MAF013 by Justin Jeffrey Williams, Jugjith Deodutt

AN ANALYSIS OF DIRECTOR INTERLOCKS ON THE JSE - WITH REFERENCE TO THE TOP 40 LISTED COMPANIES

Abstract

Director interlocks have concerned shareholders, the public and legislators since the early 1900's. In 1914 the Clayton Act prohibited interlocking directorates among competing corporations in the USA. Research has been performed since the 1930's covering stock exchanges around the world, however very little information was available concerning director interlocks in South Africa. This paper analyses interlocking directorships of the Top 40 companies listed on the Johannesburg Stock Exchange using key metrics as per Newman and Conyon's Small World theory, comparing the results to research on Italian, French, German, UK and US companies performed in 2008 by Santella, Drago, Polo and Gagliardi. South Africa was found to be closest to Italy, between the low density models (UK and US) and the significantly higher density models (Germany and France), suggesting that rather than just the two camps, there is a continuum currently reflected as the UK, US, South Africa, Italy, France and Germany. The presence of directors with multiple directorships and having significant influence in the network suggests systemic collusion is possible. There is still much that can be learned through enhancing the research coverage to provide a factual basis for understanding the impact of legislation and governance codes on the South African network, as well as to perform holistic research covering the combined network formed by board on exchanges across the globe.

Key Terms

Director Interlocks

For the purposes of this research a very broad definition of interlocks is used, being that two companies are considered interlocked if there is a common director on the two boards. Interlocks are created by both inside (executive) and outside (non-executive) directors.

Small-World Theory

A specific case of a social network (a small world) characterised by two properties, namely, a high network clustering (Network Density), being the propensity for boards to be connected if they share a mutual neighbour (a director); and distances between boards are relatively short, with any two boards being connected through a small number of steps (short average path lengths). (Conyon & Muldoon, 2005).

Board of Directors

The board of directors is fundamental to corporate governance – it is a legal requirement for incorporation and is the prime decision making body in the public corporation. "Boards of directors are an economic institution that, in theory, helps to solve the agency

problems inherent in managing an organisation." (Hermalin & Weisbach, 2003, p.7).

Director

Within the context of the Companies Act, the term 'director' means a "member of the board of a company, as contemplated in section 66, or an alternate director of a company" (Companies Act 2008, p.24). The Companies Act makes no mention

of the Chairman of the Board, nor of non-executive or independent directors. No mention is made of alternate directors in the King III report.

Executive Director

The key measure of an executive director is their involvement in the management of the company and/or being in the full-time salaried employment of the company (or subsidiary). This is found in Annex 1.1 of the King III report (IoDSA, 2009), and is not defined in the King III Code. An executive director is defined in Chapter Five of the Act as follows. ‘‘Executive Director’’ means the person appointed under section 200 (Companies Act 2008, p.214). This is in the chapter covering fundamental transactions, takeovers and offers, and does not align to the definition of executive director used within this research. The King III definition as above is therefore the one used.

Non-executive Director

The key measure of a non-executive director is that they are not involved in the management of the company. They should also meet from time to time, without the presence of the executive directors, to consider the performance of executive management. (IoDSA, 2009)

Independent Non-executive Director

The King III report recognises that independence is more about perception (or state of mind) than fact, and requires that independent non-executive directors be independent in fact and in the perception of a reasonably informed outsider. Their independence should be assessed annually by the board, and the King III code goes on to require that if serving for more than 9 years they should be subjected to a rigorous review of independence and performance by the board. (IoDSA, 2009)

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Introduction

The issue of interlocking directorships has been a matter of concern and an area of study for close to a hundred years and continues to be an area of close scrutiny as high levels of interlocks remain in the boards of the top companies across the most significant stock exchanges globally (Santella, *et al* 2008). Very little research has been performed to date on the nature of interlocking directorships within the Johannesburg Stock Exchange of South Africa. This research paper serves to fill that void by extending the research into interlocks performed by Santella *et al* (2008) for the South African director network as at October 2008 as well as providing measures of some key metrics for the South African director network for the period 2004-2010. The conclusions presented by this study are of interest to a number of stakeholders interested in the nature of the relationships between the boards of companies, including Shareholders, Directors, Employees and Unions, Regulators and the general public.

Research Question

The hypothesis of this research explores the South African director network and compares it to those of the UK and Germany, being at the extreme ends of patterns formed by such networks. Windolf & Beyer (1996, p. 205) describe the UK network as one of competitive capitalism as opposed to the German network being one of co-operative capitalism.

Hypothesis: The interlocking director network of the JSE top 40 companies compares more closely to that of the UK than that of Germany in terms of network density and average path lengths.

Research Method

The research was performed through a quantitative study. The population of data being covered included all companies listed on the main board of the Johannesburg Stock Exchange, excluding the alternate board (Alt-X). The sample was restricted to the top 40 companies at a point in time (04/03/2009) although the data collected about these 40 companies extended from June 2004 to June 2010. The sample size of 40 was chosen for reasons of comparability with similar research and due to the lack of access to reliable data, as discussed further in "Data Collection Strategies".

Literature Review

The study focuses on the main area of interlocking directorships. There is much debate in the literature as to the benefits and pitfalls of directors holding multiple positions. These include emotive writings very much against such relationships such as the plea to President Wilson quote, *"The practice of interlocking directorates is the root of many evils. It offends laws human and divine. Applied to rival corporations, it tends to the suppression of competition and to violation of the Sherman law. Applied to corporations which deal with each other, it tends to disloyalty and to violation of the fundamental law that no man can serve two masters. In either event it leads to inefficiency; for it removes incentive and destroys soundness of judgement."* Louis Brandeis, advisor to President Wilson, as cited by Dooley (1969, p.369) Elimination of competition, collusion and conflict of interest are clearly of concern. There are those who support the argument that there can be benefits from having directors sitting on multiple boards. Harris and Shimizu (2004) argue that interlocking directors provide

benefits to the companies on whose boards they sit through their ability to make informed contributions, stating that their results "are consistent with the argument that (interlocked) directors absorb environmental uncertainty by providing information" Harris and Shimizu (2004, p.777). There are a number of other arguments both for and against director interlocks. Mizruchi (1996) in his widely cited review of research on interlocks summarises four general aims, covering both positive and negative outcomes: collusion; co-optation and monitoring; the provision of legitimacy to the reputation of firms; and the advancement of careers of the directors themselves. The small world theory originated through studies of the relationships between parties in a social network. These studies date back to the 1920's and 1930's with the work of Moreno (1934) on friendship patterns and the "southern woman study" of Davis *et al* (as cited by Newman, 2003).

