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The rise of professional asset management: The UK investment trust network before World War I

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ABSTRACT

This article analyses the network of UK closed-end investment trust companies, the early pioneers of diversification before World War I, compiling data from different original sources with regard to their directors' backgrounds and their characteristics as listed companies. Our results reveal that the majority of these early asset managers were merchants, bankers, lawyers, or accountants. The structure of the network is centralised around a few firms with high board sizes and a few directors with many interlocking directorships within the sector. This is a purely structural effect and cannot be explained by individual firm or director characteristics. Our results also show that investment trusts could not be grouped according to their performance. This means that interlocking directorships were equally possible between good and weak performing investment trusts, suggesting that successful asset management was due to team work and was an outcome of collective decision making at board level.

KEYWORDS

Investment trusts; asset managers; social network analysis; bipartite networks

JEL CLASSIFICATIONS

N23; N83; G23

1. Introduction

London was the undisputable world financial centre before WWI (Hannah, 2007; Michie, 1987; Morgan & Thomas, 1962; Powell, 1915). The London Stock Exchange along with the various UK regional stock exchanges and the over-the-counter unofficial markets strengthened Britain's financial system, by making the assets traded on these exchanges both accessible and liquid. Enjoying the advantages of the gold standard as mitigation of foreign exchange risk, the British stock exchanges formed a genuine global market with significant numbers of non-domestic investors and of non-domestic security listings. It was during this period that the UK investment trust industry was established to offer small investors a low-cost financial vehicle for diversifying risk without having to sacrifice return (Corner & Burton, 1968; Glasgow, 1935; Rutterford, 2009; Scratchley, 1875). Formed as trusts from their initial appearance in the late 1860s, by 1880s the majority of UK investment trusts had acquired the limited liability company form. They issued a fixed number of shares and of fixed-income securities which were traded on the London and other stock exchanges. Such trusts generally

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employed a global diversification strategy and promoted the principles of diversification to the public, later labelling this approach as the 'scientific distribution of risk' (Glasgow, 1930, 1935; Powell, 1915). The directors of these early investment trusts were, in fact, the first professional asset managers.

Early studies of UK investment trusts before the 1930s have attempted to explain the basic principles of professional asset management as making individual investors more comfortable with the principle of diversification (The Economist 1934; Glasgow, 1930, 1932, 1935; Powell, 1915; Robinson, 1923, 1930; Scratchley, 1875; Wright, 1924). More recent studies of the development of investment trusts have put forward a comparative perspective between the UK and the US investment trust sectors (Corner & Burton, 1968; Hutson, 2005; Rutterford, 2009). There are also some case studies focusing on particular investment trusts or influential directors (Michie, 1983; Chambers & Esteves, 2014; McKendrick & Newlands, 1999; Morecroft, 2017; Mann, 2012). However, there has been no research to date on the interconnectedness between the managers and the companies of this sector. This study fills this gap. It looks at the social background of the first professional asset managers and the interdependence of investment trust companies and their directors, applying the approach of bipartite network analysis. It investigates UK investment trusts in their infancy and tries to understand the structural characteristics of the rise of professional asset management taking into consideration its inherent relations and interconnections.

There has been a considerable number of network analysis studies in business history, mostly in the form of studies of interlocking directorships. This literature can be generally grouped into two streams. On the one hand, we find studies that investigate the interlocking directorships between the largest public firms in different sectors of the economy. The majority of these studies are focused on the US corporate sector in the early twentieth century, when (according to the standard interpretation) the so-called industrial monopolies became the predominant business form (for instance, Dooley, 1969; Bunting & Barbour, 1971; Roy & Bonacich, 1988). Another group of studies investigates the particular interlocking connections between the directors of the largest banking and other industrial companies, usually in the context of the debates as to which type of financial system – the market-based (Anglo-American style finance) or the bank-based (German style finance) – was better for economic growth (see Cassis, 1985; Fohlin, 1999; Whitley, 1974).

This study differs from the above literature in two ways. First, it analyses the firm-director network ties of a particular sector of the UK economy before WWI. It utilises recent developments in statistical modelling of social networks, the so-called Exponential Random Graph Models (ERGMs) that have become the standard tool in social network analysis but have not yet been used in business history research.[1] Second, this study approaches the investment trust sector as an affiliation network, which is essentially a bipartite or two-mode network preserving the dualistic structure of company-director relations and representing the network as ties between a set of individuals (directors) and a set of organisations (investment trusts).

The outline of the article is as follows. Section two offers some background on the formation of UK investment trusts. Section three describes the data and the methodology of this study. Section four looks at the social background of the investment trust directors and their connections with other sectors and professions. Sections five and six present the

empirical analysis with regard to network characteristics. Section seven summarises the main conclusions.

2. The 'average' investment trusts

The declared purpose of British investment trusts before WWI was to channel the savings of their beneficiaries into a diversified portfolio of stock exchange securities. In the UK, the early investment trusts were legal trusts, with investors being beneficiaries and trustees managing the investments on behalf of the beneficiaries. There were problems with this structure when falling yields meant that those whose certificates were redeemed benefitted at the expense of those remaining in the trust. Trustees were also liable to be taken to court by disgruntled certificate holders. By the mid 1880s, most investment trusts had converted themselves into investment trust companies with directors rather than trustees.[2] The early trust form involved a legal agreement between the investors, as beneficiaries, and trustees with the investment objectives and constraints embodied in a trust deed. Early trusts were thus governed by trust law and the beneficiaries were the unit or certificate holders. As a matter of fact, the first 'genuine' UK investment trust, the Foreign and Colonial Government Trust, for example, formed in 1868, was initially a trust issuing participating certificates but converted to corporate status in 1879. While trusts were run by manager-trustees under a trust deed, investment trust companies were subject to the provisions of the appropriate Companies Acts operating under the limited liability structure. Their beneficiaries were the preference and ordinary shareholders.

Newly formed investment trusts were well received by financial writers, advisers, and journalists from the very beginning (see for instance, Scratchley, 1875, pp. 3–7). The mission of trusts to democratise investment was particularly welcomed making available the anticipated benefits from sophisticated asset management techniques to small individual investors, not just to 'large capitalists' who had the means, in theory at least, to manage their own portfolios using diversification as a risk reduction tool. As summarised by Powell (1915, p. 475), investment trusts 'sought to aggregate the funds of people who were too nervous or too inexperienced to invest their own money', enabling thus 'this class of moneyed individual to secure financial benefits which had otherwise been out of his reach'.[3] This was the standard explanation of the role of investment trusts in the press but also in their numerous prospectuses. Investment trusts secured capital from the sale of certificates initially, and later shares, in return offering expert risk management services to individual investors. Whereas the manager trustees of the legal trusts were usually limited to investing in the securities listed in their trust deeds, the boards of investment trusts typically enjoyed great freedom of investment. Since the majority of investment trusts were either wound up or converted into investment trust companies by the early 1880s, this study is solely focused on investment trust companies, which we call investment trusts in the remainder of the article.[4]

While investment trusts only represented a small part of the total UK stock exchange capitalisation in terms of nominal paid-up capital (English investment trusts were listed on the LSE but the majority of Scottish investment trusts were listed on the Scottish stock exchanges[5]), they were important companies that initiated certain key developments in the financial sector. Investment trusts established the strategy of international portfolio diversification. Asset management became a profession and portfolio selection acquired the

status of a 'scientific' and sophisticated activity. By 1906, this was called the geographical distribution of risk (Lowenfeld, 1907; Sotiropoulos & Rutterford, 2018). As Glasgow wrote in 1930, 'the central attraction of the trust company stocks is that they represent the nearest approach to *investment as a scientific business*.[…] In that principle is combined the *scientific distribution of risks* with the scientific extraction of whatever benefits there may be […] in financial, economic and industrial activity throughout the world' (Glasgow, 1930, p. 3).[6] 'Scientific' international diversification was thus the quintessence of investment trust portfolio strategy and their risk was the 'average' risk of the underlying portfolio. Indeed, the initial success of the Foreign and Colonial Government Trust's diversification strategy of investing in twenty different international fixed-income securities led to a rash of imitations of what became known as 'average' investment trusts – 'averaging' risk through diversification (Glasgow, 1935; Scratchley, 1875).

