift Bank Group as to Total Assets as of December 30, 2023.

Table 1. Description and total assets of publicly listed financial sector corporations in the Philippines.

Company name	Subsector	Description	2023 total assets (in millions PHP unless otherwise specified)
Asia United Bank Corporation (AUB)	Banks	In addition to commercial banking, with AUB's universal bank status, the Company is authorized with the powers of an investment house, such as securities underwriting and trading, loan syndication, financial advisory, private placement of debt and equity securities, project finance, and direct equity investment; and the power to invest in allied and non-allied enterprises.	355,190
BDO Unibank Inc. (BDO)	Banks	BDO offers an array of products and services, i.e. retail banking; lending (corporate, commercial, consumer, and SME); treasury; trust; credit cards; corporate cash management; and remittances. Through its subsidiaries, the Company offers leasing and financing; investment banking; private banking; bancassurance; insurance brokerage; and stock brokerage services.	4,477,661
Bright Kindle Resources and Investments Inc. (BKR)	OFIs	BKR is engaged in the purchase, exchange, assignment and hold investments of all properties, including but not limited to, bonds, debentures, promissory notes, shares of stocks and other securities without however engaging in the business of an investment company or a broker or dealer in securities. At present, BKR has no operating segment other than being a holding company.	2,897
Bank of Commerce (BNCOM)	Banks	BNCOM provides a range of products and services in deposit, commercial loans, credit card services, consumer banking, corporate banking, treasury, asset management, transaction banking, and trust and investments.	231,668
Bank of the Philippine Islands (BPI)	Banks	BPI offers an array of financial services that include corporate banking, consumer banking, investment banking, asset management, corporate finance, securities distribution, and insurance services.	2,888,372
China Banking Corporation (CHIB)	Banks	Main businesses of CHIB include corporate and SME lending, retail loans including mortgage and auto loans, treasury and foreign exchange trading, trust and asset management,	1,321,822

		investment banking and advisory services, wealth management, cash management, insurance products, internet banking and mobile banking services and remittances through tie-ups with remittance companies and exchange houses in the Middle East, Asia and major US cities. It also offers foreign currency deposits in four currencies – US dollar, euro, yuan, and yen.	
COL Financial Group, Inc. (COL)	OFIs	COL is engaged in the business of brokerage and/or dealership of securities and provides stock brokerage services through the internet.	12,322
Citystate Savings Bank, Inc. (CSB)	Banks	Aside from the traditional products and services offered by a thrift bank, CSB offers banking services, such as but not limited to deposit products and services, cash management, onsite/offsite automated teller machine facilities, corporate and retail banking, and treasury services.	5,653
Dominion Holdings, Inc. (DHI)	OFIs	The primary and secondary purpose of the DHI was amended on January 31 2020 from operating as a leasing and financing entity, which provides direct leases, sale and leaseback arrangements and real estate leases to operate as a listed holding company that invest in, purchase, acquire or own, hold, use, sell, assign, transfer mortgage, pledge, exchange, or dispose real and personal property of every kind.	6,383
East West Banking Corporation (EW)	Banks	Principal banking products and services of EW include deposit-taking, loan and trade finance, treasury, trust services, credit cards, cash management, custodial services, insurance services and leasing and finance.	464,205
First Abacus Financial Holdings Corporation (FAF)	OFIs	In 1996, FAF changes its purpose into a financial holding company. FAF, through its subsidiaries, is engaged in stockbroking activities, investment banking, real estate business, and other financial services.	7,017
Ferronoux Holdings, Inc. (FERRO)	OFIs	In 2015, the primary purpose of FERRO was changed to that of a holding company with a secondary purpose of engaging in mining and smelting operations. Its lending activities ceased following this change.	154
Filipino Fund, Inc. (FFI)	OFIs	FFI is an investment company with services in investments in equities, unit investment trust funds, and fixed income securities. It does not deal or trade in goods or products. FFI likewise has no business operations aside for the trading of its shares as well as the maintenance of its investment portfolio.	216

I-Remit, Inc. (I)	OFIs	I and its subsidiaries are primarily engaged in the business of fund transfer and remittance services, from abroad into the Philippines; undertaking the delivery of such funds or monies, both in the domestic and international market, by providing courier or freight forwarding services; and conducting foreign exchange transactions as may be allowed by law and other allied activities, including financial derivatives activities such as foreign currency swaps, forwards, options or other similar instruments.	2,458
Metropolitan Bank & Trust Company (MBT)	Banks	Principal business activities of MBT involve deposit-taking and lending, trade finance, remittance, treasury, investment banking and thrift banking.	3,104,902
Medco Holdings, Inc. (MED)	OFIs	MED has been engaged in investment holding activities. Its investment portfolio is composed of holdings in companies involved in financial services (commercial and investment banking) and trade development (operation of exhibition halls and conference facilities).	57
Manulife Financial Corporation (MFC)	OFIs	MFC is domiciled in Canada and is the holding company of The Manufacturers Life Insurance Company. MFC offers financial protection and wealth management products and services to personal and business clients as well as asset management services to institutional customers through its operations in Asia, Canada, and the US.	CAD 875,574
National Reinsurance Corporation of the Philippines (NRCP)	OFIs	NRCP provides life and non-life reinsurance capacity and support to insurance companies in the Philippines and neighboring insurance markets.	20,421
NextGenesis Corporation (NXGEN)	Banks	In 2015, the primary purpose of NXGEN was changed into an investment holding company. It currently has no existing operations.	123
Philippine Business Bank (PBB)	Banks	PBB provides banking services and products including cash management, retail and corporate lending, deposit products, international trade finance, and treasury and trust products.	154,414
Philippine Bank of Communications (PBC)	Banks	PBC offers basic commercial banking services such as deposit products, credit and loan facilities, trade-related services, treasury and foreign exchange trading, cash management services, trust and investment management services. Ancillary services such as safety deposit boxes and manager's checks, demand drafts, acceptance of tax and SSS payments are also available. These products are both offered	147,478

		to individuals and corporate clients.	
Philippine National Bank (PNB)	Banks	PNB's principal commercial banking activities include deposit-taking, lending, trade financing, foreign exchange dealings, bills discounting, fund transfers, remittance servicing, asset management, treasury operations, comprehensive trust services, retail banking and other related financial services.	1,210,549
Philippine Savings Bank (PSB)	Banks	PSB's operating segments are organized and managed separately according to the nature of services provided and the different markets served, with each segment representing strategic business unit that offers different products and serves different markets. These business segments are consumer banking, corporate banking, branch banking, and treasury. PSB caters mainly to the retail and consumer markets.	238,433
The Philippine Stock Exchange, Inc. (PSE)	OFIs	The PSE is the only stock exchange that operates and regulates the Philippine equities market in the Philippines with the objective of maintaining efficiency, fairness, and transparency. The end-to-end roster of services it offers include listing, trading, market data, clearing, and settlement.	7,143
Philippine Trust Company (PTC)	Banks	The Company offers domestic, international and trust services. Domestic services include checking accounts, savings accounts, time deposits, money market placements, business loans, transfer of funds and collections, remittances, securities investments and safety deposit boxes. International transactions involve commercial letters of credit, collections and remittances, foreign exchange, traveler's checks and FCDU transactions. Trust operations consist of trust placement, investment management, estate administration/trustee of bond issues, savings and pension plan administration, insurance trust, and acting as escrow agent and stock registrar and transfer agent.	176,437
Rizal Commercial Banking Corporation (RCB)	Banks	RCB offers commercial, corporate and consumer lending products, cash management products, treasury products, remittance services as well as digital and mobile services.	1,238,332
Security Bank Corporation (SECB)	Banks	SECB's businesses include wholesale banking, financial markets and retail banking. The company provides commercial banking services such as deposit products, loans and trade finance, domestic and foreign fund transfers, treasury, foreign exchange and trust services.	871,509

Sun Life Financial Inc. (SLF)	OFIs	SLF is domiciled in Canada and is the holding company of Sun Life Assurance Company of Canada. SLF and provides savings, retirement, and pension products, and life and health insurance to individuals and groups through its operations in Canada, the US, the United Kingdom, and Asia. The SLF Group also operates mutual fund and investment management businesses primarily in Canada, the US and Asia.	CAD 333,241
Union Bank of the Philippines (UBP)	Banks	UBP offers a broad range of products and services, which include deposit and related services; corporate and middle market lending; consumer finance loans such as mortgage, auto loans and credit card; investment, treasury and capital market; trust and fund management; wealth management; remittance; cash management and electronic banking; and bancassurance.	1,145,143
Vantage Equities, Inc. (V)	OFIs	In 2000, V changed its primary purpose to financial holdings and investments, including but not limited to information technology companies and related ventures. Presently, it is engaged in the business to invest, to hold and to use for investment shares of capital stock, bonds, debentures, promissory notes, or other securities or obligations created, negotiated or issued by any corporation, association or other entities. V and its subsidiaries are organized into three major operating business segments, namely investment holdings, remittance services, and mutual fund management.	11,978

Source: Authors' compilation.
Source of basic data: Philippine Stock Exchange documents
Note: CAD = Canadian dollar, FCDU = foreign currency deposit unit, OFIs = Other financial institutions, PHP = Philippine peso, SME = small and medium-sized enterprise, SSS = Social Security System, US = United States. The descriptions are taken from the SEC Form 17-A disclosures of the respective companies as reflected as well in the PSE website.

5. Company ownership network structure

This paper examined networks among companies via ownership. This contrasts with other corporate networks that have been analyzed such as trade networks (Wilhite, 2001), relationship networks among suppliers (Choi & Wu), transactions networks among banks (Boss et al 2004), and networks that reflect loans between organizations (Battiston et al, 2016). We examined subsidiary networks and the broader ownership networks of companies. We also looked into the potential extent of control across companies by way of the interlocking directorate and officers. Unless otherwise stated, all estimates are from the author's calculations based on disclosed documents.

5.1. Subsidiary network

We first focused on the subsidiary networks of financial institutions publicly listed at the PSE. That is, a link between companies *i* and *j* exists if *j* is a subsidiary of *i.* In terms of strength of tie, we consider subsidiary networks to be of greater strength than other ownership ties like those shared with affiliates and minor stockholders. So, we expect that the network of subsidiaries is more illustrative of the extent of corporate control of financial companies as opposed to the broader ownership network that includes affiliates and others. The subsidiary network of financial companies is made up of 285 entities (see Table 2). These are mostly financial institutions like banks, holding companies, investment companies, asset management entities, remittance companies, among others. The network is created from information about which companies own what and were listed as subsidiary in documents disclosed with the PSE.

The density of the subsidiary directed network is at 0.006; that is, only 0.6 percent of all possible ties are actual ties making the network a sparsely connected network. The average number of connections is 1.7. There are 42 components or separate groups including some isolated nodes, which are those that do not own subsidiaries and hence, no entity is connected to them in the graph. The average distance between the nodes is nearly 2.4 and its diameter is 6, the maximum distance between any two vertices (nodes/entities). The short average distance of 2.4 indicates the ease of reaching other nodes within the group. These parameters, however, indicate network fragmentation.

Table 2. Whole network measures by type of network, financial sector, Philippines, 2023.