Newman (through his interpretation of the theory) provided a mechanism to evaluate the interlocking director networks. He suggests measuring the elongation of the network (path lengths) and the density of connections (clustering). Within the context of a group of companies such as top 40 on a stock exchange and the director network that is formed, the density looks at the interconnectedness of those companies, how closely interconnected they are and the numbers of connections between them. A highly dense network would have many connections and large numbers of companies would be connected to each other. The elongation or path lengths would look at the number of steps one would count in moving from one end of the network to the other. The more interconnected the network, the more bunched up the connections are, and the lower the number of steps needed to move across the network, and hence the lower the average path lengths between companies.

The principles laid down in the work of Newman have since been used for the evaluation of networks in Singapore by Conyon & Muldoon (2006), Switzerland and The Netherlands by Heemskerk & Schnyder (2009), as well as France, Germany, Italy, the UK and US by Santella *et al* (2008).

Research Methodology

The review of prior work identified the small world model, that described by Newman (2003) and Jackson (2006), as an effective model to evaluate the interlocking directorships within a group of companies. The small world model has been used by researchers to map out the country networks of key stock exchange boards across the globe. Using the small world model therefore allows comparisons to be made between South Africa and other key country networks. Two key statistics of a small world are *average path length* (L) and *clustering* (C_{Δ}).

The data to be analysed is represented graphically as a bipartite graph and as unipartite projections (as shown in Figure 3.1.) The top half of the graph (network) shows the relationship between the corporate boards (1-4) and the company directors (A-K). The board projection removes the intermediate directors and just shows the inter-connectedness of the boards is presented on the projection bottom left. The board projection (bottom right) shows the interconnectedness of directors, and is the key projection considered within the small world model.

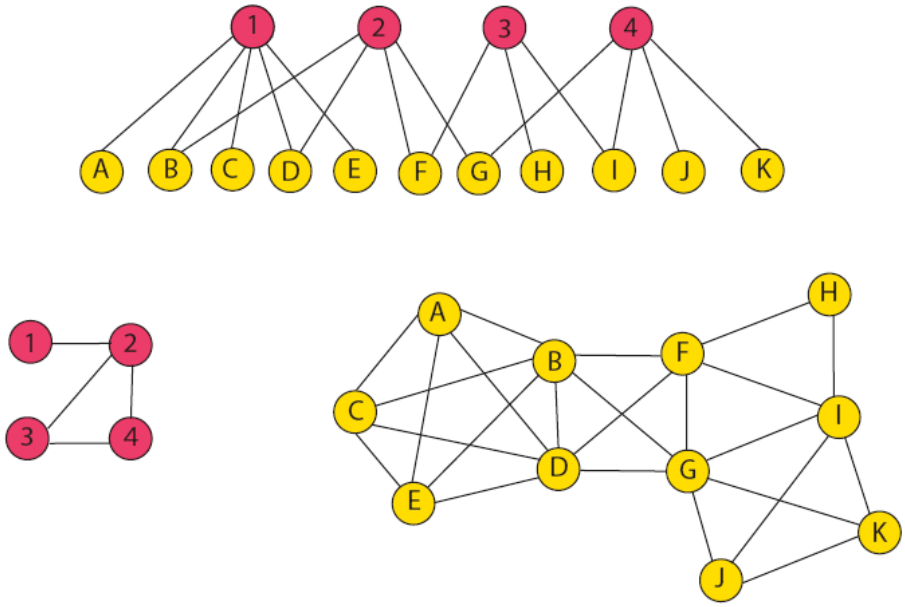


Figure 13 The Corporate Board Projections, Conyon & Muldoon (2006, p.3)

Data Collection Strategies

The population for this study comprises the companies listed on the Johannesburg Stock Exchange. The McGregors BFA directors' database was downloaded on 8 February 2009, the integrity of the information was immediately in doubt as no fields were present to identify the date of appointment and resignation of the directors. An attempt was made to use the CIPC database to validate the information but this lead to further discrepancies as directors were present with the same surname but differing initials and identity numbers (or had invalid or no identity number present). At this point a decision was taken to restrict the sample for purposes of this study to 40 companies to allow the data to be manually verified and corrected. The sample selected was therefore a purposive sample and random sampling of the entire population was not regarded as appropriate. The FTSE provide details of the current rand value market capitalization for the companies listed on the JSE (FTSE, 2009). The list obtained for the 04/03/2009

was obtained and sorted to select the top 40. In the data collection process approximately 281 sets of annual financial statements (latest available) were downloaded and examined. The final list contained the 40 companies and 1061 lines reflecting directors, alternate directors and group management committee members. The annual reports examined cover the period June 2004 to June 2010 for the entire sample, with annual reports in some cases having been examined from prior to 2000 (Netcare) and as recently as 2011. For the study to be comparable with that performed by Santella *et al* (2008), the date of data extraction for the comparison purposes would need to align with those used in Santella's study. Santella's ranged from 31 December 2007 (Italy) to 2 September 2008 (USA). The date of 1 October 2008 was selected as the cut-off date.

Results

The results are described in two sections, the general analysis and network analysis (performed using NodeXL, Ucinet and NetDraw).

Network Analysis

The 526 records from the sample were analysed using NodeXL and the key metrics were calculated as per the table below:

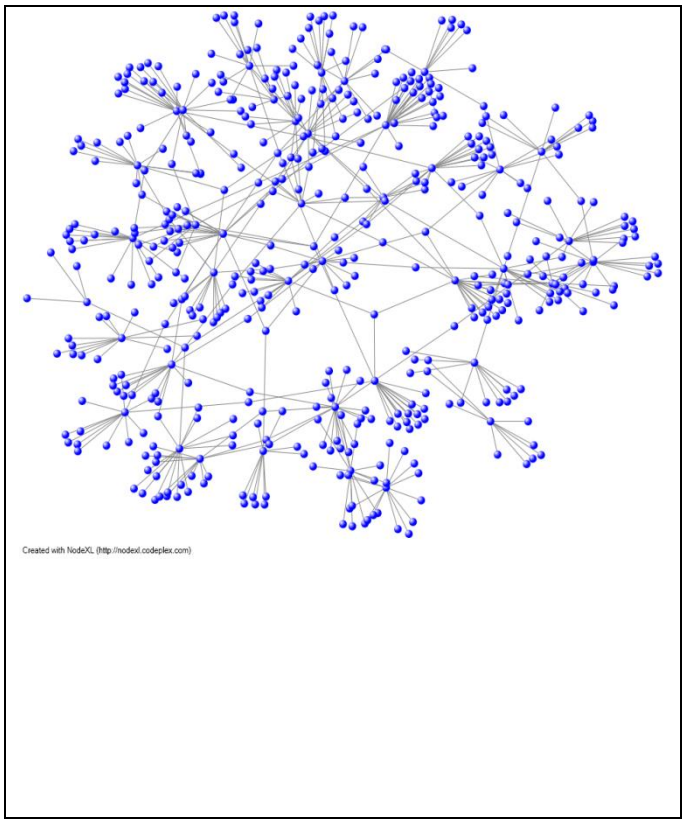
Metric	Value
Unique Edges	526
Vertices	498
Graph Density	0.0042504
Connected Components	7
Maximum Vertices in a Connected Component	396
Maximum Edges in a Connected Component	430