However, not all investment trusts pursued an 'averaging' diversification strategy. There were generally three different categories of investment trusts (Robinson, 1930, p. 288; Rutterford, 2009, pp. 162–163). The first category included companies that limited themselves to a particular market sector, forgoing broader 'averaging' of risk strategies. Holding and operating companies of this kind proved very active before WWI in the economic development of particular non-domestic sectors (such as tea, tin, and other mineral products, rubber, and wool, railways, public utilities, and shipping). The second category of investment trusts included essentially finance companies which, while they had a wider range of interests than the first category, made no attempt to diversify risk by averaging. These financial trust companies sometimes invested in non-stock-exchange assets (such as mortgages), or acted as traders and dealers by earning fees from company promotions and underwriting commissions. The late 1880s saw a boom in new share issues of investment trust companies belonging to the first two categories. It is only the third category that includes the so-called 'average' investment trusts, which applied the geographic distribution of risk approach to their investment portfolios. At the time, however, investors were not always able to tell the difference between the three categories, as not all investment trusts disclosed their list of holdings or offered enough information about their activities (Glasgow, 1935; McKendrick & Newlands, 1999). Some, though, suggested their investment strategy by their name.

This study is focused on the average investment trusts as described by category three. In the following analysis we use the term 'investment trust' for the companies in this category and apply the term 'financial trust' to trust companies belonging to the first two categories.

3. Data and methodology

This article is based on the complete sample of English and Scottish average investment trusts as provided by the three studies made by George Glasgow: one in 1930 on English investment trusts (Glasgow, 1930), one in 1932 on Scottish investment trusts (Glasgow, 1932), and one updated and revised study in 1935 of both English and Scottish investment trusts (Glasgow, 1935). Glasgow's studies offer important insights into the workings of the investment trust industry, carefully distinguishing investment trusts from financial trusts that pursued a different investment strategy.[7] These studies attracted considerable attention at the time and without them it would now be impossible to accurately map the investment trust sector in the late 19th and early 20th centuries. Not only did Glasgow offer a detailed list

of investment trusts for every year after their initial incorporation, but he also carefully inspected their (disclosed or not) portfolio holdings and annual accounts, indicating on which particular date, say, a financial trust converted into an 'average' trust. Appendix 1 gives a complete list of the 52 English and 24 Scottish averaging trusts registered and acting as investment trusts by 1911.

We have chosen the dates of our sample as 1891, 1901, and 1911 to match with UK census years. Census data is currently only available up to 1911.[8] Discussing company-director networks on these particular dates allows us to use census data to acquire information on the social background of directors in our sample. We additionally used the *Directory of Directors*, available from 1880 onwards, to identify all the directorships held by the investment trust directors in our dataset. The *Directory of Directors* allows us to estimate the number of interlocking directorships both internal and external to our investment trust network. Although not a perfect measure of business participation (private companies and partnerships are excluded), the *Directory of Directors* is arguably the best available source for interlocking directorships including large British businesses such as railways, banks, insurance companies, and the largest industrial concerns (Rubinstein, 2006, p. 220).

Finally, from the *Stock Exchange Yearbook* and several annual reports that exist in Guildhall Library we were able to identify and collect information for most of the registered firms functioning as investment trusts (most of the data series offered by Glasgow do not run before WWI). We used the *Stock Exchange Yearbook* to collect additional information (not provided by Glasgow's studies) about the names of directors along with a series of corporate performance and governance variables (for the complete definition of these variables see Table 2 in the Appendix). Table 1 shows the number of English and Scottish public investment trusts in our sample along with their capitalisation in nominal terms and the total number of directors and directorships.

Our study approaches the investment trust sector as an affiliation network, which is essentially a bipartite or two-mode network between existing companies and their directors (see, for instance, Harrigan & Bond, 2013; Wang, Sharpe, Robins, & Pattison, 2009). A bipartite network produces a graph of network ties on the basis of existing interlocking directorships. These ties are usually called formal ties in the literature because they indicate formal connections between the directors and the corresponding firms. The bipartite network analysis reveals important inherent connections between the participants of the network, and allows us to examine the characteristics of the company-director network in the investment trust sector. Figure 1 illustrates the bipartite network structure of investment trusts in 1891, 1901, and 1911.[9] Two one-mode network projections can be derived from a bipartite network: a director-only network, which defines ties between directors in the same firm, and a company-only network, which can be constructed in a similar way specifying ties between firms that share one or more directors on their boards. The majority of research with regard to interlocking directorships uses one mode networks as a starting point of analysis, which leads to significant information being lost. For instance, the one-mode network connects firms in an undifferentiated way regardless of the number of shared directorships and important information is thus lost about both the numbers and the properties of the shared directorships. At the same time, in deriving a one-mode network from a bipartite one, there are dependencies among ties that require particular statistical treatment. Recent advances in social network theory allow a sophisticated statistical analysis of bipartite networks (see Harrigan & Bond, 2013; Wang et al., 2009).

Table 1. Investment trust companies in our sample.

	Investment trust companies					
	English	Scottish	Total	Directorships	Directors	Average size (million £)
1880	5	4	9	62	46	0.837
1881	5	4	9	63	47	0.928
1882	6	4	10	65	48	1.184
1883	7	4	11	75	45	1.162
1884	7	4	11	75	44	1.209
1885	8	4	12	85	53	1.118
1886	8	4	12	84	54	1.219
1887	10	5	15	114	71	1.058
1888	16	5	21	146	96	1.087
1889	30	9	39	283	183	1.143
1890	37	9	46	324	204	1.092
1891	37	10	47	327	207	1.185
1892	37	10	47	320	203	1.201
1893	39	10	49	315	200	1.186
1894	39	10	49	293	195	1.114
1895	40	10	50	304	203	1.115
1896	40	11	51	313	205	1.108
1897	40	11	51	314	206	1.125
1898	40	11	51	299	196	1.101
1899	40	12	52	297	191	1.081
1900	41	12	53	299	194	1.082
1901	43	12	55	306	195	1.056
1902	43	13	56	313	197	1.057
1903	43	13	56	310	200	1.069
1904	42	14	56	305	197	1.071
1905	44	13	57	310	197	1.083
1906	44	14	58	312	196	1.092
1907	46	14	60	320	216	1.107
1908	46	16	62	328	208	1.106
1909	46	18	64	342	220	1.102
1910	47	19	66	348	221	1.144
1911	49	24	73	388	232	1.135
1912	50	24	74	397	240	1.169
1913	52	28	80	421	247	1.169

Sources: Stock Exchange Official Intelligence, Stock Exchange Yearbook, and our dataset.
Note: As we can see in Table 1 of the Appendix, there were three private English investment trust companies for which we were not able to find information and are thus excluded from our analysis.

Table 2. The principal occupations of investment trust directors (% of total).

Occupation	1891	1901	1911
Merchant	27.9	15.7	14.1
Banker/Stock-broker	22.1	22.0	21.2
Barrister/solicitor/lawyer	13.1	12.6	11.5
Civil servant	8.2	11.0	2.6
Accountant	5.7	9.4	9.6
Director	4.9	8.7	15.4
Industrial	4.9	0.8	2.6
Land owner/aristocrat	4.1	7.1	2.6
Army	3.3	4.7	3.2
Professional	2.5	1.6	5.8
Agent	1.6	0	1.3
Ship owner	1.6	3.1	3.8
Other	0	3.1	6.4
Total (%)	100.0	100.0	100.0
Number of identified directors	122	127	156
Total number of directors	213	203	234

Sources: English Census archives in 1891, 1901, and 1911.