Parameter (1)	Subsidiary (2)	Subsidiary and others (at least 5% ownership) (3)	Subsidiary and others (at least 5% ownership, no PCD) (4)
# of nodes	285	455	453
# of ties	498	1006	930
Avg Degree	1.747	2.211	2.053
Density	0.006	0.005	0.005
Components	42	5	20
Connectedness	0.047	0.931	0.167
Fragmentation	0.953	0.069	0.833
Avg Distance	2.374	5.037	7.731
Diameter	6	15	24

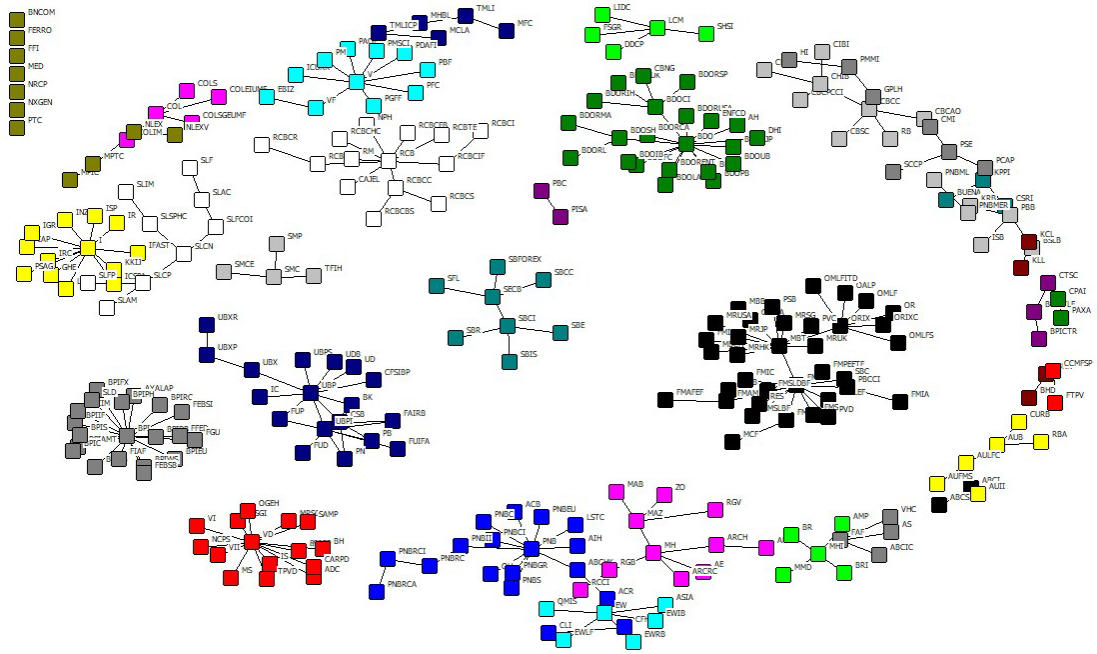
Source: Authors' computation.
Source of basic data: Philippine Stock Exchange documents

The graph of the subsidiary network of financial companies is shown in Figure 3. Each square figure (node) represents a company. The nodes are colored based on their components or groups. The network exemplifies a hub and spoke system that usually characterizes many financial institutions. In this case, the companies at the center of each graph component/group act like hubs surrounded by the companies they own (partially or wholly) as their spokes. This hub and spoke structure of network centralizes decision-making, coordination and resource allocation. It also has the advantage of efficient and simplified communication channels.

The graph clearly illustrates the business group nature of financial companies in the country. These are groups of financial institutions where the parent company is a bank or other financial institution that also owns another financial institution such as rural bank, leasing and financing

company, remittance companies abroad, holdings company, investment company, insurance company/insurance brokerage, securities company, foreign currencies trading company, asset management company, rental company, and real estate companies, among others.

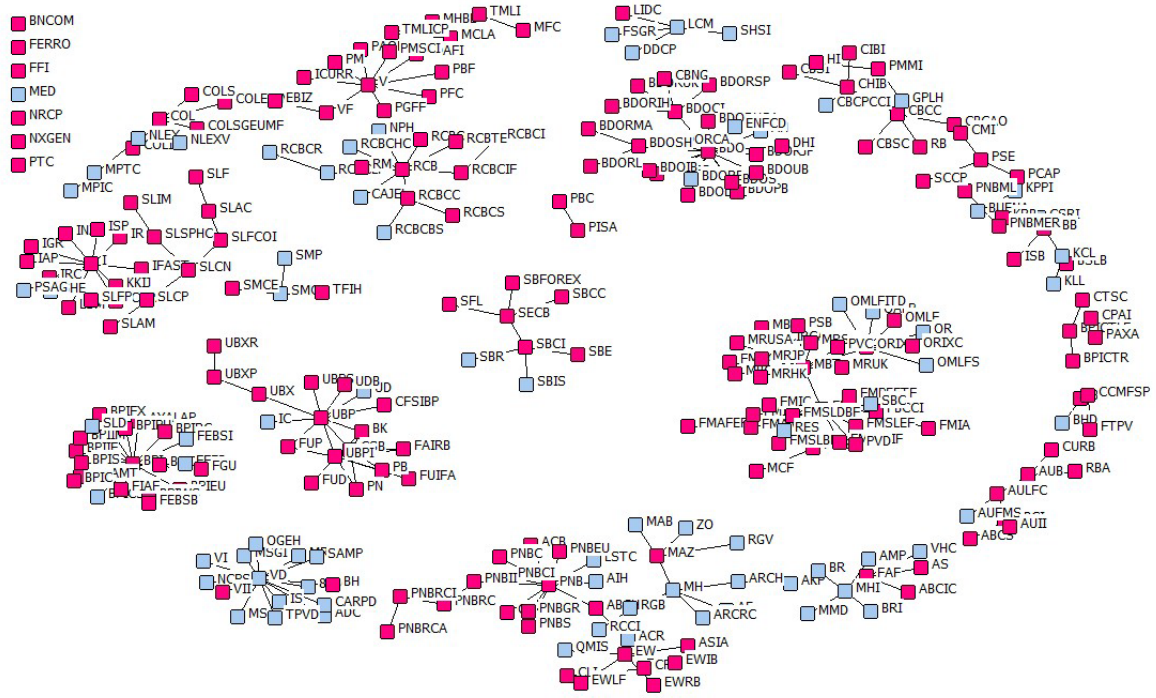
Figure 3. Whole network ownership structure of PSE-listed financial companies, subsidiary only, 2023 (node color by component).



Source: Authors' computation.
Source of basic data: Philippine Stock Exchange documents

When examined in a more detailed manner, particularly the sector/subsector of the entities that make up the network components, it was found that their networks extend to other sectors. Figure 4 shows the same network graph, but the nodes were colored bright pink or red if these are financial companies (including leasing and finance) and light blue otherwise. We found that aside from owning various financial companies, financial institutions are also into the business of real estate, business services and other services, rental & leasing, wholesale & retail trade, mining, food & beverage, manufacturing, transportation infrastructure and logistics. Holding companies and conglomerates were also assigned a light blue color for their nodes, although most of these may be operating within the financial sector.

Figure 4. Whole network ownership structure of PSE-listed financial companies, subsidiary only, 2023 (pink/red nodes are financial companies; light blue nodes – others).



Source: Authors' computation.
Source of basic data: Philippine Stock Exchange documents

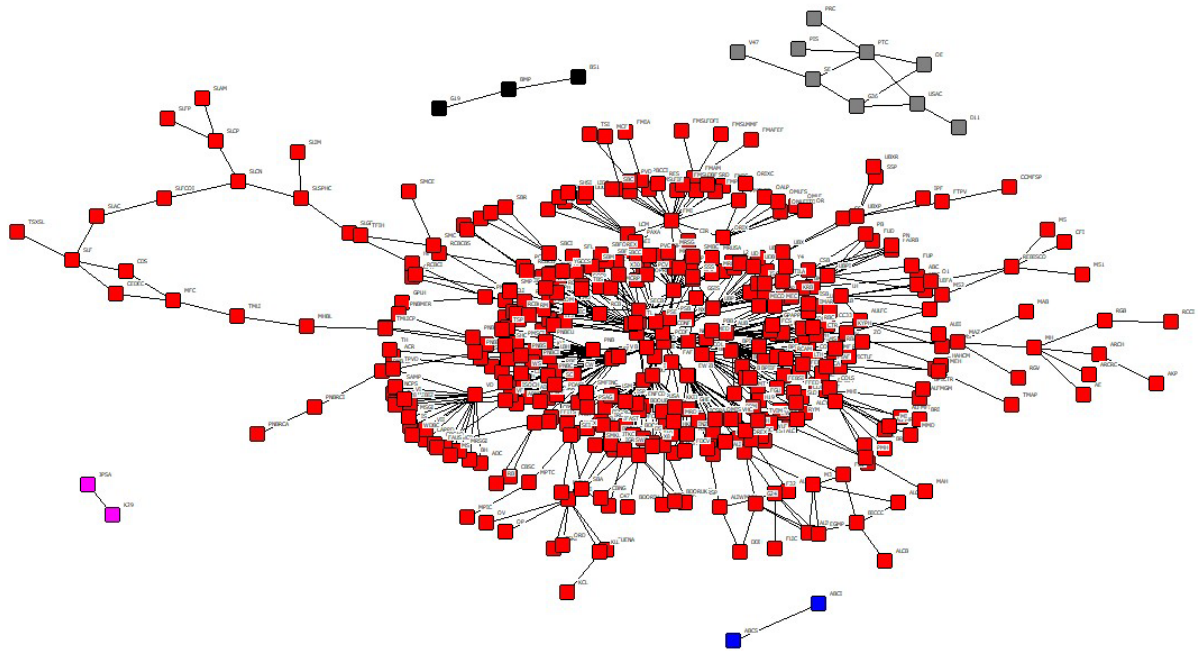
5.2. Broader ownership network

We broadened the analysis of ownership links to all entities that own at least 5 percent of the company. That is, a link between companies *i* and *j* exists if *j* owns a portion of at least 5 percent in i. the graph shows a completely different story from that of the subsidiary-only network. Figure 5 shows that part from several entities at the periphery of the graph, the network of the financial companies of interest shows a one big, connected network (nodes in red color). In fact, compared to the subsidiary network, this broader ownership network now comprises of only 5 components or groups because most are now part of the main component (see Table 2, column 3). The average number of connections is 2.2 although its network density is only 0.05 percent. Interestingly, the average distance is now 5 which means that one would, on average, take 5 steps to reach other nodes. The network may be connected but the proximity among nodes is reduced. We can also see that the diameter of the network is 15 which means that it would take 15 steps (edges) before the two most distant nodes can meet.

The formation of one big, main component that includes nearly all the entities is the outcome when the relatively weaker ties (via lower shares) are included. These ties have the ability to bridge otherwise distinct and separate clusters as is expected from social network theory (Granovetter, 1973). Understanding the nature of these bridging entities is crucial in the effort to characterize the structure of networks of the financial sector. More importantly, analyzing their roles in establishing indirect links among companies that operate on the same business lines can provide insights competition-wise. It is interesting to note the extent to which companies tend to be shareholders of each other. Furthermore, it is likely through the "bridging ties" that companies can extend their control or reach to other segments of the network. This

paper carries evidence of the existence of these bridging ties in the ownership networks. Without them, the financial sector would become a highly clustered network with many players exhibiting hub and spoke structures.