Maximum Geodesic Distance (Diameter)	12
Average Geodesic Distance	6.532589
NodeXL Version	1.0.1.196

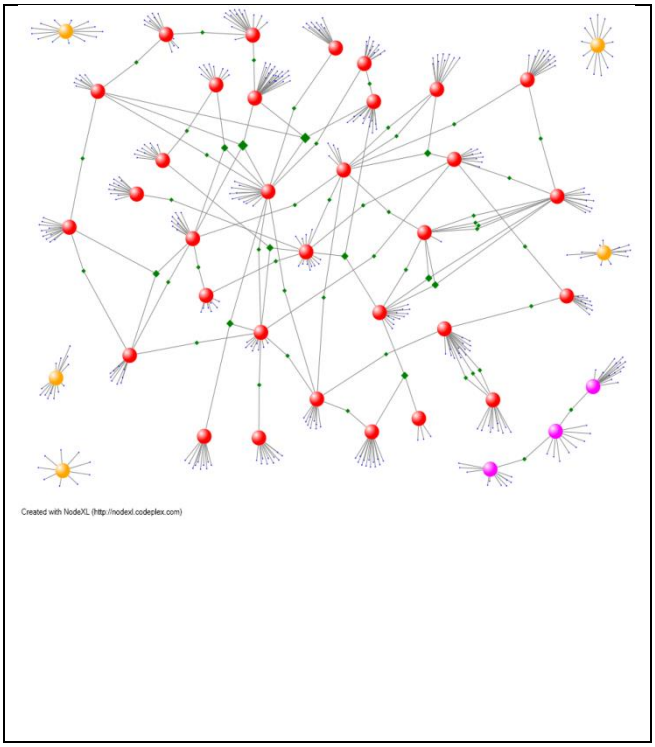
Table 14 NodeXL Key Graph Metrics

Graphical representation

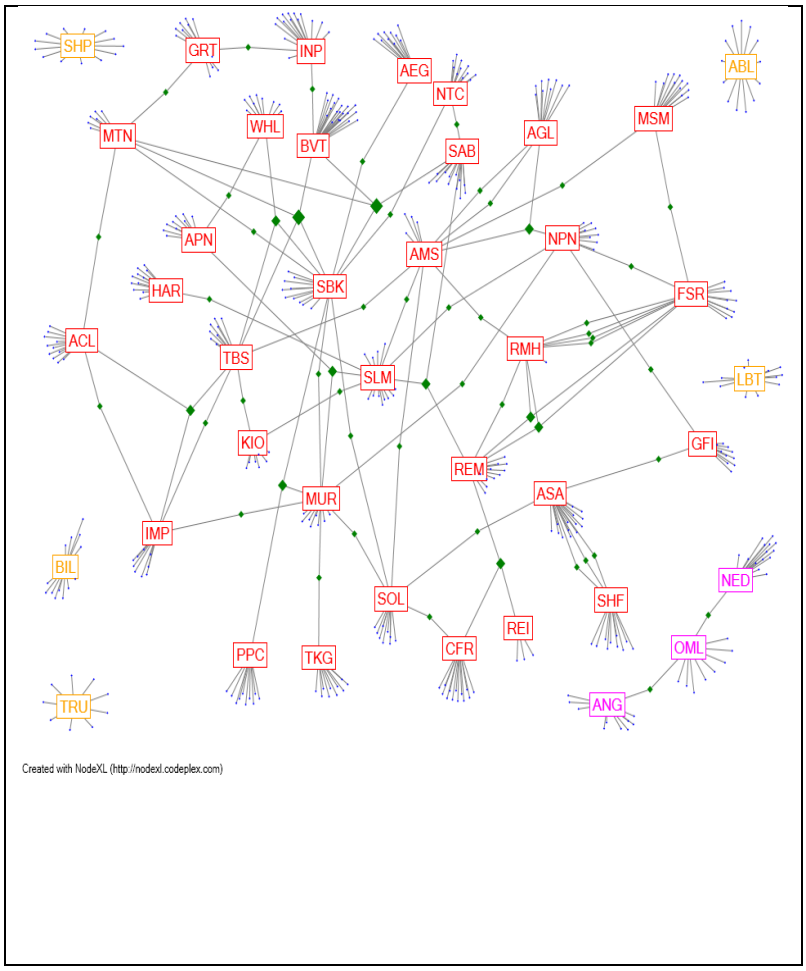
The Graph Layout type was set as "Fruchterman-Rheingold", in an undirected graph, with a Repulsion force of 3.0, and 50 iterations. This initial layout did not differentiate between directors and companies and the layout has many overlapping vertices and edges.



The vertex properties were set to differentiate between companies (spheres) and directors (diamonds). The primary segment was marked in red, secondary in pink and isolates as orange. The size of the director diamonds was increased based on number of directorates. A number of iterations of Fruchterman-Rheingold were executed to reduce overlap between the edges.



In the next representation the spheres previously reflecting the companies have been replaced with the JSE short codes for the companies in the sample. This provides a representation of the network in which the



companies are more easily identifiable.

Ucinet & NetDraw

The 531 records were transformed to create a company-to-director matrix and then again to create company-company and director-director matrices. Ucinet was used to calculate network density, Freeman degree and Normalised betweenness centrality. Using NetDraw, the number of directors shared between two companies was determined. The initial network was then drawn as presented below:

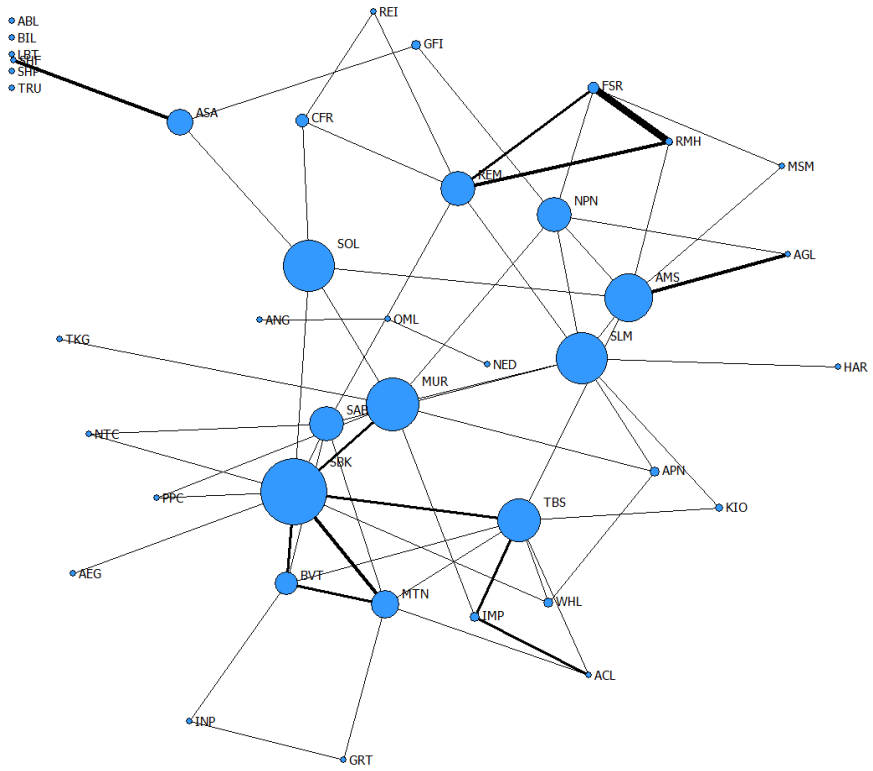


Figure 14 Initial South African Network

The final South African network was then available and used in The South African Companies' Network and Comparison between the six countries' Networks.

Bipartite Network (South African Directors and Companies)

The network diagram (**Figure 15**) reflects the bipartite relationships between the directors and companies selected for the sample and was generated using NodeXL. In the diagram the directors are reflected as diamonds, blue diamonds for directors who are members of the board of a single company, and green diamonds for those directors who sit on (and therefore connect to) the boards of multiple companies. The size of the diamond reflects the number of boards the director connects. The network has 526 unique edges (directorships) between 498 vertices (458 directors and 40 companies) as reflected in **Table 14 NodeXL Key Graph Metrics**. The South African network visibly displays the properties of a highly connected network. There are two connected components, one consisting of 32 companies (names indicated in red) and one of 3 companies (pink). The

remaining 5 companies (orange) are isolated from the two networks.

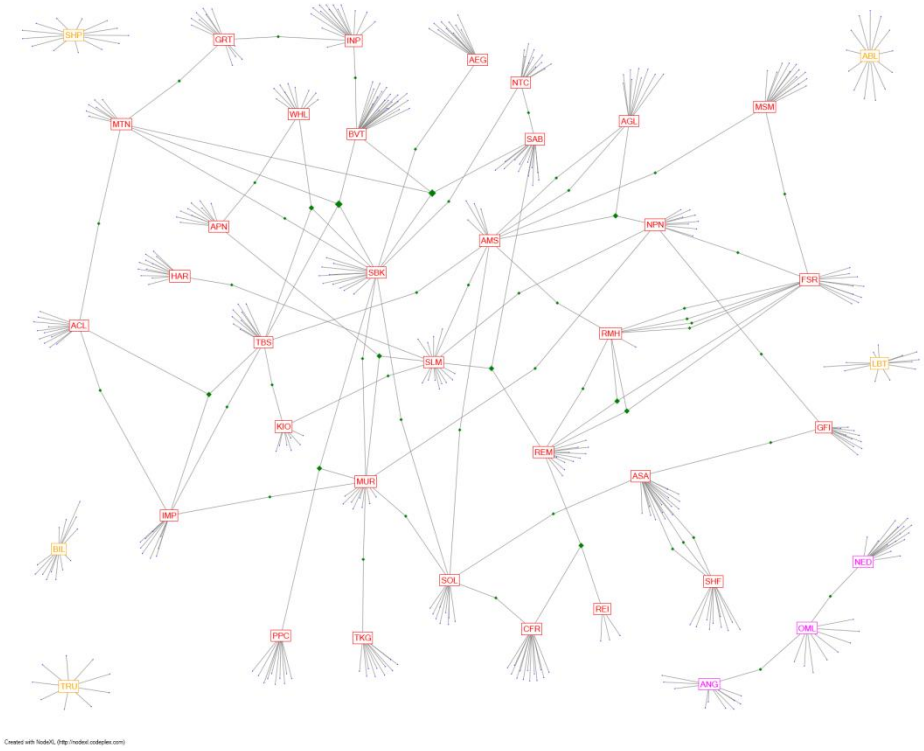


Figure 15 The Bipartite South African Network (Oct 2008)

The largest component contains 430 of the 536 edges comprising 82% and 364 (396-32) of 458 (498-40) director vertices, making up 79% of the directors in the sample. Clearly the majority of directors and directorships constitute the primary component of the network.

While the majority of the directors and directorships are included within the network, it is still one of relative low density (calculated as 0.004). This is immediately apparent as most organisations share just a single director with another although some share as many as 4 (RMH and FSR). There are two directors who hold the most directorships in the sample, Ramaphosa MC (Cyril) and Band DDB (Doug), clearly visible as the large diamonds towards the top centre of the network. These two directors jointly sit on the boards of Standard Bank (SBK), MTN Holdings (MTN) and Bidvest (BVT). Mr Band sits on Tiger

Brands (TBS) as his fourth directorship while Mr Ramaphosa sits on the board of SAB Miller (SAB). The primary component of the network has a fairly high number of redundant connections. There are three companies (AEG, HAR, TKG) which could be isolated from the primary component through the termination of a single directorship (either on the part of the affected company or the connected company). A further two companies (PPC, REI) have connections to two other companies, but, both of these connections occur through a single director. Termination of the directorship by the affected company would therefore sever the links to both of those companies and disconnect the company from the network. Termination of a single directorship by one of the other companies to which these are connected would not have the same affect. There are no directors (even those above) which when removed from the network would cause the network to splinter into multiple components. The key network statistics (of length and density) for the bipartite network are were calculated and presented in **Table 14 NodeXL Key Graph Metrics**. The maximum Geodesic Distance (Diameter) of the network is 12. At its widest point, it therefore takes 12 directorships to traverse from the outermost company across the network to the company furthest away. The average Geodesic Distance is reflected as 6.533, just over half of the maximum, aligning to the visible representation of a clustered rather than elongated network. As noted earlier, the network density is 0.004. Without comparative metrics this in itself is not a hugely useful metric.