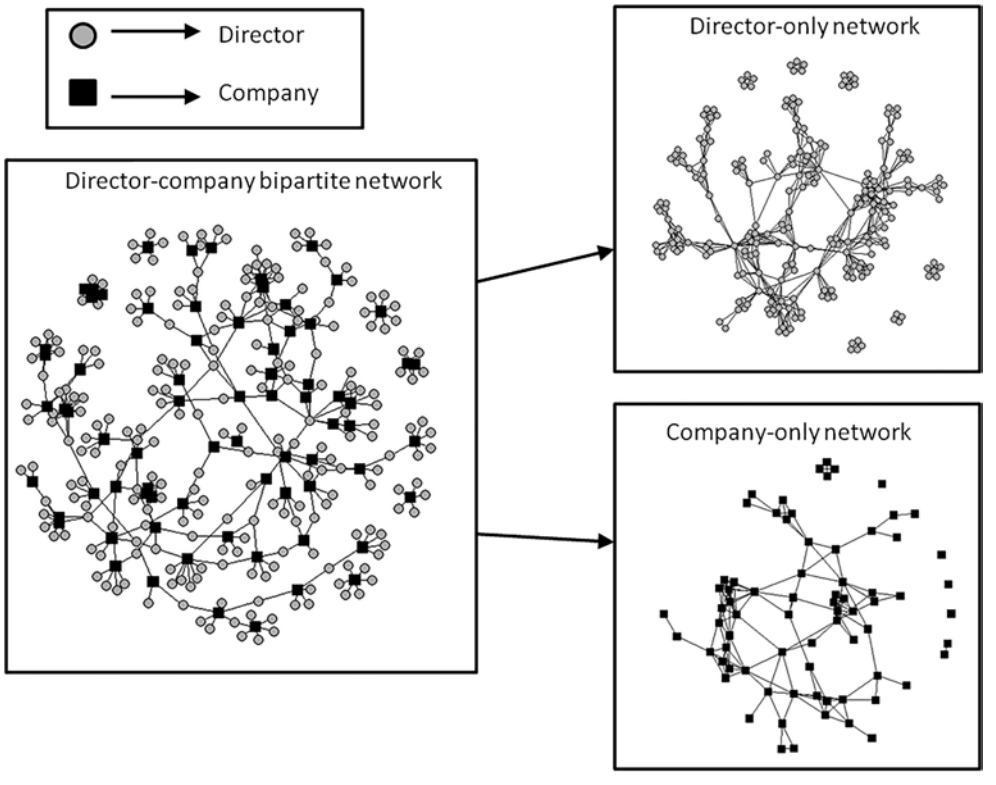

Figure 1. The bipartite affiliation network between directors and investment trust companies and its two one-mode projections: the director-only network and the company-only network. 'This is the investment trust network in 1911, including 73 investment trusts and 232 directors. Notes: All calculations and visualisations of this study are based in the following R packages: *ggplot2*, *network*, and *ergm*.

4. Social background of investment trust directors and affiliation with other sectors

Table 2 above shows the primary occupation of investment trust directors in the three census years 1891, 1901, and 1911. The table reports the share of principal occupations for the directors that we managed to identify from the English census lists. However, a significant part remains unspecified, from 35% to 43%, mostly comprising Scottish directors.

As Table 2 shows, merchants dominated investment trust boards in 1891. Their share declined in 1901 and 1911, but they still remained an important professional group, along with people from financial (banker/stockbroker) and legal (barrister/solicitor/lawyer) backgrounds. Accountants also increased their share, which reached 9.6% in 1911, while civil servants comprised about 10% of directors in 1891 and 1901. A few case studies verify the findings of Table 2 (see Gilbert, 1939; McKendrick & Newlands, 1999; Michie, 1983; Mann, 2012). For instance, in his analysis of the British Assets Trust – a Scottish investment trust which was formed in 1897 – Michie argued that key professionals for the establishment of investment trusts were people mostly from legal and accountancy backgrounds who were 'actively involved in seeking out investment opportunities, which they could develop with

their expertise and contacts' (Michie, 1983, p. 130). Early investment trust directors came from professions with 'considerable experience in both forming and managing new financial companies, as well as valuable contacts and investment expertise' (ibid.).

The structure of investment trust boards of directors has some resemblance to the boards of the (largest) English joint stock banks during the same period (1890–1914). According to Cassis (1985, p. 302), bankers and merchants also appeared as the most significant professional categories in joint stock bank boards, while industry had very few representatives in both banks and investment trusts. As we can see in Table 2, there was indeed very little involvement of industrialists in investment trusts. There were also some civil servants on both the boards of joint-stock banks and investment trust companies.[10]

Table 3 presents the possible relationships of investment trusts with other UK economic sectors on the basis of interlocking directorships. The investment trust sector appears closely affiliated with rest of the financial sector. For instance, in 1891, 37.6% of investment trust directors held at least one directorship in a financial, land, and investment firm (this sector also includes financial trusts that did not follow the averaging strategy diversifying their portfolios across liquid assets), 30.0% of investment trust directors held at least one directorship in an insurance firm, and 24.9% of them held at least one directorship in a bank. There was also a significant but lower number of interlocks with railways and with commercial and industrial firms. Despite the fact that there are interlocking directorships with almost all sectors, investment trusts appear to have formal (director) ties predominantly with other financial companies. This supports Michie's argument above that investment trust directors had contacts with other financial firms, especially with banks, as well as having significant investment experience. There were also connections to the railway sector perhaps because many of these investment trusts held a substantial number of railway securities in their portfolios.

Table 3. Percentage of investment trust directors holding directorships of non-investment trust companies by sector.

Sector	1891	1901	1911
Financial, Land & Investment	37.6	44.3	45.7
Insurance	30.0	27.1	26.9
Banks	24.9	18.2	16.2
Railways	19.7	22.2	21.4
Commercial, Industrial, &c.	11.7	16.3	17.9
Coal, Iron and Steel	7.0	3.9	6.0
Agriculture	6.6	1.5	8.1
Breweries & Distilleries	6.6	10.8	5.6
Mines	5.6	7.4	8.5
Waterworks	4.2	2.5	1.3
Gas & Electric Lighting	3.8	0.5	0.4
Canals and Docks	3.3	3.0	0.0
Shipping	2.8	4.9	6.0
Electric lighting & power	2.3	2.0	5.6
Tramways and Omnibus	1.9	1.0	5.6
Telegraphs and Telephones	1.9	3.4	3.4
Tea and Coffee	0.9	3.9	3.4
Oil	0.0	3.0	3.4
Nitrate	0.0	0.5	0.9
Unspecified	24.9	10.3	13.7

Sources: Directory of Directors and Stock Exchange Yearbook.

5. Network centrality: key investment trusts and asset managers

As mentioned above, the early success of the Foreign and Colonial Government Trust (which later changed its name to Foreign and Colonial Investment Trust) has been assumed to have led to a rash of imitations, thus playing an influential role in the formation of the investment trusts network. For example, the prospectus of the first issue of the American Investment Trust in 1873 draws directly on the success of the Foreign and Colonial Government Trust:

> The soundness of the principle upon which the Foreign and Colonial Government Trust was established has been abundantly proved by the five successive Issues, and the large premiums which these Investments command in the market show the extent to which they are appreciated. It has been urged upon the Trustees of the Foreign and Colonial Government Trusts that this principle is peculiarly applicable to United States Securities, and that a Special Trust should be formed to be exclusively confined to investments on the American Continent. […] Believing in the advantages of such a Trust to the investing public, and after having received from several of the leading American houses in London, the promise of their co-operation and advice in the selection of the investments, the Trustees of the Foreign and Colonial Government Trust have consented to act as Trustees in the formation of an American Trust.[11]

Indeed, almost all early investment trust flotation prospectuses referred explicitly to the success of the Foreign and Colonial Government Trust.[12] The above passage indicates also how the formal ties or official relationships between early investment trusts were formed. The American Investment Trust more or less presents itself as a satellite of the Foreign and Colonial trust (which became a limited liability corporation in 1879), hiring all the management team of the latter to take advantage of its expertise in portfolio selection. As revealed by many first issue prospectuses, the early formation of investment trusts often drew upon existing asset management expertise and networks.[13] This raises the question of the network centrality: which companies or directors were more central and influential to the whole network?