Figure 5. Whole network ownership structure of PSE-listed financial companies, ownership 5% and above, 2023 (node color by graph component).



Source: Authors' computation.
Source of basic data: Philippine Stock Exchange documents

Using selected measures of centrality, we looked at the individual entities' centrality measures that suggest their strategic positioning within the ownership network. We found that Bank of the Philippine Islands (BPI), PCD Nominee Corporation, Filipino (PCDF), Banco de Oro (BDO), Metropolitan Bank & Trust Company (MBT), First Metro Investment Corporation (FMI), I-Remit (I), Philippine National Bank (PNB), Rizal Commercial Banking Corporation (RCB), Vicsal Development Corporation (VD), Vantage Equities, Inc. (V), Security Bank Corporation (SECB), and Union Bank of the Philippines (UBP) are considered the most centrally positioned entities within the network. A disruption in any of these entities will send ripples to the entire system because these not only have greater number of connections (via degree centrality), but they are also situated in between many other players (with high betweenness scores). Seven of these entities belong to the Top 10 universal and commercial bank groups based on total assets data from the Bangko Sentral ng Pilipinas (BSP).[18] Network centrality appears to be positively correlated with asset size, although this requires a more formal testing.

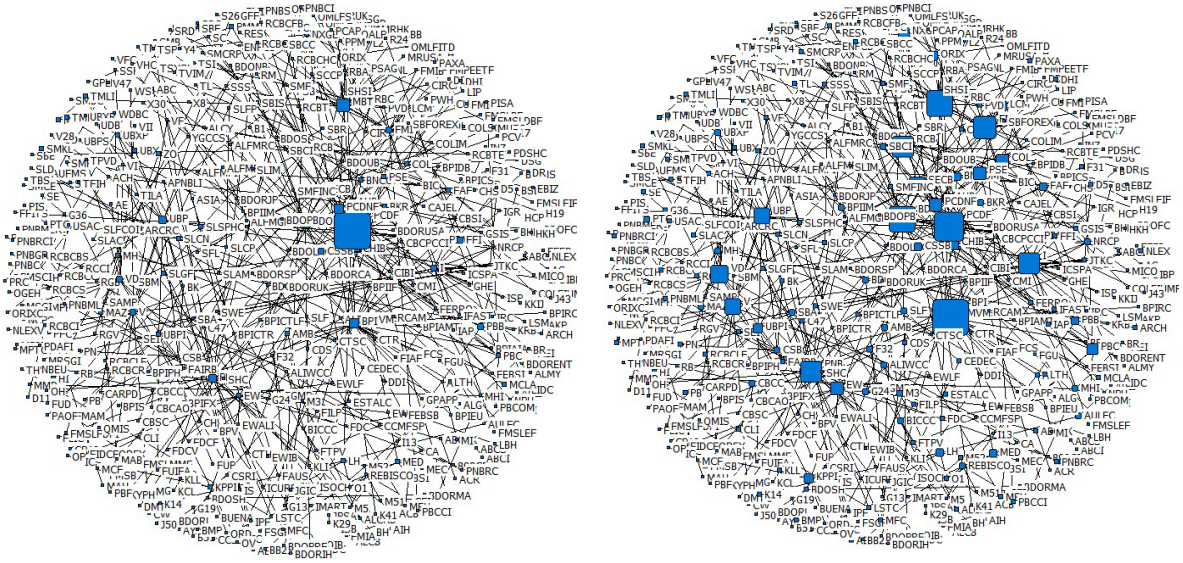
It is quite difficult, however, to interpret the extent of control that PCDF has because the beneficial owners are not readily available. It can be an assortment of many companies and individuals, but it can also be an aggregation of few. Understanding its role more deeply is important given its central position within the network. Figure 6 is the same network as that in

[18] https://www.bsp.gov.ph/Statistics/Financial%20Statements/Commercial/assets.aspx

Figure 5 but illustrated using the scaling/ordination layout. The graph shows the node sizes proportional to their betweenness and degree centrality. The biggest nodes are those of PCD Nominee Corporation (Filipino and Non-Filipino) along with several other entities (including BPI). The entity "PCD Nominee Corporation[19] is the registered owner of shares beneficially owned by participants in the Philippine Central Depositary, Inc. (PCD), a private company organized to implement an automated book entry system of handling securities transactions in the Philippines." As an entity, the current data show that PCD Nominee Corporation (Filipino) is the registered owner of the lodged shares of their clients' and participants' stocks in 27 financial institutions (only in network of those with at least 5% ownership) with lodgment in its book-entry system representing ownership that ranges from 8.41 to 99.9 percent of the outstanding common shares. The clients of PCD in the non-Filipino variation has ownership in 11 companies, with lodged shares ranging from 5.13 to 38.24 percent.

Figure 7 shows the ego networks of PCD Nominee Corporation handling Filipino (PCDF) and non-Filipino (PCDNF) clients. It occupies a very strategic position because it connects most of the central actors in the financial sector. To further illustrate this, we obtained the second level ego networks emanating from PCDF and PCDNF – that is the alters of the alters of PCDF and PCDNF (friends of the friends). Figure 8 shows the resulting network. In fact, we found some indirect connections among top financial institutions, and these are mostly due to the links between these on one hand and PCDF and PCDNF, on the other hand. However, PCDF and PCDNF themselves do not hold beneficial ownership of the shares. A report notes that clients of PCD "have the power to decide how their shares are to be voted" (BDO Annual Report 2023).

Figure 6. Whole network ownership structure of PSE-listed financial companies, ownership 5% and above, 2023 (node size by centrality).

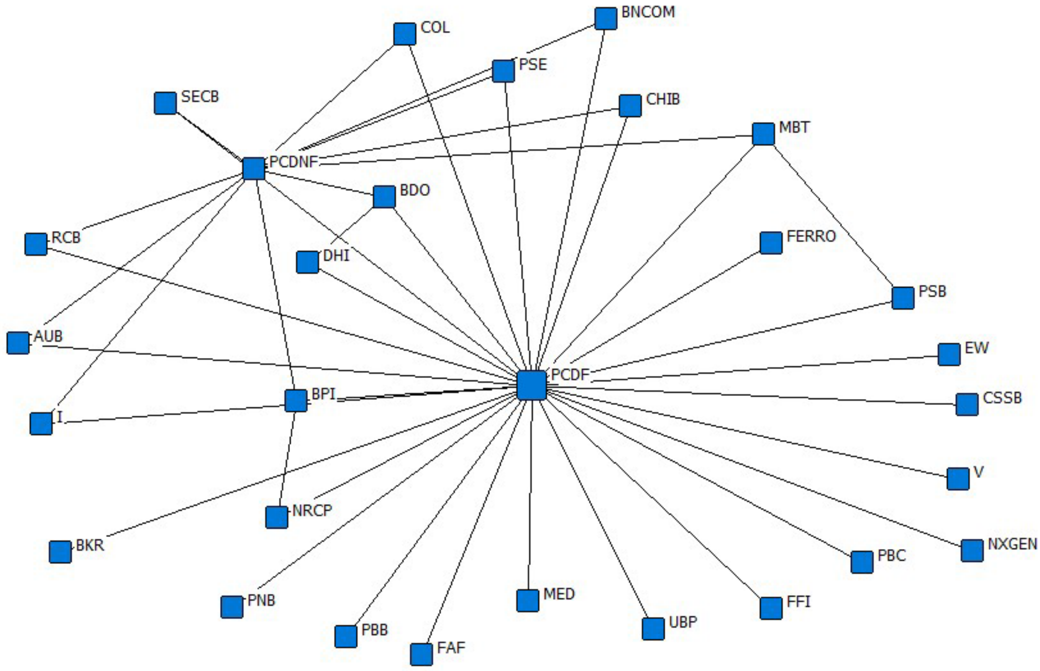


a. Betweenness b. Degree

Source: Authors' computation.
Source of basic data: Philippine Stock Exchange documents

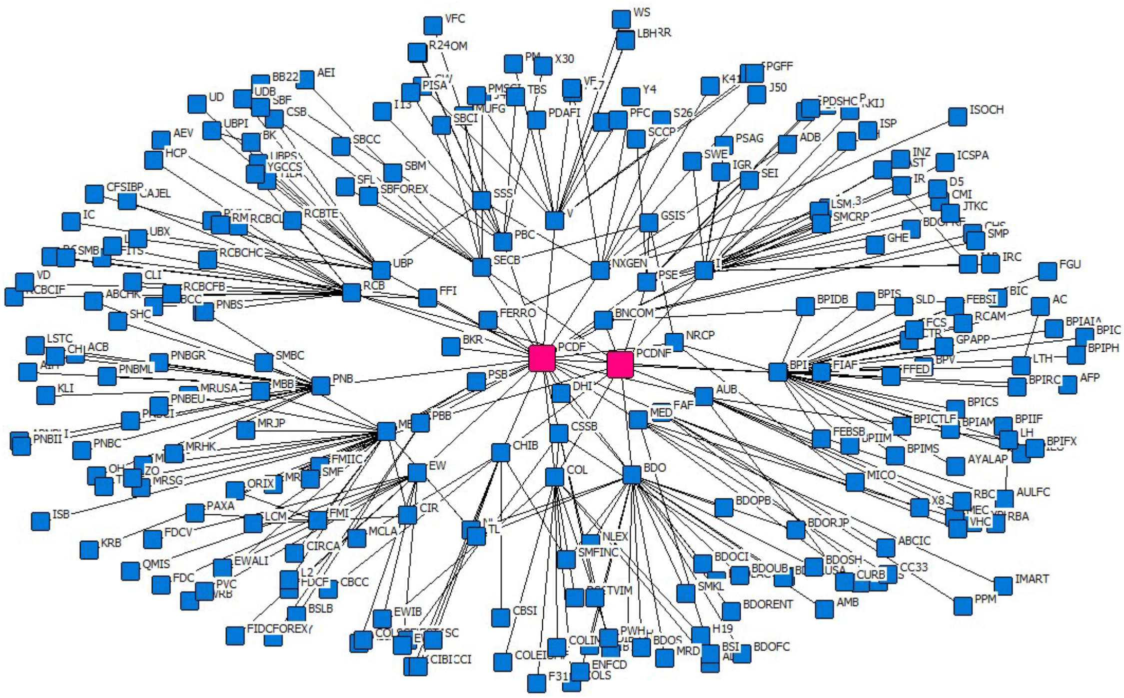
[19] https://www.mpic.com.ph/wp-content/uploads/2019/06/DIS-April-16-2019.pdf

Figure 7. Ego networks of PCDF and PCDNF.



Source: Authors' computation.
Source of basic data: Philippine Stock Exchange documents

Figure 8. Level 2 ego networks of PCDF and PCDNF.