Unipartite Company Network Projection

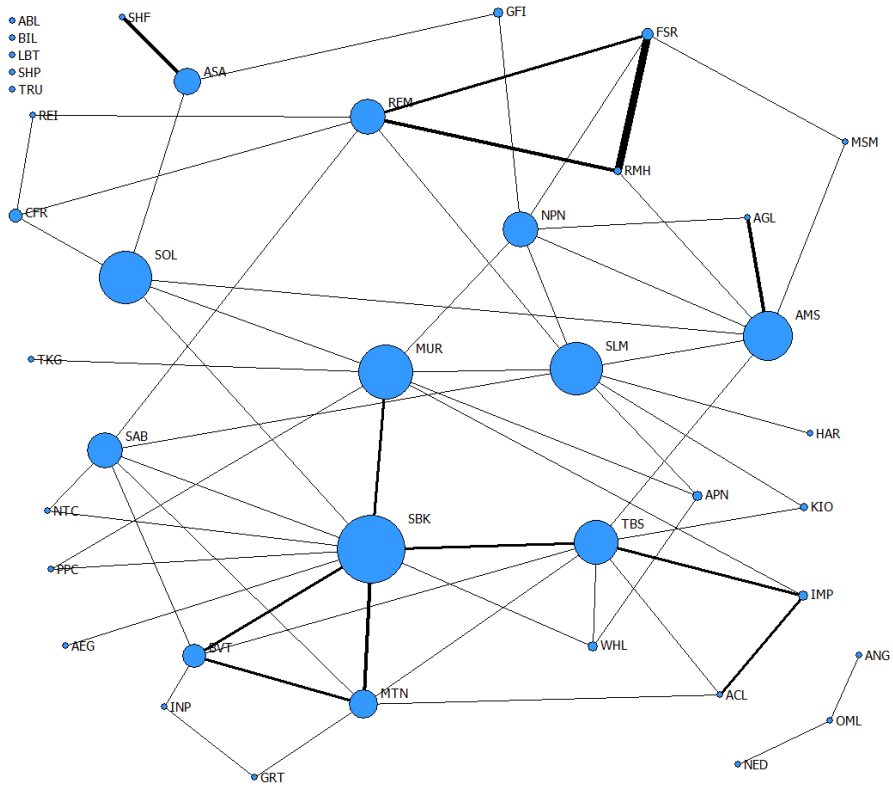


Figure 16 South African Companies' Network Unipartite Projection (Oct 2008)

The company network now shown in **Figure 16** is a unipartite projection after the matrix transformation, now shows directorships as the edges connecting the company vertices. The thickness of the edges represents the number of directors in common. For example, in the previous graph (**Figure 15**) it can be see that there are three directors in common between Steinhoff International Holdings (SHF) and Absa Group Limited (ASA). The edge between these two is in **Figure 16** is now clearly thicker than that of Anglo American (ANG) and Old Mutual (OML) which share only a single director. The RMB Holdings (RMH) to FirstRand Limited (FSR) connection (with 4 directors) clearly shows up as being the strongest connection. The clustered nature of the South African network is even more clearly visible in this representation. The three companies (TKG, HAR, AEG) connected through a single directorship (as discussed in section 0) are

clearly visible. What is much less clear from this representation is the tenuous nature of the connections of PPC and REI. In this representation they appear no different to the connections of GFI, KIO, NTC amongst others. The sizes of the company vertices in the graph are scaled relative to their normalised betweenness, calculated using Ucinet. The dominant role played by Standard Bank (SBK) in the network is clear, with supporting positions of Murray and Roberts (MUR), Sanlam (SLM) and Sasol (SOL). This hand-full of companies form the core of the South African JSE network and bind the network together. The number of directorships linking the companies is assessed through the Freeman degree. Looking at the top list immediately highlights some anomalies. Standard Bank being at the top of the list is not unexpected with links to ten other companies through fifteen directorships. The positions of RMB Holdings (RMH), Firstrand (FSR) and Murray and Roberts deserve special mention. RMH appears second on the top ten list with FSR appearing fourth and MUR appearing seventh. Of these, RMH and FSR are not amongst the most central in the network. These two companies both have ten directorships linking them to other companies, however, RMH is linked to just three companies and FSR to four. Both therefore have multiple directorships to the same companies. This is visible through the strong edge connecting them to each other, and to Remgro Limited (REM). Murray and Roberts on the other hand has nine directorships in common with other companies, connecting it to eight other companies. This moves it to second spot in the normalised betweenness ranking despite the relatively low number of directorships, and it plays a far more important role in the network then others with more directors. The Geodesic distances are key measures of the graph and the maximum and average distances were presented for the bipartite graph. For

the unipartite projection (companies) the interconnecting vertices (directors) have been removed and replaced with direct links. This therefore halves the distances between any two vertices in the projection. The maximum geodesic distance (diameter) of the company network is therefore 6 and the average geodesic distance is 3.226.

Director Relationships within the Network

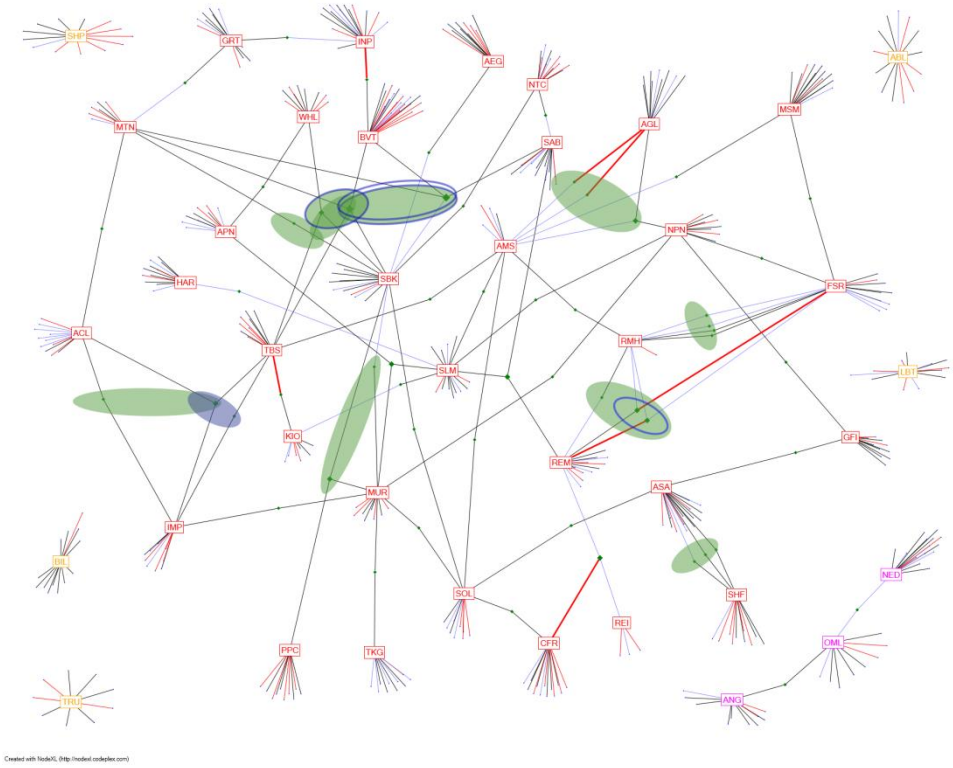


Figure 17. Relationships between Companies through Key Directors (Oct 2008)