To address this question, we have calculated the eigenvector centrality for every node of the bipartite network (that is, centrality of both firms and directors) for each year between 1880 and 1913. The basic idea behind eigenvector centrality is that a central node is connected to other central nodes in the network. This is a recursive definition, in which the centrality score of a network node is proportional to the sum of the centralities of its neighbours. This centrality measure gives a high score to nodes with connections with many nodes that are themselves central. It thus weights links according to their overall influence in the network, taking into account the entire network structure. The eigenvector centrality takes values between zero and one, with one being the maximum possible centrality score.

Figure 2 shows the box plot distribution[14] of the centrality score for investment trusts for the period 1880–1913. Figure 3 reports the same for directors. The number of investment trusts and directors for the whole period 1880–1913 is too large to be reported in a single figure. We selectively report investment trusts and directors above a certain centrality threshold. Firms and directors with lower centrality values have little influence in the network. The great majority of the 79 English and Scottish investment trust companies on the eve of WWI and the 615 directors employed by them between 1880 and 1913 had centrality values lower than 0.2. There is only one Scottish trust in the list of investment trusts with high centrality scores. Three investment trusts stand out as quite central to the network: (i) the Foreign, American and General Investments Trust, (ii) the Foreign and Colonial Investment Trust, and

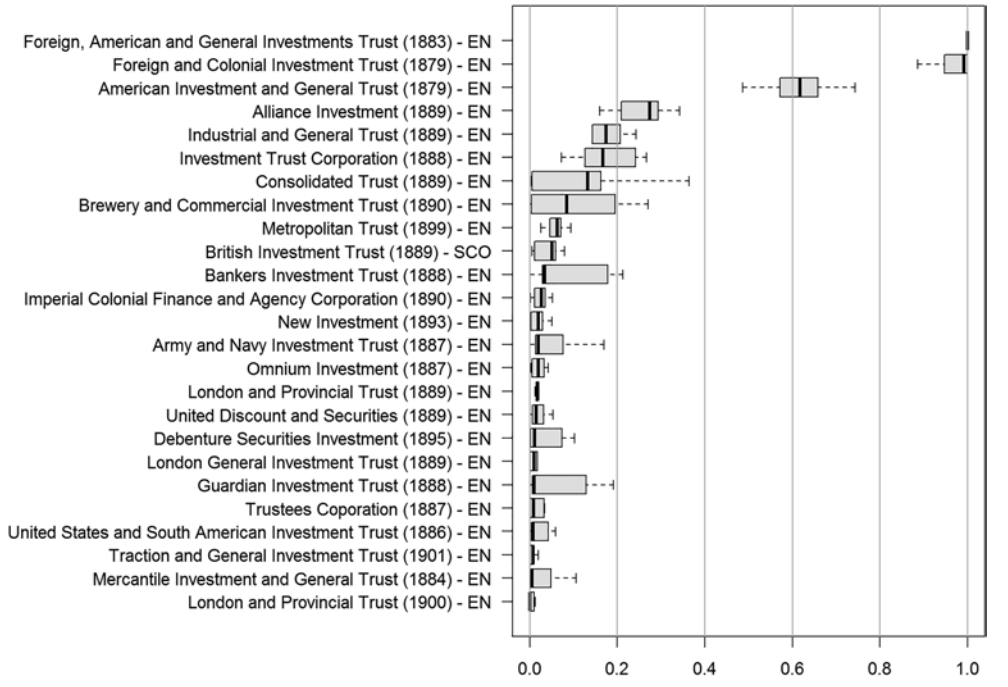

Figure 2. Box plots of the distribution of eigenvector centrality of investment trusts between 1880 and 1913. Notes: Years of incorporation in parentheses. We have excluded investment trusts with median centrality lower than 0.005. EN = English investment trust, SCO = Scottish investment trust.

(iii) the American Investment and General Trust. These three trusts, which were all incorporated before 1883, had large boards of directors, considerably larger than the average of the sector. They also had popular directors, that is board members with interlocking directorships within this sector. Almost all directors with high centrality scores belonged to the boards of the three above-mentioned key investment trusts and many of them sat on four or more different investment trust company boards. For instance, Lord E. Cecil was appointed in 1880 to the board of two key investment trusts: the American Investment and General Trust and the Foreign and Colonial Investment Trust. By 1911 he was involved in the asset management of the four most central trusts in the network: the Alliance Investment; the American Investment and General Trust; the Foreign, American and General Investments Trust; and the Foreign and Colonial Trust. Most of the directors in Figure 3 held more than one investment trust directorships.

Figures 2 and 3 offer a picture of a network that is centralised around a few central nodes of trusts and directors appointed to their boards. These two figures also show that the dispersion of centrality was within certain limits, especially for the investment trust companies. Despite the gradual rise of investment trust incorporations between 1880 and 1913, the development of the network structure over time was less dynamic: once the initial interlocking directorship links were established within existing firms, these links did not change with time. Once a director was appointed on a board, he tended to stay in it until retirement or death. In the investment trust annual reports it was not unusual to find announcements of director replacements because of death.

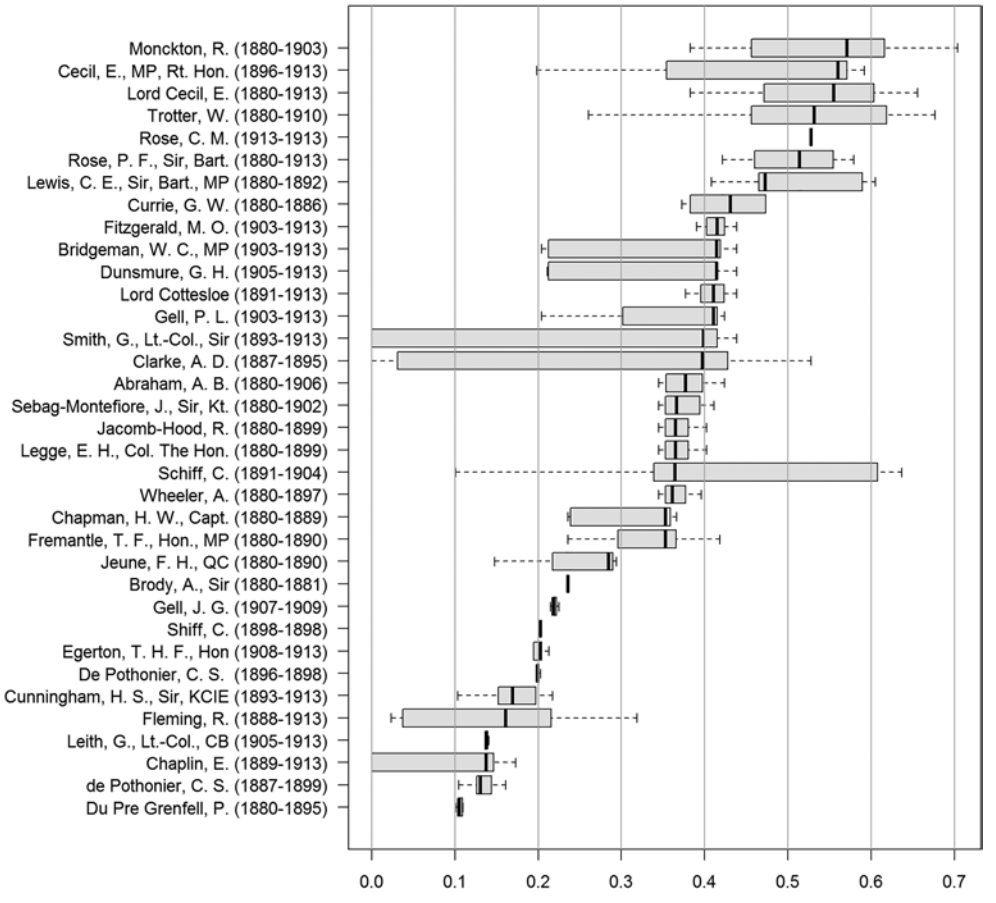

Figure 3. Box plots of the distribution of eigenvector centrality of investment trust directors between 1880 and 1913. Notes: Active director years in parentheses. We have excluded investment trust directors with median centrality lower than 0.1.