Source: Authors' computation.
Source of basic data: Philippine Stock Exchange documents

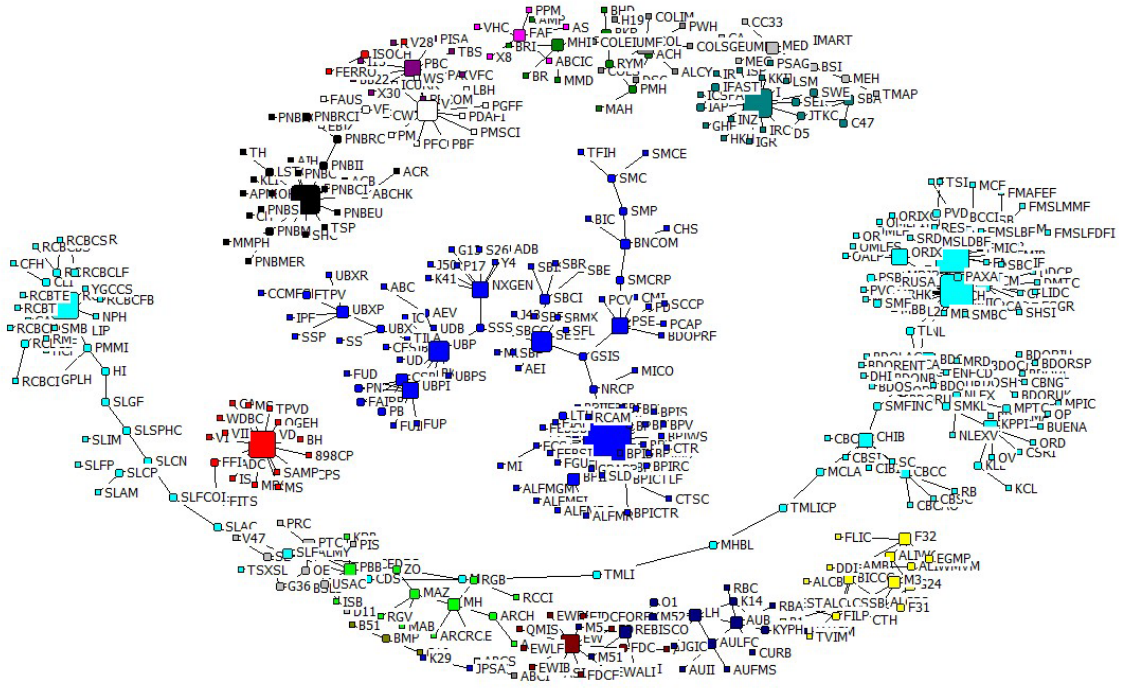
For the purposes of this paper and because of the difficulty of obtaining information about the

beneficial owners of the stocks held by the PCD Nominee Corporation (both Filipino and non-Filipino), it was deemed necessary to conduct an analysis where it is being excluded. Here, we assume that ownership shares held by the PCD Nominee Corporation would not have a significant impact on the individual companies' position within the network. After all, the names of substantial/principal stockholders have already been disclosed in the Public Ownership Report documents that can be seen from the PSE website.

Once PCD Nominee Corporation (both Filipino and non-Filipino) is excluded, the network configuration results in a more fragmented one (Figure 9). This is clear evidence that removing a highly strategic node disrupts the system in a significant way, altering its connectedness and separating otherwise connected segments of the network. However, since PCD itself is not the beneficial owner of the shares and does not control the power that these shares hold, its strategic position cannot be interpreted in the same manner as those entities that truly own the shares.

It might be interesting to compare this network with that in the subsidiary network. It can be observed that this network has fewer components or groups. From 42 in the subsidiary network, the broader network is made up of only 20 components (see column 4, Table 2). The difference between the two is the addition of weaker ownership links. Because the weaker ownership links have now been included, we can see that the separate clusters from the subsidiary network have been linked together by these relatively weaker ties (via entities that hold lower shares of stocks). While the network is still considered fragmented (its density is only 0.05% and diameter is a high 24), it is interesting to see the entities that bind the otherwise separate components together. The hub and spoke characteristic of the structure is still clearly illustrated (see Figure 9).

Figure 9. Whole network ownership structure of PSE-listed financial companies, ownership 5% and above, 2023 (without PCD Nominee, Filipino and Non-Filipino), by component; node size by degree.

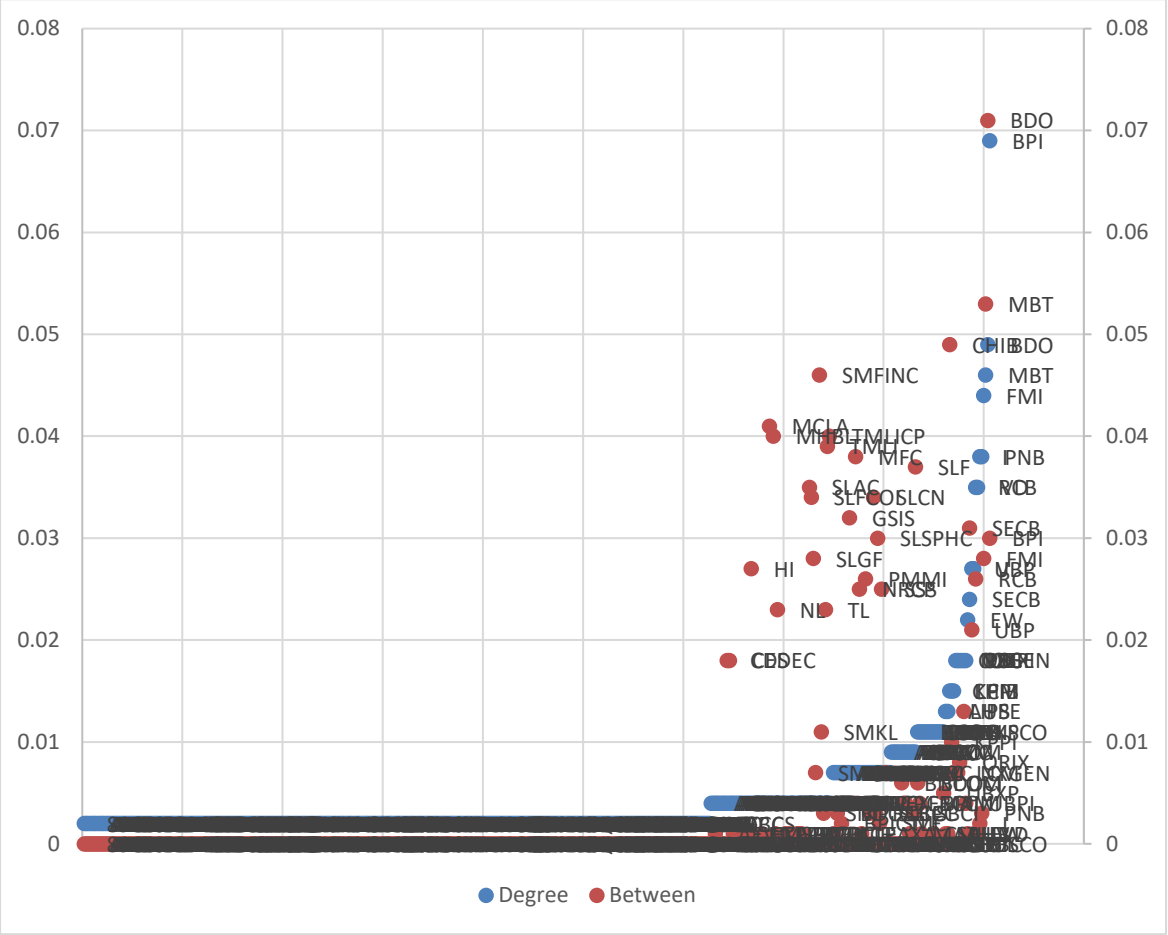


Source: Authors' computation.

Source of basic data: Philippine Stock Exchange documents

Based on degree (normalized score) and betweenness centrality, the actors that occupy the most influential and strategic positions in the network of financial institutions are Bank of the Philippine Islands (BPI), Banco De Oro (BDO), Metropolitan Bank & Trust Company (MBT), First Metro Investment Corporation, Philippine National Bank (PNB), I-Remit, Inc. (I), Vicsal Development Corporation (VD), Rizal Commercial Banking Corporation (RCB), Vantage Equities, Inc. (V), Union Bank of the Philippines (UBP), Security Bank Corporation (SECB), and East West Banking Corporation (EW) (See Figure 10).

Figure 10. Centrality scores by entity (based on network of ownership 5% and above without PCD Nominee Corporation).

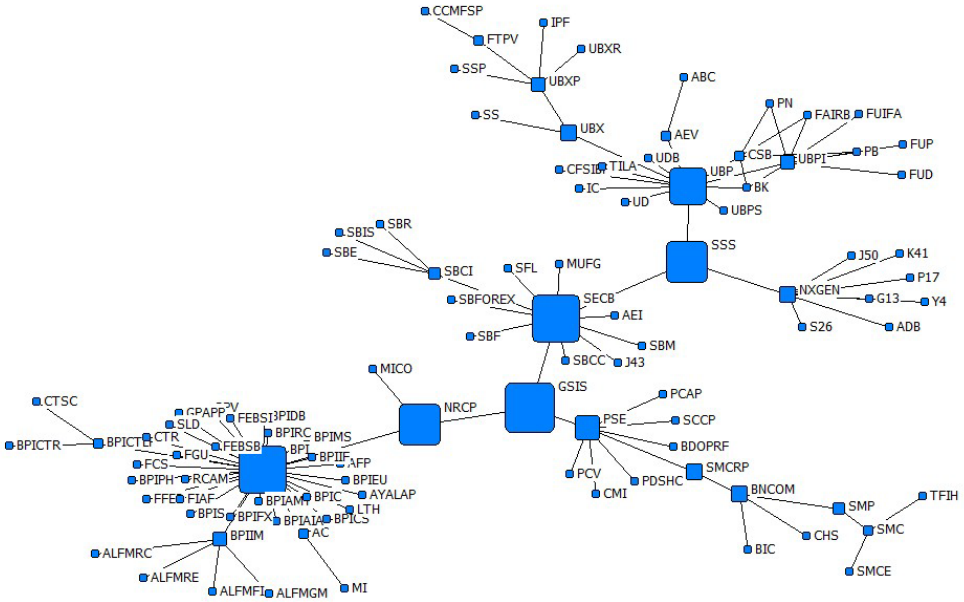


Source: Authors' computation.
Source of basic data: Philippine Stock Exchange documents