The majority of executive directors are solely directors of a single organisation. There are a limited number of executive directors who also hold positions on the boards of other companies, these seven directors are executives of six companies (TBS, CFR, REM, FSR, AGL, INP) out of the forty covered in the sample. Anglo American PLC (AGL) is the only company to have two executives sit on the board of another company, with Cynthia Carrol and Rene Medori sitting on the

board of Anglo Platinum (AMS) as non-executive directors (not independent). First Rand Limited and Remgro Limited are the only companies to have an executive from each sitting on the board of the other, with PK Harris (CEO of FirstRand) sitting as an independent non-executive on the board of Remgro, and L Crouse, the Financial Director of Remgro sitting as an non-executive (not independent) on the FirstRand Board. The cross over nature of such a relationship does beg questions around the true independence of the directors concerned and how it is that one is considered independent while the other is not. Looking at the highlighted clusters of directors, each green shaded ellipse marks a cluster of directors who are in common between two companies. The blue shaded ellipse marks another cluster which shares a director with a previous cluster. The four directors in common between MTN and Standard Bank are highlighted using three green ellipses due to their positioning amongst a number of other relationships. In this area there are also three blue shaded ellipses identifying further relationships. The number of clusters around Standard Bank serves to reinforce just how important the handful of directors is within the network. Just four directors form key multiple director bonds with four companies, one third of the number of such bonds in the entire network. Standard Bank is involved in five of the twelve multiple director relationships in the network. Six FSR directors are involved in multi-director relationships, with all six sitting on the board of RMH. Only two of the six sit on a second board (REM). Contrast this to SBK where, as discussed earlier, four directors form more bonds. It is clear that the appointment of well-connected directors has a significant impact on the centrality of the company within the company network.

Comparison of South Africa to the Other 5 Countries

Santella, Drago and Pollo (2008) in their study they compared the company networks of the main listed companies of five key stock exchanges around the world. The United Kingdom (UK) network (middle left) is the most unusual of the six with its elongated shape consisting of three clear spokes emanating from a central cluster. The density of this network is visibly the lowest of the six and there are two weak points where removal of a single directorship would split the primary component producing a secondary component of either three (Rio-Tinto to Cadbury Schweppes) or six companies (Vodafone to Shell). The top right spoke is slightly more robust in requiring at least two directorships to be removed before it would splinter away from the primary component. Whether this could happen through the removal of a single director (holding multiple directorships) is unclear from the data provided, although is unlikely as only two directors hold three directorships.

The United States (US) network (bottom left) is a low density network more conventional in shape and not having the elongated spokes of the UK network. There are number of directorships which if removed would remove a single company from the network, but only one which when removed would create a secondary segment. The removal of the directorship between Walt Disney and Bank of America would leave Bank of America and CVS in a two company segment. The US network has five isolates and no secondary segment. At first glance the French (top right) and Italian (top left) networks look fairly similar in that they have a highly connected inner core with numerous (fifteen plus) multi-

director connections each (the heavy edges zig-zagging through the core of the networks) and some companies hanging off this core, with both also having a tail which could be disconnected to produce a two company isolate by severing a single directorship (present on the top left of each of the network graphs). A clear distinction between the two is present in the number of isolates, with France having only one compared to the eight of Italy. This would have a significant impact on the density calculation of the two networks, with Italy showing a 0.1039 versus that of 0.1551 for France (**Table 1 Country Networks: Descriptive Statistics**). The German network is visibly the most connected highest density network of those presented here. This is supported through the count of the number of intercompany directorship connections as reflected in **Table 2 Total Intercompany Links for each Country Network**. Germany has 112 links versus 108 for France and 84 for Italy.

The convention of showing multi-director links by virtue of thicker connecting edges is not followed for this country network as presented by Santella *et al* (2008) so no immediate comparison is available on that front.