Figure 4 provides the complete picture of the relation between network centrality, the size of the board, and the interlocking directorships held by asset managers in the network. Trusts with high centrality tended to have large boards and vice versa. But there were also some exceptions: trusts with a high number of directors did not necessarily have high centrality values. Popular directors sitting on many boards were more central (there are exceptions here, as well).[15] It is not clear how the size of the board of an investment trust was decided. According to the company law of the time, there was a minimum requirement of two directors per registered firm but no other restriction or legal rule to be followed (Gower, 1979, pp. 127–128). For the great majority of the investment trusts in our sample, once the size of the board that was initially set, when they registered as companies, it did not vary over time.

6. The investment trusts' network formation

This section analyses the effects of director and company characteristics on the pattern of investment trust bipartite network formation. The above discussion offered some initial

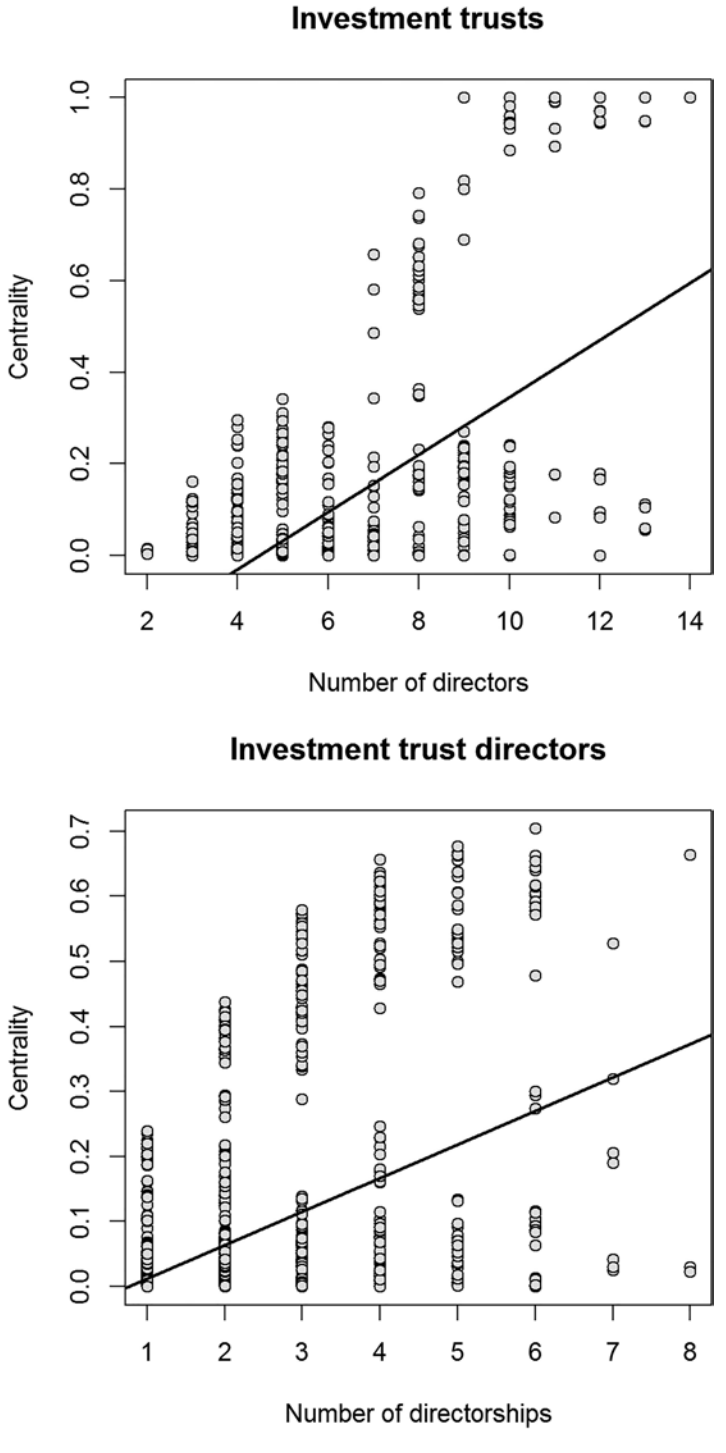

Figure 4. Scatter charts of eigenvector centrality for investment trusts and investment trust directors.
Note: The charts include observations between 1880 and 1913.

Table 4. Bipartite ERGM of investment trusts networks with structural and node-relation effects in 1891, 1901, and 1911.

	Estimates		
	Cross-sectional single network results in:		
Parameter	1891	1901	1911
Purely structural effects			
Edges	−7.650***	−7.157***	−6.168***
	(0.715)	(0.772)	(0.555)
Director popularity (interlocks)	3.056***	2.465***	2.298***
	(0.515)	(0.540)	(0.472)
Firm popularity (size of board)	4.440**	6.203***	6.406***
	(2.077)	(1.939)	(1.735)
Director main attribute effects			
Director holds a title (dummy)	−0.006	−0.297	−0.044
	(0.168)	(0.204)	(0.174)
Company main attribute effects			
Paid-up capital	0.230**	0.160	0.154*
	(0.100)	(0.120)	(0.091)
Age	−0.014	0.017	−0.011
	(0.018)	(0.017)	(0.010)
Director qualification shares	−0.086	0.141***	−0.020
	(0.142)	(0.051)	(0.075)
Origin (dummy)	0.142	0.118	0.085
	(0.230)	(0.235)	(0.195)
Dividend yield (%)	0.051***	0.089**	0.024
	(0.017)	(0.040)	(0.036)
Homophily effects (edge-wise)			
Firm size (large/small)	0.351*	0.238	0.089
	(0.213)	(0.228)	(0.208)
Director holds a title (yes/no)	2.239**	0.512	0.209
	(0.910)	(0.565)	(0.486)
Dividend yield (high/low)	0.433**	−0.100	0.145
	(0.217)	(0.228)	(0.207)

*= significant at the 10% level.
**= significant at the 5% level.
***= significant at the 1% level.

insights into the structure of the network. This section further investigates possible factors that explain the link formation. In our analysis we employ the exponential random graph model (ERGM) methodology, which describes the tie formation on the basis of firm and director characteristics (node attributes in the network) whilst allowing us to study the tie formation also as a function of purely structural network effects that cannot be explained by the individual node attributes.[16] The estimated coefficients of the ERGM models capture the probability of a network tie (actually, the logarithm of the odds of a tie), which is the dependent variable in the regression analysis. This is basically equivalent to a *logit* binary regression model in which a tie between two network nodes can either exist (value = 1) or not (value = 0), Bipartite ERGM of investment trusts networks with structural and node-relation effects in 1891, 1901, and conditional on the rest of the network. Given the bipartite structure of our investment trust network, as we can see in Figure 1, each node can be either a director or a company. In other words, network links are connections between companies and directors. The links adjacent to a director node indicate the positions this director holds on different company boards. The links adjacent to a company node indicate the size of the board of directors. So, despite the fact that the dependent variable is the same for both types of node in the model of Table 4, the interpretation of the results depends on whether the node is a director or a company. Node characteristics (variables) are not uniformly distributed

across the network. Director characteristics are only relevant to director nodes and company characteristics are only relevant to company nodes. This affects the explanation of the estimated effects in Table 4. One should have that in mind in the interpretation of the results.