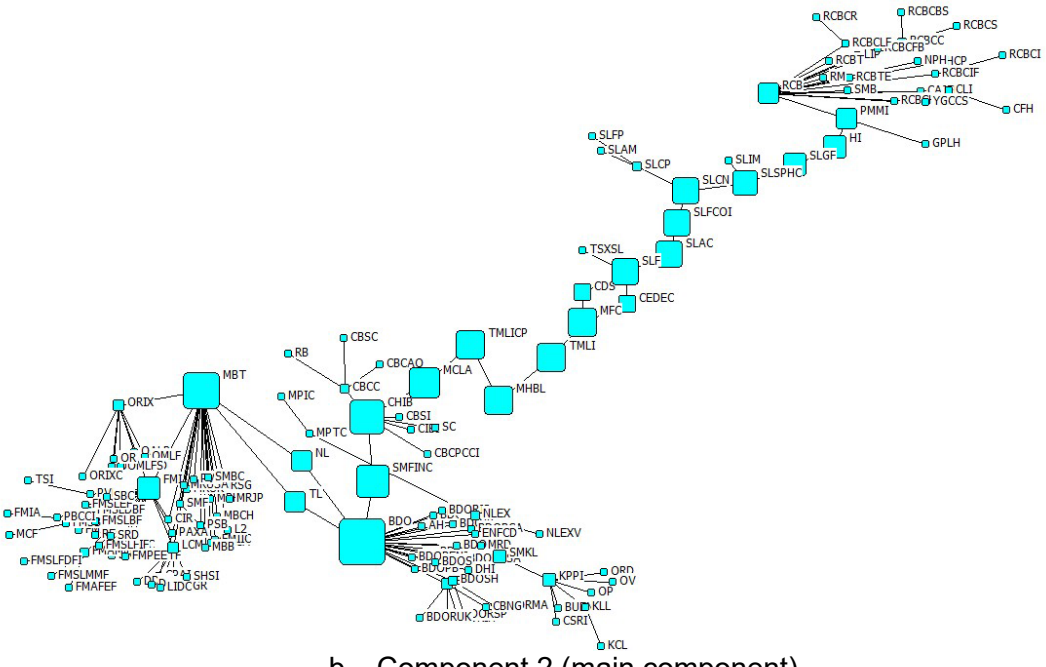
Apart from those with highest betweenness and degree, it was observed that entities with bridging roles tend to be insurance (SSS, GSIS) and reinsurance (NRCP) companies (see Figure 11 (a)), private insurance and investment companies based in the Philippines and abroad (Figure 10 (b)), companies in real estate (Northpine Land, Taal Land), and conglomerate (SM Investments Corporation). In Figure 11 (b), the long set of connected nodes that bridge the groups consist of insurance and investment houses such as The Manufacturers Life Insurance Company, House of Investments, Inc., Sun Life Financial Philippine Holding Company, Inc., Sun Life Financial Inc. (SLF), Sun Life Assurance Company of Canada, CEDE & CO (a US-

based entity that processes transfers of stock certificates on behalf of Depository Trust Company), CDS & CO (a nominee for many Canadian brokerage firms), Manulife Financial Corporation (MFC), Pan Malayan Management and Investment Corporation, Manulife Chinabank Life Assurance Corporation, and Manulife Holdings (Bermuda) Limited. The remaining components of the network pertain to distinct business clusters, structured in the same way as the network configuration in the subsidiary network – that is likened to hub and spokes.

Figure 11. Selected graph components, node size by betweenness.



a. Component 1



b. Component 2 (main component)

Source: Authors' computation.
Source of basic data: Philippine Stock Exchange documents

6. Structure of ownership network via board interlocks

To supplement the ownership network analysis, we likewise examined the extent of corporate control of financial institutions by drawing interconnections via interlocks of members in BOD and officers. A link is drawn between any two companies if they share a member of BOD or officer. The idea is that the company can exercise some influence on the other companies via its BOD member who also sits at the BOD of such companies. Another possibility is for the BOD member or officer to tend to make decisions that are beneficial to both companies. At the very least, the BOD member or officer will make decisions that will not have an adverse impact on any of the companies.

6.1. Corporate network via BOD interlocks

The network graph that links companies via BOD interlocks is shown in Figure 12. It shows a nearly single component network which means that every entity except one is connected to the network by at least one link or edge. Nevertheless, the network density is still sparse with only 1.2 percent of all possible connections being actual connections. There are 1,618 entities or nodes in all in this network because we have accounted for the non-financial companies where the BOD and officers in financial institutions are at.[20] On average, each entity is connected to 19 other entities via BOD and officer interlocks. The average distance between any two companies is 3.68 while the most distant pairs would have to take 8 steps to reach each other (see Table 3).

If we compare this with the broader ownership network (ownership is at least 5 percent), this network's density is much higher at 1.2 percent compared to 0.05 percent. The network from BOD interlocks is shown to be relatively denser via its degree distribution. It is noted that "sparsely connected networks…show the typical power-law (scale-free) node-degree distribution in which most nodes have only few links while some few nodes are extremely linked. By contrast, densely connected networks…, show a more "fair" distribution of less differences between lowly and highly linked nodes.[21] The degree distribution in a) of Figure 13 shows a relatively more fair distribution than the distribution in b) where there are very few nodes which have very high degree whereas most nodes have very few links.

The network structure of that from BOD interlocks that has two components (one component and one isolate) suggests that the reach of potential corporate control by an entity can be vast. Interestingly, compared with the subsidiary and other ownership networks, where the structure is mostly hub and spoke, the structure here is denser, that is - the spokes also link up to each other as opposed to being separate in the former. In fact, there is a relatively high level of clustering. With transitivity coefficient of 0.67, there is a considerable proportion of closures (the friend of my friend is also my friend). The transitivity coefficient provides the proportion of transitive triples (triads) among all possible triples. These connections are of pathlength 2. The high transitivity coefficient means that the network contains groups of nodes that are

[20] Data from disclosed Annual Reports show the other companies where the BOD member or officer is also a part of. All such data have been collected for analysis.
[21] http://www.network-science.org/highly-connected-society-dense-social-complex-networks.html#:~:text=A%20dense%20network%20is%20a,called%20a%20completely%20connected%20network. http://www.network-science.org/powerlaw_scalefree_node_degree_distribution.html

densely connected internally. This also validates the presence of tightly connected communities or business groups.

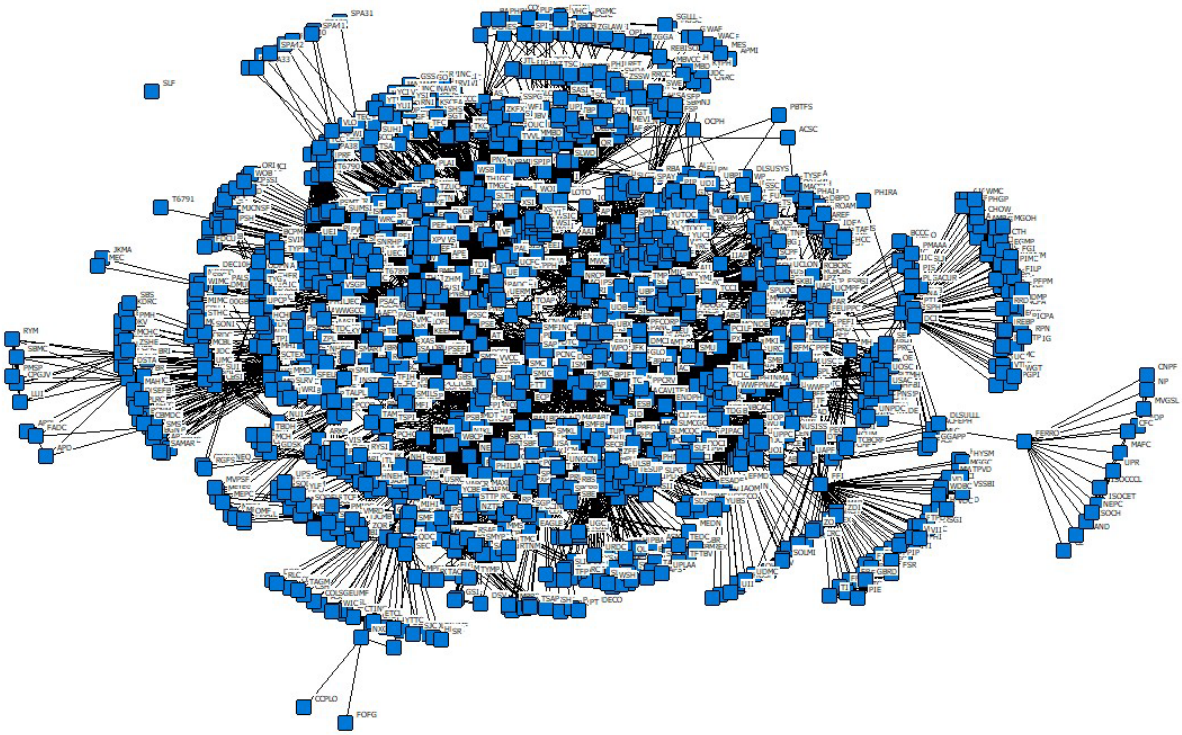
This analysis of inter-company links via board interlocks lends important insights that have not been known had the analysis been limited only to the direct ownership network. For instance, it is interesting to know that a natural person can have vast corporate power being a member of the board or officer in at least 59 companies.

Table 3. Whole network measures of company networks via BOD and officer interlocks, financial sector, Philippines, 2023.

Parameter	BOD and officer interlock
# of nodes	1618
# of ties	30960
Avg Degree	19.135
Density	0.012
Components	2
Connectedness	0.999
Fragmentation	0.001
Avg Distance	3.681
Diameter	8

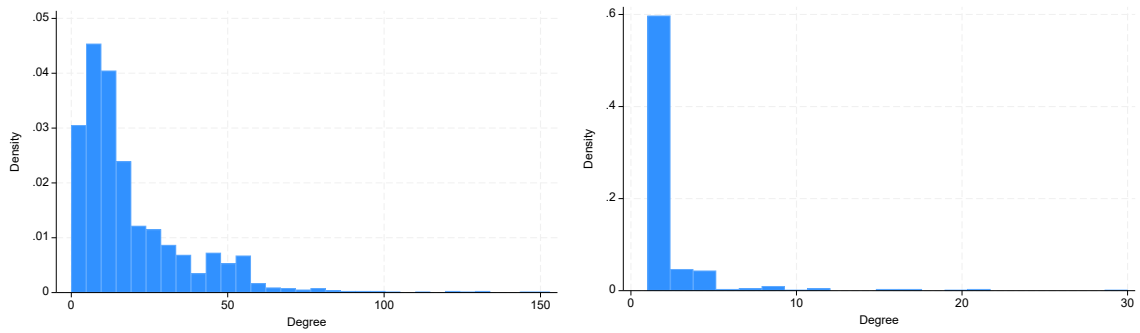
Source: Authors' computation.
Source of basic data: Philippine Stock Exchange documents

Figure 12. The whole network structure of links among PSE-listed financial companies based on BOD and officer interlocks, node size by betweenness centrality.



Source: Authors' computation.
Source of basic data: Philippine Stock Exchange documents

Figure 13. Comparison of node degree distribution between corporate network via BOD/Officership interlock and ownership network of at least 5 percent stake.