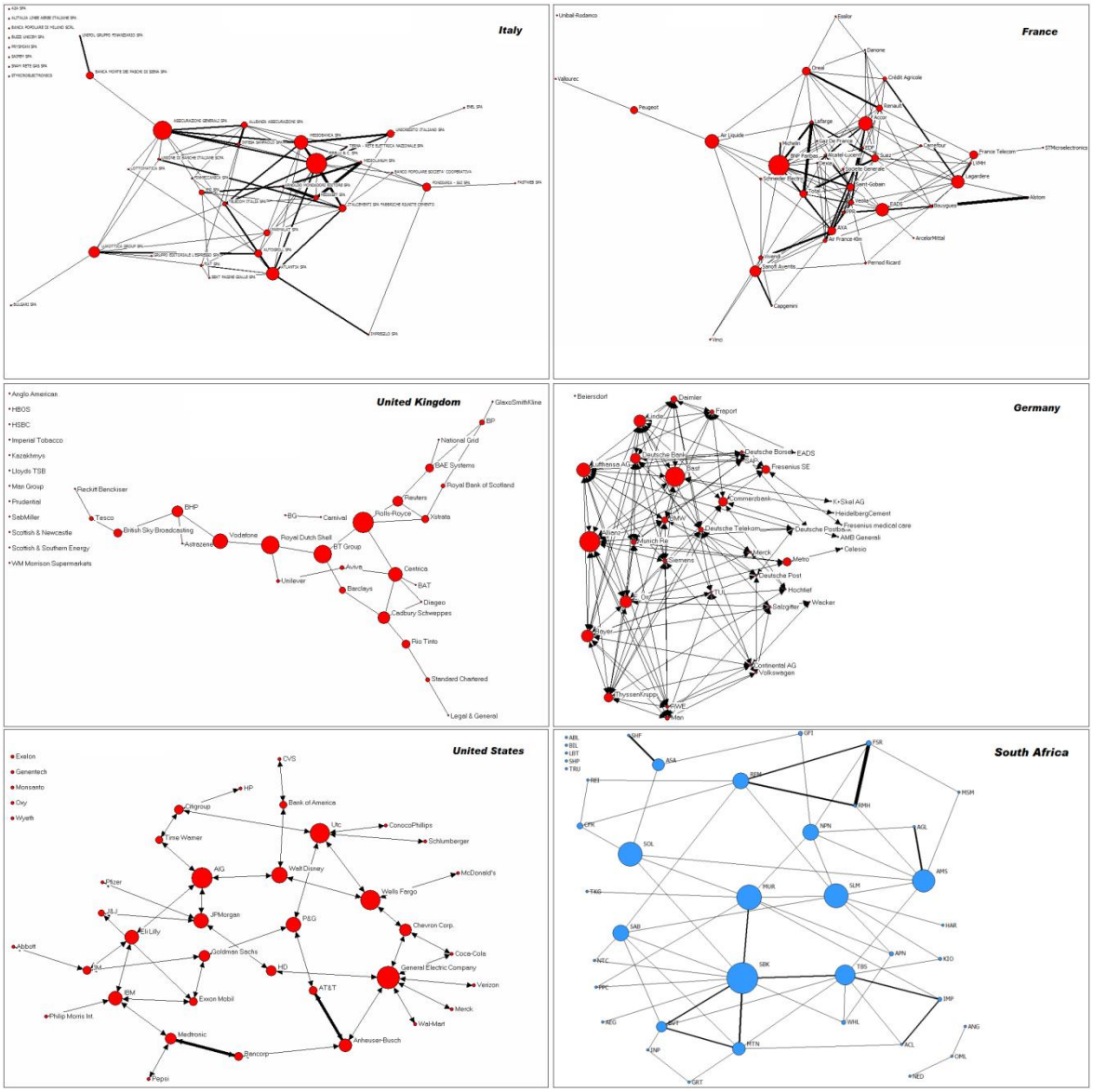


Figure 18. Graphical Comparison of the Six Countries' Networks

Having explored the five comparative networks and reflecting on the earlier discussion around the South African network, it can be concluded that the South African network is clearly denser than those of the UK and USA, while not being as strongly connected as those of France and Germany. In the measure of isolates, South Africa is similar to the USA with five, far fewer than Italy and the UK. The South African network is the only other than the UK to have a secondary segment. This comprises three companies, Nedbank, Old Mutual and Anglogold Ashanti.

The network clearly has fewer multi-directorship connections than Italy and France. By virtue of comparisons, the South African network falls in the middle, not in the same camp as the sparsely connected UK and USA networks, while not being nearly as densely connected as France or Germany. It is closer to the UK in some measures than Italy, while being farther away in others. The quantitative metrics of the six networks are presented in Table 1 Country Networks: Descriptive Statistics below. The statistics for all countries (except South Africa) were extracted or calculated from Table 1 and Table 2 of Santella's paper (2008, p.10).

A	***B***	***C***	***D***	***E***	***F***	***G***	***H***	***I***	***J***
Country	***Companies***	***Network Components***	***Companies in 1st component***	***Isolates***	***Network density***	***Dir's***	***D'ships***	***D'ships / Company***	***D'ships / Dir***
Italy	40	9	31	8	0.1039	491	575	14.375	1.171
France	40	2	39	1	0.1551	487	595	14.875	1.222
UK	40	14	26	12	0.0410	485	515	12.875	1.062
Germany	39	2	38	1	0.1984	795	908	23.282	1.142
USA	40	6	35	6	0.0564	489	532	13.300	1.088
RSA	40	7	32	5	0.1064	458	526	13.150	1.148

Table 1 Country Networks: Descriptive Statistics

These numbers are inter-related in that the smaller than size of the 1st component, the higher number of isolated components and the more overall network components will be presented. We see this clearly with the UK having only 26 companies connected in the first component (the smallest of the sample), 12 isolated companies (the most) and the largest number of network components, 14. Germany on the other extreme has just two network components, one made up of

38 companies (the largest component in all of the networks) and just one isolated company. Italy has the second smallest 1st component, and correspondingly the 2nd largest number of isolates. The earlier discussion showed that Italy (with South Africa) fell in the middle two of the six networks, so there is therefore not a direct relationship that can be inferred between the size of the 1st component and the connected nature or density of the network. Column F, the network density, again has the companies in order with the UK, US, Italy, South Africa, France and Germany. It is noticeable that the UK and US are fairly similar in network densities with values of 0.041 and 0.056 respectively. Italy and South Africa are even closer together with values of 0.104 and 0.106 respectively. France comes in 50% higher at 0.155 and Germany trails with 0.198. These values cover a wide range and clearly show the extremes in connectedness of company networks. The number of directors (G) and directorships (H) in the network are compared, along with the average number of directors per company (I), and directorships per director (J). Germany has the highest number of directors, 795, holding 908 directorships (1.14 each), and correspondingly, the highest number of directors per company, 23.28. France's directors hold the highest number of directorships per director with an average of 1.22.South Africa has the lowest number of directors, 458, holding 526 directorships (1.14 each) at an average of 13.15 directors per company (second only to the UK). The UK has 27 more directors than South Africa in 485, but they hold only 515 directorships (the lowest) at the lowest average of 1.06. The USA is the second lowest number of directorships per director at 1.088. The UK also has the lowest number of directorships per company at 12.875. The low number of directorships per director is clearly visible for the UK and the US, with neither having any directors holding more

than three positions, and both only having two directors holding three. France has one director holding six positions, and another five holding four. Italy has one with five and four with four. Germany is better than both of these, with none over four and six holding four positions. South Africa while not having as few multi directorships directors as the UK and US is better than France, Germany and Italy. South Africa has only two directors with four positions. The cumulative frequencies are presented graphically in **Figure 19 Number of Directorships per Director by Country** below. It is important to note that the graph Y axis has the range 80% to 100% in order to allow the reader to more easily see the difference between the countries. It must be noted that even the country with the lowest number of single company directors (France) has 84.8% of directors holding only a single directorship. The UK with the highest has 94.2%. The similarity in patterns between the UK and US are clearly visible, with South Africa and Germany also looking similar.