In the case of director nodes, network ties around them are basically directorships held by an individual. The coefficients thus measure the probability of directorships (director popularity) in relation to the corresponding director attributes. In Table 4 there is only one covariate/attribute for director nodes: whether or not the director holds a title (dummy variable). For instance, a positive and statistically significant effect would suggest that individuals with titles were more likely to hold more directorships than those without titles. In the case of company nodes, the network ties around them indicate the number of directors on the board. The coefficients capture how the size of the board of directors (company popularity) is related to corresponding firm characteristics. In Table 4 these firm specific attributes are: the size of the company (*paid-up capital*), the *age* of the company from incorporation, *director qualifications*, whether the trust is English or Scottish (*origin* dummy), and the *dividend yield* (as proxy of performance). For instance, the estimated coefficients of the paid-up capital capture whether the size of the firm affects the size of the board (that is, the probability of a network tie around company nodes). A full list of these node specific covariates and their explanation is given in Table 2 of the Appendix.

Our fitted ERGM model in Table 4 additionally includes *purely structural effects* (which were initially determined by the analysis of the previous section) and *homophily effects*. Homophily effects are popular in network analysis since they capture the formation of homogenous groups between network participants, conditional on the rest of the network. Network ties could be more (or less) likely to appear between firms or directors who share similar characteristics: for instance, do large (or small) firms tend to affiliate more with themselves? Are profitable trusts more connected with other profitable trusts, and vice versa? Do directors with titles tend to sit together on the same investment trust boards? Homophily effects in ERGM models offer answers to this type of question. For instance, a positive and statistically significant homophily effect of the firm size would suggest that it would be more likely for a large investment trust to be connected with another large investment trust via interlocking directorships.

The three columns in Table 4 show the estimated coefficients of the ERGM model on the investment trust cross-sectional network in the three different census years: 1891, 1901, and 1911. The ERGM specification is the same in all columns of Table 4. The results capture how likely is a link in the network in relation to a set of dependent variables that includes structural effect, node-specific effects, and homophily effects.

In the specifications of Table 4 we have included three structural effects.[17] The *edge* parameter represents the baseline probability of forming a tie in the network and has a similar role to the intercept in a classic regression model. The alternating *k-stars* (geometrically weighted degree distribution or *gwdegree*) for directors and for investment trust companies are a measure of the 'popularity' effect: a large positive parameter indicates bipartite network graphs that are centralized around a few high-degree nodes of either type. In our study, firm and director popularity both seem to be a statistically significant structural effect and the only one that clearly survives in all years of Table 4. This result verifies our descriptive analysis in Section 5, which can also be seen as a case study of this effect. Directors and companies with ties have an increased likelihood of receiving further ties and this cannot be explained

by other firm or director characteristics. It is an effect that characterises the structure of the network itself. The investment trust affiliation network seems to be centralised around firms with high board sizes and directors with many interlocks within the sector. Some directors participated in many investment trust boards without this being explained by their aristocratic, political, or military background. Some firms had large boards playing a central role in the network without this being the result of their size, age, or performance. These are purely structural effects.

With regard to the node attribute effects, the results of Table 4 show the marginal effect on the probability of a network tie for each individual covariate. Bear in mind that, as explained above, director-specific attributes capture the effect on the number of directorships held by an individual and company-specific attributes measure the effects on the size of the board. The absence of any robust or persistent effect is the main finding of Table 4. For instance, there seems to be a positive relation between the nominal value of the firm (*paid-up capital*) and the number of directors on the board, but this effect is only statistically significant at the level of 5% in 1891. After the early years of the investment trust industry, large firms do not necessarily end up with more directors or small firms with less. The *age* of the firm also does not seem to affect the board size. According to our discussion in Section 5 above, we expected this result since the number of directors on the board did not change as the investment trusts increased in age. There is also no robust evidence that English investment trusts had on average more directors than Scottish trusts (the *origin* indicates whether the firm is English, dummy = 1, or Scottish, dummy = 0). There is a statistically significant and positive relationship between the dividend yield (as a measure of performance) and the number of directors sitting on the board in 1891 and 1901, but this effect disappears in 1911.[18] Investment trusts with high dividend yields seem to have larger boards on average in the early years. A larger board possibly collected and synthesised more insights from experienced directors and may have led to improved performance during the early years of development of the investment trust sector. Results on director qualifications do not have a consistent sign and are not statistically significant in 1891 and 1911.

There is also no evidence that directors with political, military, or aristocratic titles held on average more directorships within the sector (according to our discussion above, the links adjacent to a director node indicate the directorships within the sector). Some business historians have argued that a director's reputation was valuable for the company in many respects. In the late nineteenth and early twentieth centuries, aristocrats were a new element in the marketing of share issues, adding prestige to a company when they joined the board of directors (Amini & Toms, 2018; Rutterford, 2011). At the same time, business historians have noted that élite directors were seen as a solution to agency problems, posting their reputational bond as a guarantee of company quality, leading to more positive outcomes. Élite directors would be reluctant to sacrifice their reputation by sitting on boards of poorly performing firms (Amini & Toms, 2018; Hannah, 2007). Our results show that directors with titles were not more 'popular' managers than directors without titles in the investment trust sector. This is also evident in Figure 3 above. Directors with high centrality (and thus directorships) were not necessarily those with titles. Many people without titles were actively engaged in the asset management of different investment trusts. For instance, in 1911, S. C. Boulter sat on the boards of five investment trusts (Guardian Investment Trust; Mercantile Investment and General Trust; United States and South American Investment Trusts; Imperial

Colonial Finance and Agency Corporation; and New Investment Company). In the same year, the highest number of eight directorships within the sector were held by M. W. Mattinson, who did not have any title.

With regard to homophily effects, there is no evidence that large firms (that is firms above the median paid-up capital) were associated together into a homogeneous group, establishing links between themselves. This implies that directors with more than one board position were involved in the management of firms of different sizes throughout the period under consideration. It was also more likely for directors with titles to be on the same boards in 1891 but this effect loses its statistical significance in 1901 and 1911. Social background and connections might have played a role in the early board appointments, but this effect disappears as we enter the twentieth century.

Perhaps the most intriguing finding from Table 4 relates to the last homophily effect. Investment trusts with good performance (that is, with above median dividend yields on ordinary shares) were more likely to form a group in 1891, but not in 1901 and 1911. However, the magnitude of this effect in 1891 is very small, practically negligible.[19] This implies that formal communication links between investment trusts via shared directorships were basically unrelated to performance. Or, alternatively, the insignificant coefficient of this homophily effect means that interlocking directorships between successful and unsuccessful trusts are just as likely as those between successful ones. It seems that directors in a successful trust could not guarantee equal success if they were appointed to the board of a less successful trust, and vice versa. How can this absence of positive spillover effects be explained?

Further investigation, which exceeds the scope of this article, is required to answer this question. For instance, one interpretation could be that investment trust performance was the result of luck and not of the asset management skills of the directors. Such a hypothesis requires further investigation and the use of alternative measures of performance in order to make a comprehensive case. At the same time, assessing the spillover effects of interlocking directorships on performance would ideally require a dynamic framework of network analysis over time. Unfortunately, such a methodology is not currently available for unbalanced networks, in which the number of bipartite nodes is increasing with time (see our discussion in footnote 17). Our cross-sectional single network ERGM regression analysis in Table 4 in three different years is admittedly an imperfect attempt to capture possible dynamic effects. If one takes the time dimension into consideration, another possible answer to the above question might simply be that unsuccessful trusts would be keen to hire experienced directors from successful ones in an attempt to improve their performance. In that case, the spillover effects would be positive with a time lag, despite the fact that they appear as insignificant in the cross sectional analysis. This argument implies a reverse causality: the homophily effect is insignificant exactly because asset management skills matter.

Our preferred explanation is different. Since the directorships and interlocking positions within the investment trust network were rather static and time invariant, we have reason to doubt the importance and effectiveness of possible dynamic effects or time lags in the results of Table 4. In that case, the fact that shared directorships were irrelevant to investment trust performance implies that individual contributions to asset management were negligible. This argument suggests that successful asset management was due to team work, reflecting collective decision making at board level. However, more evidence is required to support this position.[20]

7. Conclusions

From the 1880s, UK closed-end investment trusts have been a dynamic financial sector systematically applying and promoting international diversification strategies. Although their capitalisation was a small fraction of the overall stock exchange capitalisation in the UK, their sophisticated asset management practices played an important and influential role in changing the overall investment mindset.[21] This study investigates the social background of the early UK investment trust directors, as the first professional asset managers, as well as the characteristics of the investment trust affiliation network.