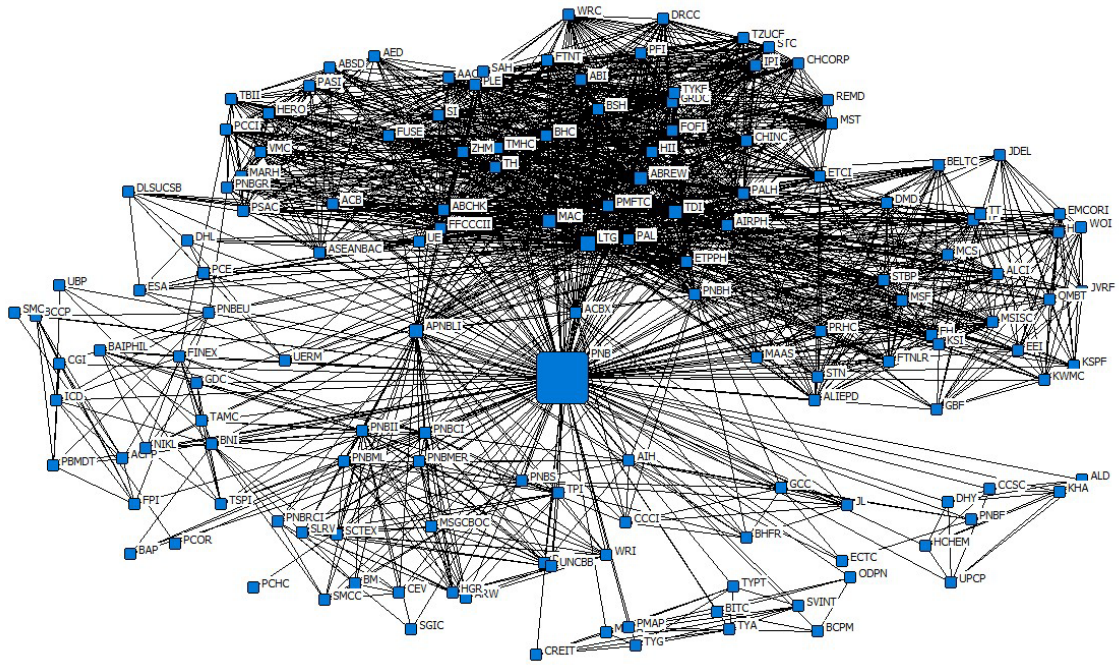
a. Network from BOD/officership interlocks b. Ownership network (at least 5%)

Source: Authors' computation.
Source of basic data: Philippine Stock Exchange documents

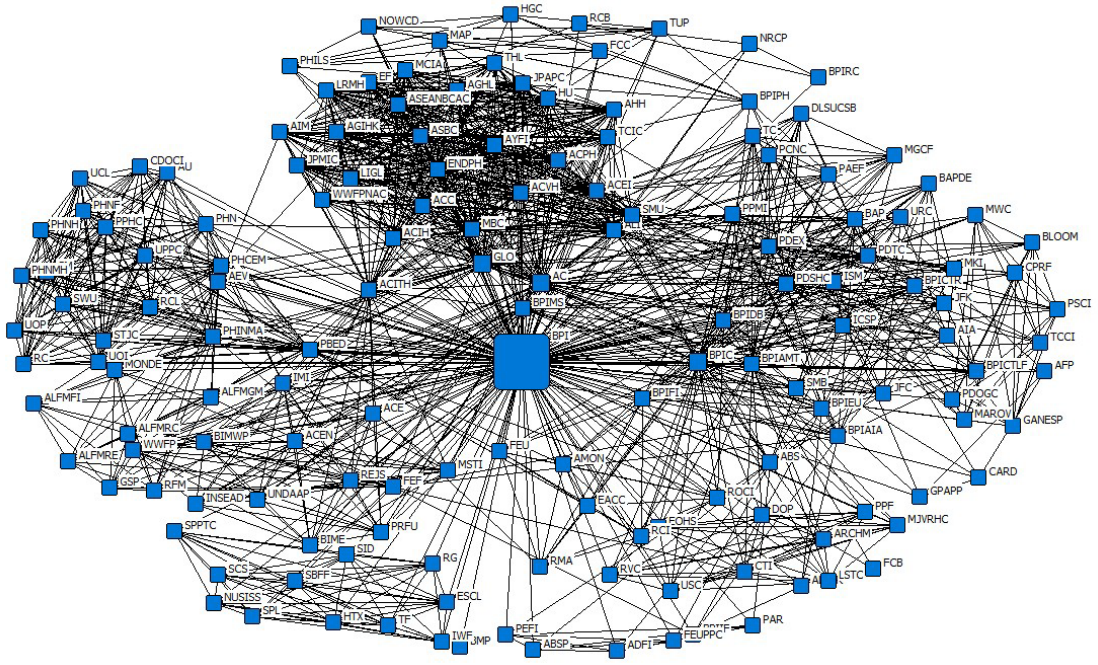
6.2. Ego networks of selected top bank organizations

Analyzing the connectedness of various entities, the highest score of degree centrality (based on raw score) is 237 by the Philippine National Bank (PNB). PNB is followed by BPI (191), PBC (185), BDO (174) and NRCP (145). There are 237 edges that connect various companies directly PNB's BOD members/officers (see Figure 13a). There are companies with two or more BOD members/officers being shared. If these multiple links are taken as one, there are 146 companies that are connected to PNB via its BOD/officers. Figure 13b shows the ego network of BPI. Note that the alters of these top financial entities are also connected to each other. Further analysis of the sectoral characteristics of the egos' alters or connections would provide a better understanding of the extent of the potential corporate control and influence of each of these top companies.

Figure 14. Ego networks based on BOD and officer interlocks, node size by betweenness centrality.



a. Philippine National Bank



b. Bank of Philippine Islands

Source: Authors' computation.
Source of basic data: Philippine Stock Exchange documents

6.3. Links between and among top bank organizations

One of the objectives of the study is to examine links among companies that are considered as competitors. To obtain links (direct and indirect) between or among financial companies particularly the biggest bank organizations, we drew the ego networks of the top seven banks based on assets per BSP data – these are BDO, BPI, MBT, PNB, RCB, SECB, and UBP. Selecting these seven ego networks and drawing them together into one sub-network allows us to determine their interconnections. Figure 14 shows the resulting graph. It clearly shows the numerous entities that connect these egos (in orange-colored nodes). In fact, it is extremely difficult to separate the seven groups into distinct business groups because of the presence of multiple entities acting as intermediaries. Such multiple links suggest the opportunity or potential for interaction. These have implications for their ability to potentially influence business decisions, and their reach in terms of corporate control.

Table 4. Network measures of company networks via BOD and officer interlocks, top 7 bank organizations, Philippines, 2023.

Parameter	BOD and officer interlock, top 7 bank organizations
# of nodes	732
# of ties	15404
Avg Degree	21.044
Density	0.029
Components	1
Connectedness	1
Fragmentation	0
Transitivity/Closure	0.661
Avg Distance	3.042
Diameter	4

Source: Authors' computation.
Source of basic data: Philippine Stock Exchange documents

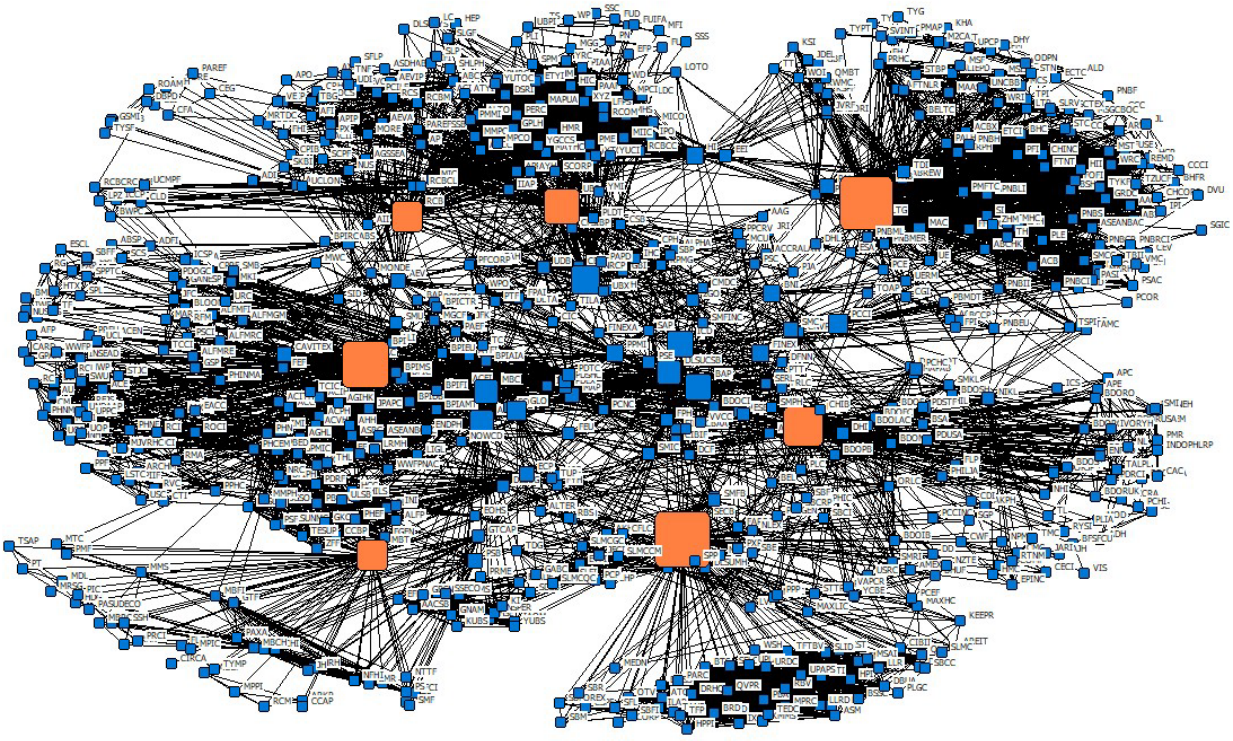
Looking at the links more deeply, we can see that this sub-network with a density of 2.9 percent is more connected compared to the whole BOD interlock network that has a density of only 1.2 percent. In fact, this is relatively more compact with a lower average distance. Each entity included in the 732 nodes can reach another via an average pathlength of only 3.042 steps. The maximum distance (diameter) between the nodes located farthest to each other is smaller at 4 steps, half that of the whole BOD interlock network.

Direct connection via BOD or officer interlock is rare. Notably, we found that two (mutually exclusive) pairs out of the seven top bank organizations are directly connected via a board/officer interlock. This means that four top bank organizations are connected to at least one competitor by pathlength of 1 – there is no company in between. Upon closer examination, it was found that in both cases, the commonalities involve officers, not BOD members and they have served the linked companies in 2023; these seem like cases where officers transfer from one company to the other. Indirect links are more common. At least 21 entities serve as a link between two top bank organizations, where the pathlength between the two banks is 2. At least 14 other entities link up between/among 3 or more top banks. These findings illustrate the potential for interaction among competitors in the financial sector.

Interestingly, most companies that can serve as common grounds or venues for interaction of these top bank companies are characterized in terms of sector as non-profit or business organizations, educational institutions including one foreign school, conglomerates and/or holdings companies, and electronic payments companies (i.e. Bancnet, PPMI). The less common ones are manufacturing companies (electronic, cement, food and beverage), mining companies, companies engaged in construction, energy, telecommunications, mass media, transport and financial services. We define such common venues as companies that lie between the top seven bank companies by virtue of board member/officer interlocks.

The non-profits or business organizations include the Bankers Association of the Philippines, Chamber of Thrift Banks, Financial Executives Institute, Institute of Corporate Directors, Makati Business Club, Management Association of the Philippines, Nextgen Organization of Women Corporate Directors Philippines, Philippine Business for Education. Other organizations like the Philippine Clearing House Corporation and Confederation of the Philippines also serve as intermediaries. The educational institutions include the Asian Institute of Management, CDO College, De La Salle Greenhills, De La Salle College of Saint Benilde, PAREF Southridge School for Boys, and Singapore Management University. The conglomerates noted are San Miguel Corporation, San Miguel Food & Beverage, Inc., First Philippine Holdings, Aboitiz Equity Ventures, and Phinma Corporation. It should be clear that these entities are not necessarily the most central actors based on the whole network that was created out of board/officer interlocks. But these were determined from a closer analysis of the interconnections of only the seven top bank organizations.

Figure 15. Ego networks based on BOD and officer interlocks, Top 7 universal and commercial bank groups, node size by betweenness centrality.