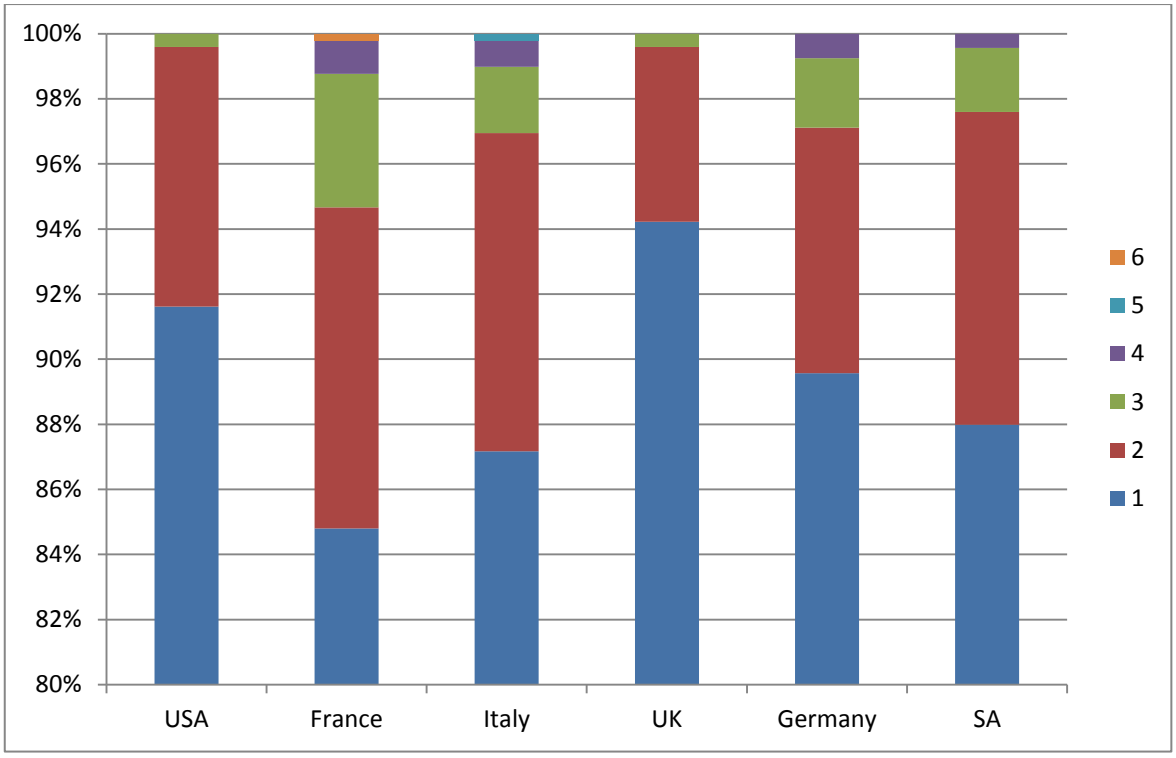


Figure 19 Number of Directorships per Director by Country

An alternate way to view the multi directorship directors (and hence the links between companies), providing focus on the totals rather than relative positions, is to calculate the total number of links between companies. This has been done by using Directorships (#) subtract one multiplied by the frequency of directors (Dir.) for each level within a country and adding up the results. The results per country are presented in the table below:

#	*Country*	*Intercompany Links*	*#*	*Country*	*Intercompany Links*
1	UK	30	4	Italy	84
2	USA	43	5	France	108
3	SA	68	6	Germany	112

Table 2 Total Intercompany Links for each Country Network

Summary

One of the primary purposes of this paper was to contribute to the research on director interlocks on the South African director network and provide comparable data to the work performed by Santella *et al* (2008). The authors first calculated the comparable South African metrics, then considered the country network before proceeding to integrate the South African information into the country networks comparison performed by Santella *et al* (2008). This comparison was performed according to Freeman Degree (local centrality), and Betweenness (measure of whether a company has a central or peripheral position).In Santella's conclusion the authors suggest that there are two models, firstly that made up of France, Italy and Germany with their high number of companies linked to each other through a small number of well-connected directors serving on multiple boards; and secondly, the UK, with a smaller number of companies connected in a far less redundant manner by directors tending to have no more than two board positions. Santella *et al* (2008) goes on to suggest that the US provides a third model, having a high number of connected companies (as do Germany, France, and Italy) but having connections through directors with just two board positions (as with the UK). The South Africa network was shown to be similar to the Italian one in some respects (network density, layout, number of strong links between companies) however it was also shown to be closer to the UK and US networks in other respects (number of links between network nodes). The introduction of South Africa into the comparative group suggest that rather than just the two extremes of the UK vs Germany, that there is a continuum currently reflected as the UK, US, South Africa, Italy, France and Germany. In considering the matter

of whether there are signals of whether the South African network is susceptible to systemic collusion, the patterns are certainly closer to those of Germany, France and Italy, and although the density is far lower than that of Germany and France, it still falls within the region of Italy and is far higher than the UK and US. While the number of links is far lower than Italy it is still higher than the US and UK. While on the continuum South Africa is in-between the camps, the presence of a handful of directors with more than two directorships suggests systemic collusion is possible.

Recommendations and Conclusions

The comparative information allowed the South African company network to be compared to those of the UK, US, Italy, France and Germany. In so doing the authors sought to provide a deeper understanding of the nature of patterns of the South African network by allowing it to be benchmarked and not simply providing the South African network in isolation. The research provides a clear view on the networked structure connecting companies within the JSE. While there has long been anecdotal talk of clubs, "old boys" networks and cross director relationships within the boards, there has been little to substantively support this position. The bipartite company/director network projections as well as the unipartite company network projections clearly show the network that connects 32 of the top 40 companies, and while one can debate the cause of network, one can no longer argue about its existence. The low density of the UK and US networks suggests the connections in these networks are more likely to be beneficial through provision of information rather than providing control, while the high density networks present in France and Germany suggest they provide

influence and control. The South African network falls in-between and has a handful of powerful companies and directors, as well as sections of the network in which high levels of control are present. Taking this into account, it is possible to evaluate the resignation / retirement of directors and the appointment of their replacements to see the impact on the overall network and infer the underlying reasons for the appointment. The key statistics examined for the South African network for the period 2004-2010 give insight into the shifting patterns of directorships and connections within the network.

Recommendations for Future Studies

There is scope to consider international links formed by directors sitting on the boards of companies across the globe. The directors of many of the top companies, particularly the multinationals, are foreign nationals. For example, on the main board of directors of Compagnie Financière Richemont SA, a diverse range of nationalities are represented. In limiting the research to the interlocks of the largest 40 South African companies the complete picture of global interlocks is not uncovered. Comparisons of the situations across the largest stock exchanges still will not produce the complete picture as links between the country exchanges will not be visible. Such a complete global analysis can only be done through integrating the datasets of all of these stock exchanges and running the model again. This would be a mammoth task given the numbers of companies and directors spread across the stock exchanges of the world; however, it could reveal networks, connections and patterns of control not previously considered. It would not be unexpected to find that the largest networks of each of the exchanges are

linked, creating one large mega-network of influence and control across the globe. This may seem a little far-fetched and bordering on a grand conspiracy theory, however, taking a look at the Compagnie Financière Richemont SA annual report for 2008 and examining the director profiles for details of other boards on which the directors sit reveals some clues as to what may exist.. The research set out to answer one key question, as expressed in the hypotheses.. Through detailed mining of this dataset the question implied in the hypotheses have been answered. The hypothesis with summarised conclusions is presented as follows:

Hypothesis 1: The interlocking director network of the JSE top 40 companies compares more closely to that of the UK than that of Germany in terms of network density and average path lengths. This could not be conclusively stated. The South African network (as at 1 October 2008) is not as dense as the German network, although it is denser than UK network and reflects a different pattern.

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