Our results show that the majority of the early asset managers before WWI came from a commercial, banking, accounting, or legal background. Using social network analysis, we also find that the investment trust network was centralised around a few firms with large numbers of directors on their boards, and around directors with many interlocking positions within the sector. This is a typical popularity effect, which is a purely structural social result independent of director or company attributes and characteristics. The firm-director ties within the network cannot be consistently explained on the basis of individual node-specific individual characteristics, such as the size, the age, or the performance of the investment trust nor whether the directors held an aristocratic, military, or political title. Our results also show that investment trusts could not be grouped according to their size or performance. The latter result means that interlocking directorships were equally possible between good and weak performing investment trusts, casting some doubt on the effectiveness of asset management at the individual level.

One possible way to understand company and director popularity is to see them as proxies for either individual skills in asset management or participation in other, formal or informal but less apparent and visible, pre-existing social networks or clubs outside the investment trust sector. For instance, most of the directors in our dataset had professional activities that placed them in existing professional networks and associations. A few others were members of parliament who belonged to political parties and had related political networks. At the same time, one could account for several other complementary formal or informal networks: directors came from particular social backgrounds; some of them had military titles; many belonged to prestigious and aristocratic clubs; others shared the same educational background or kinship links;[22] and, finally, one must not forget shareholders' influence and related networks.[23] The popularity effect that we see in our regression results might be the complex outcome of existing social institutions not identified by our formal investment trust network ties.

Notes

1. Most of the above-mentioned literature in economic and business history does not go beyond a description of some structural features of an observed network such as the density or centrality. These metrics describe the observed network which is only one instance of a large number of possible alternative networks and cannot support statistical inference on the processes influencing the formation of network structure. Because network data is inherently relational, it violates the assumptions of independence and identical distribution of standard statistical models such as linear regression. The ERG models have been developed to permit inference about the relative frequency of network substructures of theoretical interest, disambiguating the influence of confounding processes, efficiently representing complex structures, and linking local-level processes to global-level properties (see Robins, Pattison, Kalish, & Lusher, 2007).

2. For a detailed discussion about the differences between unit trusts and investment trusts see Corner and Burton (1968), Morgan and Thomas (1962), Scratchley (1875), and Rutterford (2009).
3. See also Ripley (1934, pp. 122–131). In his 1910 lectures, at the LSE, Powell offered a list of holdings under just the letter 'M' held on January 1910 by the Mercantile Investment and General Trust. In that way, he wanted to emphasize the so-called principle of the geographical distribution of investments (Powell, 1910, p. 34).
4. See also Morgan and Thomas, (1962, p. 179) and Scratchley (1875, p. 21). There were two main reasons why investment trust companies prevailed over unit trusts. On the one hand, the restrictions to the range of the securities specified in the trust deed generally implied legal obligations on trustees should they neglect or mistakenly carry out its provisions (Scratchley, 1875). On the other hand, the formation of a trust was a means of gaining access to capital without the legal safeguards embodied in the Companies Acts, and there were clearly possibilities of abuse (Morgan & Thomas, 1962). As a matter of fact, many trusts formed in the early 1860s were fraudulently managed.
5. This is evident from our dataset. See also Gilbert (1939, p. 10).
6. Robinson (1930, p. 284) describes as follows the development of average investment trusts: 'Diversification is, in British eyes, the corner stone of the investment trust. […] Diversification, for these reasons, has shown a tendency to widen its scope in Britain. A few specialising trusts, such as the Rubber Plantations Investment Trust, have done good work for their shareholders, but the tendency has been for the sweep of the net to be widened. The early trusts were generally confined to a group of securities, but in their subsequent history most of them, such as the Foreign and Colonial, and the British Steamship have burst their investment bonds and adopted general diversification. Nearly all the new companies that lately have multiplied so fast in England and Scotland, have, like Pistol, made the world their oyster which they will open, not with the sword, like Shakespeare's jolly ruffian, but with the peaceful key of finance'.
7. For instance, all these company types were grouped together in the Stock Exchange Official Intelligence and in the Stock Exchange Yearbook.
8. UK census data are also available in 1881 but there were only very few investment trusts companies registered on that date.
9. All calculations and visualisations of this study are based on the following R packages: *ggplot2*, *network*, and *ergm*.
10. The low level of directors' fees was probably a disincentive for recruiting from this professional category according to Cassis (1985, p. 305).
11. The quotation is from the original prospectus that exists in the Loan and Company Prospectuses archives in the Guildhall Library in London.
12. This applies to Scottish investment trusts as well (Gilbert, 1939).
13. This conclusion is evident in the investment trust prospectuses we looked at in the archives of the Guildhall Library in London. In his analysis of early investment trusts, Scratchley (1875) also reaches the same conclusion.
14. Boxplots capture the dispersion and skewness of a variable by graphically depicting its quartiles. The rectangular box stretches from the first to third quartile. The vertical line through the box denotes the median. The two 'whiskers' extend above and below the box as far as the highest and lowest value excluding outliers.
15. Both the size of the board and the popularity of each director is a naïve measure of centrality in a bipartite network, which is called degree centrality, and is expected to be related to the eigenvector centrality.
16. Until recently, most research into interlocking directorates did not go beyond the level of descriptive statistics. The development of the ERGM literature allowed for more accurate and complex network studies. The problem with bivariate descriptive tables is that they involve no controls for either structural or node-attribute network effects. ERGM regression analysis may significantly change the results of bivariate tables. In other words, the impact of the node-related attributes of both directors and firms might not be correctly estimated when these ef-

fects are estimated in isolation or without accounting for the purely structural social processes that might define the network (Harrigan & Bond, 2013; Wang et al., 2009).

17. We also included other possible structural effects that appear in similar studies of firm-director networks but the model failed to converge. Having the complete series of trust-directors network graphs between 1880 and 1913, ideally we would like to employ a Separable Temporal ERGM (STERGM) model, which is basically an extension of ERGMs for modeling dynamic networks in discrete time (see Krivitsky & Handcock, 2014; Krivitsky, Handcock, & Morris, 2011). However, the unbalanced structure of our network panel dataset, in which the number of investment trusts grows over time, does not allow us to do so. We decided instead to run cross-sectional ERGM regressions for each of the census dates: 1891, 1901, and 1911, to capture the determinants of tie formation.
18. To capture the performance of investment trusts, we ideally need comprehensive information for the market prices and returns of their portfolio holdings (Jensen, 1968; Sharpe, 1966; Wang, 1998). It is in practice impossible to collect this information for the whole network because Scottish investment trusts and some English investment trusts did not disclose the lists of their portfolio holdings. For instance, in 1911, there were 76 UK investment trust listed as companies, with all 24 Scottish trusts and 21 out of 52 English trusts not publishing the list of their investments. In this study we have thus adopted more conventional performance measures: the market to par value ratio and the dividend yield of the ordinary shares. In our regression analysis we have used the dividend yield, but we obtained similar results when we used the market to par value ratio in our background regressions. It is quite standard in the literature to use these two performance measures to capture price fluctuation in terms of profitability. The Campbell and Shiller (1988) model relates the dividend yield to a present value of expected future returns and future dividend growth rates, while Vuolteenaho (2002) argues for a book-to-market model to capture future profitability, interest rates, and excess stock returns.
19. The homophily effects in Table 4 count the number of edges (actually, one-half of the number of edges to avoid double counting) that connect nodes of the same type (that is, nodes having at least one two-path bridge). For instance, the homophily effects for the dividend yield count half the number of company-director combinations with at least one other company of the same performance (high or low dividend yield) sharing the same director. The odds of a director being on the boards of equally good or bad performing trusts were: exp $(-7.650 + 0.433 \cdot 0.5) = 0.0006$ as opposed to exp $(-7.650) = 0.0005$ odds for the remaining combinations. The difference is very small.
20. There has been some debate as to whether directors with titles brought about economic rents to shareholders by boosting returns. See for instance, Grossman and Imai (2016) and Braggion and Moore (2013). Grossman and Imai looking at banks contradict the evidence offered by Braggion and Moore, arguing that directors with political connections were irrelevant or even detrimental to 19th century British bank performance. To the extent that our interpretation of the results in Table 4 is correct, our findings support Grossman and Imai: shared directors with political, military, or aristocratic titles did not guarantee a successful asset management performance and were irrelevant to overall investment trust performance.
21. See Rutterford (2009), Rutterford and Sotiropoulos (2016) Sotiropoulos and Rutterford (2018).
22. This is quite clear in some of the investment trusts directors we managed to identify in the study of Bassett (1900) with regard to 'who's who' of the UK business directors.
23. For instance, in his analysis of Alliance Trust, Mann (2012, p. 86) explicitly mentions that Fleming, an influential figure in the investment trust sector (Morecroft, 2017), never became a director of Alliance Trust but his influence was strong and went beyond his role as a major shareholder.