Source: Authors' computation.
Source of basic data: Philippine Stock Exchange documents

7. Discussion and Concluding Remarks

Using the inter-company direct ownership connections, this study provides objective parameters and graphical illustrations of how numerous financial institutions are clustered into several business groups. The subsidiary network of financial companies is composed of 285 entities. We consider the network as a fragmented one with only 0.06 percent of all possible ties being actual ties and with 42 separate clusters called components. The network parameters suggest that the connections among members of a group are closely-knit.

They exhibit a hub and spoke structure with a parent company in the center and subsidiaries around it. This centralized structure is said to be used by investment companies for the purpose of pooling assets, cutting costs and improving efficiency. It is likely that the subsidiaries with each being individually managed combine their assets or resources to contribute to the parent company.[22] We found that financial institutions diversify their portfolio by owning various companies not only in the financial sector but also in other sectors. To illustrate, there are large banks that are also into the business of processing overseas remittances, insurance, asset/investment management, payments, foreign exchange brokering, securities, leasing and/or rental, business services, and real estate. It is recommended that more in-depth studies are undertaken to understand the financial sector's level of vulnerability to any shocks that may arise from their exposure in the above-mentioned sectors.

Nonetheless, it is important to understand why these entities have such diverse portfolios. In the literature, ownership networking activities in financial companies are driven by various factors, primarily for economic reasons. Financial institutions engage in these activities to maximize shareholder value, enhance competitive advantage, and optimize resource allocation. Research by Chronopoulos, Girardone, and Nankervis (2011) highlights that diversified banks tend to achieve greater cost efficiency and profitability compared to specialized banking systems, emphasizing the economic benefits of ownership diversification (Allen and Rai, 1996; Cavallo and Rossi, 2002).

Ownership stakes enable financial firms to strategically position themselves in emerging markets, new industries, and high-growth sectors, facilitating their ability to seize market opportunities and expand their presence. Moreover, ownership networking allows these companies to form strategic alliances and partnerships with complementary firms. For example, banks may invest in fintech startups to access innovative technologies or collaborate with asset management firms to broaden their product offerings. Li, Qiu, and Wang's study (2019) underscores how such alliances foster corporate innovation among technology conglomerates, enhancing patent output and knowledge exchange.

Furthermore, ownership stakes provide financial companies with significant influence over other firms' strategic decisions, governance structures, and operational activities. This influence can be leveraged to align business interests, improve profitability, and achieve organizational synergies. Additionally, by diversifying their investments through ownership networking, financial institutions mitigate risks associated with their core business activities, market volatilities, and regulatory changes. This diversification strategy helps manage portfolios effectively, reducing exposure to economic downturns or market shocks. Regulatory compliance and capital requirements also shape ownership networking activities, with financial

[22] Investopedia https://www.investopedia.com/terms/h/hub_and_spoke_structure.asp#:~:text=What%20Is%20a%20Hub%20and,contributing%20to%20one%20central%20vehicle.

regulators imposing limits to mitigate concentration risks, ensure financial stability, and protect consumers.

Apart from owning various businesses, this study found evidence of the interconnections among companies in the financial sector, and between financial companies and others. Using the links among BOD members and officers, we found connections that have a high proportion of triples suggesting ease of reaching others within a short distance. The finding of an interconnected network, nearly one component network, also suggests that the extent of corporate control can be wide. Further analysis must be done to identify the sectors where the reach of the financial sector via BOD/officer interlocks can be identified. Due to time constraints, such have not been thoroughly examined in this paper. Likewise, the implications for having such a network structure must also be understood. It is likewise crucial to inquire if there are any systemic risks that emanate from the interconnections of these companies. In addition to the need to probe into such questions, future work must investigate transaction-based interconnections to better ascertain magnitude of systemic risks.

It is important to note that the top-ranking financial actors are also likely to be the most influential in the network, which is consistent with the findings of Hopkins (1964). We noted this based on the BSP data on top bank organizations and this study's results of the actors with higher betweenness centrality, although this requires more formal testing in the future. Policy-wise, it is important for regulators to take this into account in their risk management programs because any disruptions involving any of these top-ranking financial actors can cause significant disruptions to a great segment of the economy knowing that (based on the literature) the financial sector is at the core of the entire economic system.

The study likewise found that multiple indirect connections exist among competitors, and these require more in-depth analysis in the future. It is premature at this point to suggest any indication of uncompetitive behavior. However, this study clearly shows that opportunities for such are not absent, at least based on the multiple indirect connections that were found. Consistent to the literature, the study found a small world phenomenon being exhibited by networks of financial institutions via board and officership interlocks via a high transitivity coefficient (proportion of triples).

While this study provides a novel set of insights owing to the meso-level or systemic approach of inquiry that was used, there are limitations that are worth noting which are important considerations of future inquiries. One is the lack of data that can provide a more complete picture of the ownership networks of financial companies. Although the PSE data covers most of the top companies, there may still be those that were not included simply because they are not publicly listed but which may occupy important roles within the network that we have not accounted for. To reduce some of these limitations, we supplemented the analysis with company links via BOD and officers' interlocks which provided a wider illustration of the corporate reach of the financial sector.

Conducting network analysis as it applies to corporations/companies is not without challenges. Determining the correct threshold of company ownership was not straightforward. This is because the Public Ownership Reports (POR) do not provide a clear cut-off as to how companies determine the substantial/principal stockholders. In some companies, the percentages are substantial but for others the percentage of stocks of their substantial/principal stockholders are quite minimal. Furthermore, the presence of entities like PCD Nominee Corporation where beneficial owners of the stocks are not clearly shown limited the author's

ability to account for the total extent of ownership held by companies lodged in such platform.[23]

Notwithstanding these limitations, this study contributes to our understanding of the structure of the country's financial sector via the network approach. These contributions come from the illustration via network graph the structure of the system of links and the extent of potential corporate influence, and the identification of not only direct but indirect links as well as highly influential actors.

8. References

Aggarwal, M., A.S. Chakrabarti, and P. Dev. 2020. Breaking "bad" links: Impact of Companies Act 2013 on the Indian Corporate Network. *Social Networks* 62: 12-23.

Albert, J.R.G., and J.F.V. Vizmanos. 2020. Vulnerability to Income Poverty in the Philippines: An Examination of Trends from 2003 to 2015. PIDS Research Paper Series No. 2020-01. Quezon City: Philippine Institute for Development Studies.

Allen, M. P. 1974. The Structure of Interorganizational Elite Cooptation: Interlocking Corporate Directorates. *American Sociological Review*, 39 (3): 393-406.

———. 1978. Economic interest groups and the corporate elite structure. *Social Science Quarterly*, 58 (4): 597-615.

———. 1981. Power and Privilege in the Large Corporation: Corporate Control and Managerial Compensation. *American Journal of Sociology*, 86 (5): 1112-1123.

Alley, W. A. 1997. Partial ownership arrangements and collusion in the automobile industry. The *Journal of Industrial Economics*, 45 (2): 191-205.

Andrikopoulos, A., Georgakopoulos, A., Merika, A., and Merikas, A. 2019. Corporate governance in the shipping industry: board interlocks and agency conflicts. *Corporate Governance*, 19 (4): 613-630.

Azar, J., Schmalz, M., and Tecu, I. 2018. Anticompetitive effects of common ownership. *The Journal of Finance*, 73 (4): 1513-1565.

Azar, J., S. Raina, and M. Schmalz. 2022. Ultimate ownership and bank competition. *Financial Management* 51 (1): 227-269.

Bangko Sentral in Pilipinas (BSP). 2023. Labour market conditions and wage developments in the aftermath of the pandemic: implications for monetary policy in the Philippines. In Inflation and labour markets. BIS Papers No. 142. Bank for International Settlements. Retrieved on March 12, 2024, from https://www.bis.org/publ/bppdf/bispap142.htm

Battison, S., and Catanzaro, M. 2004. Statistical properties of corporate board and director networks. *The European Physical Journal B*, 38: 345-352.

Bearden, J., W. Atwood, P. Freitag, C. Hendricks, B. Mintz, and M. Schwartz. 1975. The nature and extent of bank centrality in corporate networks. Paper presented at the Annual Meeting of the American Sociological Association: San Francisco.

Benmelech, E. N. Bergman, and H. Kim. 2018. Strong employers and weak employees: How does employer concentration affect wages? / NBER Working Paper No. 24307.

Bikker, J.A., and K. Haaf. 2002. Measures of competition and concentration in the banking industry: a Review of literature. *Economic & Financial Modelling*. Central Bank of the Netherlands

Bresnahan, T.F., and S.C. Salop. 1986. Quantifying the competitive effects of production joint ventures. *International Journal of Industrial Organisation* 4: 155-175.

[23] It is noted however that any shareholder in the PCD Nominee Corporation that has a shareholding of 10% or more must be included under Principal Stockholder.

Bugayong, P.G., M.T. Sadicon, and J.J.P. Katigbak. 2022. Women in Philippine government financial institutions: A network analysis of interlocking governing boards. *Asia Social Issues* 16(2). E-ISSN: 2774-0315.

Burt, R. S. 1978. A structural theory of interlocking corporate directorates. *Social Networks*, 1: 415-435.

Cardenas, J. 2012. Varieties of corporate networks: Network analysis and fsQCA. International Journal of Comparative Sociology 53 (4): 298-322.

Carroll, W. K., and Jean Philippe Sapinski. 2011. "Corporate Elites and Intercorporate Networks". In Peter J. Carrington and John Scott (ed.), The SAGE Handbook of Social Network Analysis: 180-195. London: SAGE Publications.

Carvalho C. A., and Ribeiro, E. M. S. (2019). Shareholding Interest in Companies Listed on B3 in 2018: A Study of Networks. *Brazilian Business Review*, 16 (5): 519-536.

Cayanan, A. 2019. Corporate Governance Issues in Philippine-Listed Companies. *Philippine Management Review*, 26: 1-16.

Chen, Y., Y. Wang, and L. Lin, 2014. Independent directors' board networks and controlling shareholders' tunneling behavior. China Journal of Accounting Research 7: 101-118.

Chronopoulos, D. K., Girardone, C., & Nankervis, J. C. (2011). Are there any cost and profit efficiency gains in financial conglomeration? Evidence from the accession countries. The European Journal of Finance, 17(8), 603–621.

Claessens, S., S. Djankov, and L.H.P. Lang. 2000. The separation of ownership and control in East Asian Corporations. *Journal of Financial Economics* 58: 81-112

Corporate Finance Institute (CFI), n.d. Affiliated Companies. https://corporatefinanceinstitute.com/resources/management/affiliated-companies/

Debuque-Gonzales, M. M.C.F. Epetia, and J.P.P. Corpus. 2023. Effects of the Covid-19 pandemic on employment and wages in the Philippines. Ch. 8 in (ed. D.B. Canlas) Labor Market Implications of the Covid-19 pandemic in the Philippines. Bangko Sentral ng Pilipinas: Manila, Philippines.

dela Rama, M. 2010. The dominance of family-owned business groups in the Philippines. 24th Annual Australian and New Zealand Academy of Management Conference. https://opus.lib.uts.edu.au/bitstream/10453/16647/1/2009008646.pdf

Doherty, J, 1982. Who controls the Philippine economy: Some need not try as hard as others. In Bellinda A. Aquino (ed.), Cronies and enemies: The current Philippine scene. Philippine Studies Occasional Paper No. 5. Philippine Studies Program. Center for Asian and Pacific Studies. University of Hawaii.

Edmans, A., Levit, D., and Reilly, D. 2014. Governance and comovement under common ownership. NBER Working Paper No. 20420. National Bureau of Economic Research.

Edmans, A., Levit, D., and Reilly, D. 2018. Governance under common ownership. Finance Working Paper No. 437/2014. European Corporate Governance Institute.

Edeling, A., and A. Himme. 2018. When does market share matter? New empirical generalizations from a Meta-Analysis of the market share-performance relationship. *Journal of Marketing* 82 (3): 1-24.

Engel, J., Nardo, M., & Rancan, M., 2021. Network analysis for economics and finance: An application to firm ownership. In Sergio Consoli, Diego Reforgiato Recupero, and Michaela Saisana (ed.), Data Science for Economics and Finance: Methodologies and Applications: 331-355. Springer.

Ferrer, R., and Banderlipe, M. 2012. The influence of corporate board characteristics on firm performance of publicly listed property companies in the Philippines. *Academy of Accounting and Financial Studies Journal*, 16 (4): 123-142.

Gould, E. and J. Kandra. 2022. Inequality in annual earnings worsens in 2021. Economic Policy Institute.

Gramlich, J., and S. Grundl. 2017. Estimating the competitive effects of common ownership. Finance and Economics Discussion Series 2017-029. Washington: Board of Governors of the Federal Reserve System.

Gutierrez, B.P.B., and R.A. Rodriguez. 2013. Diversification strategies of large business groups in the Philippines. *Philippine Management Review* 20

Hallock, K. F. (1997). Reciprocally interlocking boards of directors and executive compensation. *The Journal of Financial and Quantitative Analysis*, 32(3): 331–344.

He, J., and Huang, J. 2017. Product market competition in a world of cross-ownership: Evidence from institutional blockholdings. *The Review of Financial Studies*, 30 (8): 2674-2718.

Hopkins, T.K. 1964. The Exercise of Influence in Small Groups. Totawa, N.J: Bedminister Press.

Huse, C. Ribeiro, R., and Verboven, F. (December 2022) Common-Ownership vs. Cross-Ownership: Evidence from the Automobile Industry, Centre for Economic Policy Research Discussion Paper Series DP17776.

International Accounting Standards Board (IASB). 2014a. IFRS 10 Consolidated Financial Statements. International Financial Reporting Standards Foundation. https://www.ifrs.org/content/dam/ifrs/publications/pdf-standards/english/2021/issued/part-a/ifrs-10-consolidated-financial-statements.pdf

———. 2014b. IFRS 11 Joint Arrangements. International Financial Reporting Standards Foundation. https://www.ifrs.org/content/dam/ifrs/publications/pdf-standards/english/2021/issued/part-a/ifrs-11-joint-arrangements.pdf

———. 2017. IAS 28 Investments in Associates and Joint Ventures. International Financial Reporting Standards Foundation. https://www.ifrs.org/content/dam/ifrs/publications/pdf-standards/english/2022/issued/part-a/ias-28-investments-in-associates-and-joint-ventures.pdf?bypass=on

Keynes J.M. 1936. The General Theory of Employment, Interest and Money.

Koike, K. 1993. The Ayala group during the Aquino period: Diversification along with changing ownership and management structure. *The Developing Economies*, 31(4): 442-464.

La Porta, R., Lopez-de-Silanes, F., & Shleifer, A. (1999). Corporate ownership around the world. *Journal of Finance*, 54(2): 471–517.

Lamberte, M. 1989. Assessment of the problems of the financial system: The Philippine case. PIDS Working Paper Series No. 89-18. Philippine Institute for Development Studies.

Leigh, A., and Triggs, A. 2021. Common ownership of competing firms: Evidence from Australia. IZA DP No. 14287. IZA Institute of Labor Economics.

Levin, J.H. 1972. The Sphere of Influence. *American Sociological Review* 37 (1): 14-27.

Li, K., Qiu, J., & Wang, J. (2019). Technology Conglomeration, Strategic Alliances, and Corporate Innovation. *Management Science*.

Mahdi, K., A. Almajid, M. Safar, H. Riquelme, and S. Torabi. 2012. Social Network Analysis of Kuwait Publicly-Held Corporations. *Procedia Computer Science* 10: 272-281.

Markarian, G., Parbonetti, A., and Previts, G. J. 2007. Circumstances relating to interlocking directorates in Italy: An exploratory study. *Corporate Ownership & Control*, 4 (2): 192-204.

Mizruchi, M., and Bunting, D. 1981. Influence in Corporate Networks: An Examination of Four Measures. *Administrative Science Quarterly*, 26 (3): 475-489.

O'Brien, D. 2017. The competitive effects of common ownership: Ten points on the current state of play. Background material for Item 6 of the 128th meeting on the OECD

Competition Committee on 5-6 December 2017. Organisation for Economic Co-operation and Development.
O'Brien, D. and Waehrer, K. 2017. Competitive effects of common ownership: We know less than we think. *Antitrust Law Journal*, 81 (3): 729-776.
Onaran, O. and G. Galanis. 2012. Is aggregate demand wage-led or profit-led? National and global effects. Conditions of work and employment series No. 40. International Labour Office – Geneva.
Orbeta, A.C. 2021. Poverty Reduction Experience in the Philippines: Lessons Moving Forward. Presented in the third session of the ESCAP Committee on Macroeconomic Policy, Poverty Reduction and Financing for Development.
Panopio E.L. and C.P. Cudia. 2022. Impact of COVID-19 on the 2020 Financial Results of Selected Philippine Publicly-Listed Companies. *DLSU Business & Economics Review* 32(1): 92-102.
Patalinghug, E.E. 2016. Ownership Structure, Corporate Governance, and Firm Value: The Philippine Experience. UPVSB Professorial chair paper no.16-02. Cesar E.A. Virata School of Business, University of the Philippines.
The Philippine Stock Exchange (PSE). 2024. Consolidated listing and disclosure rules, April 2024. https://documents.pse.com.ph/wp-content/uploads/sites/15/2024/04/Consolidated-Listing-and-Disclosure-Rules_as-of-April-2024_FINAL.pdf
———. n.d. Guidelines in Determining Public Ownership of Listed Companies. https://documents.pse.com.ph/wp-content/uploads/sites/15/2022/10/Guidelines-in-Determining-Public-Ownership.pdf
Pratyaksa, R., R.A. Sayoc, M.M. Koga, and M.D.O. Siy. 2015. The Influence of Unrelated Diversification and Ownership Structure on Firm Value: Evidence from Philippine Conglomerates. *DLSU Business & Economics Review* 25 (1): 45-62.
Reyes, C.M. 2021. Eradicating Poverty in the Philippines by 2030: An Elusive Goal? PIDS Discussion Paper Series No. 2021-42. Quezon City: Philippine Institute for Development Studies.
Richardson, D., M. Saunders, and R. Denniss. 2022. Are wages or profits driving Australia's inflation? An analysis of the National Accounts. The Australia Institute Discussion Paper.
Roberts, T. 2014. When bigger is better: A critique of the Herfindahl-Hirschman Index's use to evaluate mergers in network industries. *Pace Law Review* 34 (2): 894-946.
Rutkowski, J.J. 2015. Employment and Poverty in the Philippines. Philippine Social Protection Note No. 9.
Salop, S., and O'Brien, D. 2000. Competitive Effects of Partial Ownership: Financial Interest and Corporate Control. *Antitrust Law Journal*, 67: 559-614.
Sankar, C.P., K. Asokan, and K.S. Kumar. 2015. Exploratory social network analysis of affiliation networks of Indian listed companies. *Social Networks* 43: 113-120.
Saw, C., and P. Manasan. 2019. Network Analysis of the Boards of Directors of the Philippines Stock Exchange Inc. Listed (PSEI) Companies. https://asite.aim.edu/data_science/network-analysis-of-the-boards-of-directors-of-the-philippines-stock-exchange-inc-listed-psei-companies/
Securities and Exchange Commission (SEC). 2017. 2018 Implementing Rules and Regulations of the Investment Company Act. https://www.sec.gov.ph/wp-content/uploads/2019/11/2018IRRofInvestmentCompanyAct.pdf
SEC Memorandum Circular No. 15 s. 2019 – Amendment of SEC Memorandum Circular No. 17, Series of 2018 on the Revision of the General Information Sheet (GIS) to include

Beneficial Ownership Information ("2019 Revision of the GIS"). Securities and Exchange Commission. https://www.sec.gov.ph/mc-2019/mc-no-15-s-2019/#gsc.tab=0

Shinozaki, S. and L.N. Rao. 2021. Covid-19 Impact on micro, small, and medium-sized enterprises under the lockdown; Evidence from a rapid survey in the Philippines. Asian Development Bank Institute Working Paper Series No. 1216. Asian Development Bank Institute: Tokyo, Japan.

Shrader, C., Hoffman, A., and Stearns, T. 1991. Agency Directors And Network Centrality: An Examination of Resource Dependencies. *Journal of Managerial Issues*, 3 (1): 46-61.

Shy, O., and Stenbacka, R. 2019. An OLG model of common ownership: Effects on consumption and investments. *Journal of Macroeconomics*, 62: 1-13.

Szalacha, J. 2011. Interlocking Directorates and Possible Conflict of Interests. *Polish Sociological Review*, 174: 205-216.

Szymanski, D.M., S.G. Bharadwaj, and P.R. Varadarajan. 1993. An analysis of the market share-profitability relationship. *Journal of Marketing* 57 (3): 1-18.

Tan, E. A. 1993. Interlocking directorates, commercial banks, other financial institutions and non-financial corporations. *Philippine Review of Economics and Business*, 30 (1): 1-50.

Unite, A. and Sullivan, M. 2000. Reform and the corporate environment in the Philippines. In P. Drysdale (ed.), Reform and recovery in East Asia: The role of the state and economic enterprise: 191-213. Routledge.

U.S. Congress, House Banking and Currency Committee. 1913. Report of the Committee Appointed Pursuant to H.R. 429 and 504 to investigate the concentration of control of money and credit. 62nd Congress, 2nd session. Washington, D.C. US Government Printing Office.

World Bank (WB). 2001. Finance for Growth: Policy Choices in a Volatile World (English). A World Bank Policy Research Report No. 22239. Washington, D.C. World Bank. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/341151468762914798/finance-for-growth-policy-choices-in-a-volatile-world

World Bank (WB). 2021. Impacts of COVID-19 on firms in the Philippines: May 2021. https://thedocs.worldbank.org/en/doc/470bd69ba34a869f7a87568b2be917d7-0090062021/original/Survey-Results-Impacts-of-COVID-19-on-Firms-in-the-Philippines-Survey-Round-3.pdf

Windolf, P., and Beyer, J. 1996. Co-operative Capitalism: Corporate networks in Germany and Britain. *The British Journal of Sociology*, 47 (2): 205-231

Yao, Q., Evans, T, and Christensen, K. 2019. How the network properties of shareholders vary with investor type and country. PLoS ONE, 14 (8): 1-19.

Yu, S. 2022. The properties of interlocking directorates in the Philippines: An Exploratory Analysis. *Recoletos Multidisciplinary Research Journal*: 77-99.