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Appendix

Table 1. List of average investment trusts registered before 1911 in England and Scotland.

	English Investment Trusts	Year of incorporation	Number of directors on incorporation	Paid-up capital in 1911 (£m)
1	Alliance Investment Co,. Ltd	1889	6	1.10
2	American Investment Trust Co,. Ltd	1879	8	1.50
3	Anglo-American Debenture Corporation, Ltd.	1890	7	1.28
4	Army and Navy Investment Trust Co., Ltd	1887	6	0.96
5	Bankers Investment Trust, Ltd	1888	9	2.70
6	Brewery and Commercial Investment Trust, Ltd.	1890	10	0.49
7	British Steamship Investment Trust, Ltd	1887	7	0.75
8	Charter Trust and Agency, Ltd	1907	5	1.00
9	City National Investment Company, Ltd	1909	–	–
10	Colonial Rubber and Produce Investment Corporation, Ltd.	1889	6	0.49
11	Colonial Securities Trust Co., Ltd	1889	8	1.19
12	Consolidated Trust, Ltd.	1895	11	0.44
13	Debenture Securities Investment Co., Ltd	1883	14	2.00
14	Foreign and Colonial Investment Trust Co., Ltd	1879	14	2.36
15	Foreign, American and General Investments Trust Co., Ltd.	1888	7	0.90
16	General and Commercial Investment Trust, Ltd	1907	6	0.80
17	General Investors and Trustees, Ltd	1888	3	0.30
18	Government and General Investment Co., Ltd	1871	9	1.35
19	Government Stock and Other Securities Investment Co., Ltd.	1888	8	1.12
20	Guardian Investment Trust Co., Ltd.	1890	7	0.15
21	Imperial Colonial Finance and Agency Corporation, Ltd	1889	5	0.50
22	Indian and General Investment Trust, Ltd.	1889	10	3.00
23	Industrial and General Trust, Ltd	1888	10	1.75
24	International Investment Trust, Ltd.	1888	4	4.44
25	Investment Trust Corporation, Ltd.	1911	5	0.36
26	London and British North America Co., Ltd	1910	6	0.23
27	London and New York Investment Corporation, Ltd	1889	6	0.63
28	London and Provincial Trust, Ltd.	1900	7	0.19
29	London General Investment Trust, Ltd	1889	5	0.35
30	London Maritime Investment Co., Ltd	1897	–	–
31	London Scottish American Trust, Ltd	1889	7	1.33
32	London Trust Co., Ltd	1889	7	1.44
33	Mercantile Investment and General Trust, Co., Ltd	1884	8	5.00
34	Merchants Trust, Ltd	1889	7	2.50
35	Metropolitan Trust Co., Ltd	1899	4	1.20
36	Municipal Trust, Co., Ltd.	1879	3	0.75
37	New Investment Co., Ltd	1893	6	0.20
38	Omnium Investment Co., Ltd	1887	9	0.90
39	Premier Investment Co., Ltd	1892	2	0.48
40	Railway Debenture and General Trust Co., Ltd	1881	4	3.40
41	Railway Investment Co., Ltd	1873	8	2.54
42	Railway Share Trust and Agency Co., Ltd	1890	8	0.80
43	River Plate and General Investment Trust Co., Ltd	1888	5	0.75
44	Second Industrial Trust, Ltd	1911	8	0.52
45	Traction and Power Securities Company, Ltd	1901	6	0.85
46	Trust Union, Ltd	1887	12	1.78
47	Trustees, Executors, and Securities Insurance Corporation, Ltd	1905	6	0.85
48	United Discount and Securities Company, Ltd	1889	5	0.19
49	United States and South American Investment Trust Co., Ltd	1890	6	0.25
50	United States Debenture Corporation, Ltd	1886	8	1.50
51	United States Trust Corporation, Ltd	1889	13	1.67
52	Witan Investment Co., Ltd	1909	–	–

	Scottish Investment Trusts	Year of incorporation	Number of directors on incorporation	Paid-up capital in 1911 (£m)
1	Aberdeen Trust Co,. Ltd	1911	5	0.18
2	Alliance Trust Co., Ltd	1888	6	2.38
3	American Trust Co., Ltd.	1902	3	0.34
4	British Assets Trust, Ltd	1898	4	0.45
5	British Canadian Trust, Ltd	1910	7	0.29
6	British Investment Trust, Ltd	1889	7	3.00
7	Caledonian Trust Co., Ltd.	1910	5	0.90
8	Edinburgh Investment Trust, Ltd	1889	7	0.84
9	First Scottish American Trust Co., Ltd	1879	4	0.55
10	Investors' Mortgage Security Co., Ltd.	1891	5	1.08
11	London Scottish Investment Trust, Ltd	1909	6	0.05
12	Northern American Trust Co., Ltd	1896	4	2.00
13	Scottish American Investment Co., Ltd	1873	8	2.99
14	Scottish and Canadian General Investment Co., Ltd	1910	5	0.23
15	Scottish Investment Trust, Co., Ltd	1887	7	0.75
16	Scottish Mortgage and Trust Co., Ltd	1909	6	0.10
17	Scottish Northern Investment Trust, Ltd	1908	5	0.51
18	Scottish Western Investment Co., Ltd	1907	5	1.51
19	Second Edinburgh Investment Trust, Ltd	1902	6	0.72
20	Second Scottish American Trust, Ltd	1879	4	0.75
21	Second Scottish Investment Trust, Co., Ltd	1889	7	0.50
22	Second Scottish Northern Investment Trust, Ltd	1910	5	0.46
23	Third Edinburgh Investment Trust, Ltd	1911	6	0.30
24	Third Scottish American Trust Co., Ltd	1879	4	0.75

Table 2. Definition of the node covariates in Table 4.

Variable	Description
Age	The age of the investment trust from incorporation.
Board popularity	The total number of investment trust directorships held by the board of directors divided by the number of directors.
Director holds a title (dummy)	Dummy variable that takes the value 1 if the director has an aristocratic, military, or political title, and 0 otherwise.
Director qualification shares	The value of shares (in thousand £) required to be a director.
Dividend Yield (%)	The dividend yield of the ordinary share (%).
Dividend yield (high/low)	Investment trusts grouped according to their performance: high = trusts with dividend yield higher than the median dividend yield, and low = trusts with dividend yield lower than the median dividend yield.
Firm size (large/small)	Investment trusts grouped according to their paid-up capital: large = trusts with size higher than the median size, and small = trusts with size lower than the median size.
Origin (dummy)	Dummy variable that takes the value 1 for English investment trusts and 0 for Scottish investment trusts.
Paid-up capital	The paid-up capital of the company in million £ (ordinary or deferred shares plus preferred shares plus debentures).