Impact of the Managers' Network of Influence on the Productivity of SMEs: The Case of Advertising Agencies in Southern France

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Abstract

The paper presents two econometric models aimed at analyzing the role of managers and the impact of their professional connections on company performance, focusing on how these can enhance the productivity of small and medium-sized enterprises (SMEs). To this end, a sample of companies was examined through an empirical study based on both quantitative and qualitative data. The results demonstrate that the professional relationships of Board of Directors (BoD) members significantly influence corporate performance and financial stability, as theorized and hypothesized. It follows that a manager's ability to establish and manage a network of business connections can have a substantial impact on the success of the company. Moreover, SMEs can derive concrete benefits from the interconnections of their BoD members, gaining access to resources, knowledge, and opportunities available only through their ties with other organizations.

Keywords: managers, professional relationships, connections, costs, performance, SMEs

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L'impatto della rete di influenza dei manager sulla produttività delle PMI: il caso delle agenzie pubblicitarie della Francia meridionale

Sommario

Il paper presenta due modelli econometrici finalizzati ad analizzare il ruolo dei manager e l'impatto delle loro connessioni professionali sulle performance aziendali, con particolare attenzione a come queste possano incrementare la produttività delle piccole e medie imprese (PMI). A tal fine, è stato analizzato un campione di imprese attraverso uno studio empirico basato su dati sia quantitativi che qualitativi. I risultati dimostrano che le relazioni professionali dei membri del Consiglio di Amministrazione (CdA) influenzano in modo significativo le performance aziendali e la stabilità finanziaria, come teorizzato e ipotizzato. Ne consegue che la capacità di un manager di creare e gestire una rete di connessioni professionali può avere un impatto sostanziale sul successo dell'impresa. Inoltre, le PMI possono trarre benefici concreti dalle interconnessioni dei membri del proprio CdA, ottenendo accesso a risorse, conoscenze e opportunità disponibili solo attraverso i legami con altre organizzazioni.

Parole chiave: manager, relazioni professionali, connessioni, costi, performance, PMI

1. Introduction

In recent decades, managers' professional networks have become crucial for the growth and competitiveness of small and medium enterprises (SMEs), influencing access to financial resources, knowledge flows, and innovation. Despite SMEs comprising over 99% of businesses and driving employment and GDP (Savlovschi and Robu, 2011), the direct impact of managerial networks on SME productivity remains underexplored, with existing studies often fousing on large firms (Moro and Fink, 2013), management (Cisi *et al.*, 2018), and competitive advantage (Nu'man *et al.*, 2020). This study analyzes how managerial networks affect revenue, net profit, and ROE in 116 advertising agencies located in Southern France, a sector selected for its strong reliance on professional relationships for securing knowledge, reputation and new businesses. The theoretical framework integrates Granovetter's (1973) weak ties, Burt's (1992) structural holes and Nahapiet and Ghoshal's (1998) structural social capital theory, to assess how diversified managerial ties influence SME resilience and growth. Leveraging data from two major sources, "*Société.com*" and "*Dirigeant.com*", the analysis provides a comprehensive mapping of managerial influence networks, allowing for an in-depth assessment of their impact on SME performance. Findings highlight networks strategic value in revenue generation but show limited effect on

profitability. This research aids SMEs strategy by clarifying how board connections help access resources, attract investment, and enhance competitiveness in network-driven markets.

2. Theory and Hypothesis

2.1. Managerial relationships and their role in small and medium-sized enterprises (SMEs) performance

Managers are vital to SME performance, leveraging networks to access resources and shape strategy. Professional ties influence decisions, financing, and innovation (Cisi *et al.*, 2018; Nu'man *et al.*, 2020). In resource-limited SMEs, social capital substitutes formal mechanisms, enabling adaptability (Capoani and Izzo, 2024). These networks facilitate knowledge sharing, enhance reputation, and foster partnerships. Managers typically prioritize long-term network value over short-term gains (Gerschewski *et al.*, 2020). Furthermore, broad ties foster trust and improve capital access (Moro and Fink, 2013), even in contexts without direct financial intermediation (Gharsalli, 2019).

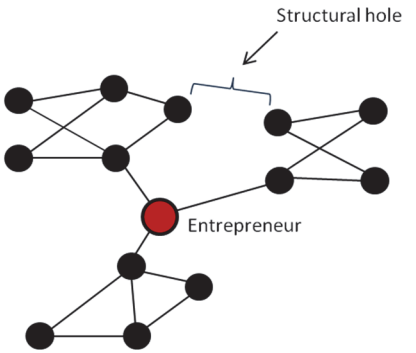
2.2. The Theory of Weak Ties and Structural Holes

This study is guided by two key social network theories: Granovetter's (1973) theory of weak ties and Burt's (1992) theory of structural holes. According to Granovetter, weak ties, defined as casual or non-redundant relationships, provide access to new ideas and opportunities, while strong ties often limit information diversity. Burt's concept of structural holes highlights gaps between disconnected groups. Managers who bridge these gaps, acting as brokers, control information flow and access exclusive resources (Burt, 2004), thereby enhancing innovation and creating strategic advantage. Figure 1 illustrates a simplified professional network where the entrepreneur connects otherwise disconnected clusters of actors. This "bridging" role across the structural hole grants access to unique flows of information and influence, positioning the entrepreneur as a key facilitator in the network (Adams *et al.*, 2014).

This bridging function is further exemplified in more complex systems (Figure 2), where managers link entire subgroups, enabling resource exchange and communication across structural gaps that would otherwise limit

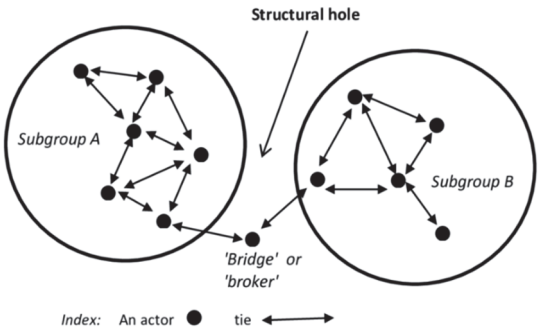
organizational reach and adaptability (Ward, 2016). This demonstrates how a manager's network position can enhance firm-level resilience and competitiveness.

Figure 1: Structural holes in a social network



Source: Adams et al.*, 2014.*

Figure 2: A "Structural hole" and the role of the "bridge" actor in providing information or resources between two subgroups



Source: Ward, 2016.

In this context, a manager's networking approach can be characterized by their willingness to build networks, the range and intensity of their relationship-building activities, and their prestige (Ostgaard and Birley, 1994; Barnir and Smith, 2002). The subsequent analysis examines how these networks influence knowledge diffusion, resource sharing, and innovation, thereby elucidating the link between social structure and business performance.

2.3. Research Hypotheses on the Impact of Managers' Professional Networks on SME Performance

Building on existing theories, this study develops three hypotheses:

1. Direct professional connections boost SME revenue. Board members' direct ties with other companies provide access to strategic resources and business opportunities (Granovetter, 1973). Higher number of direct connections will be associated with increased revenue.
2. Indirect professional connections enhance financial stability. Indirect ties, connections mediated by third parties, offer access to unique information and resources (Burt, 1992). We hypothesize that more indirect connections lead to greater financial resilience and profitability.
3. Stronger governance amplifies the impact of professional networks on business performance is stronger in SMEs with a more structured governance system. SMEs structured governance system and diverse BoD can better leverage professional connections due to more effective management of social capital.

This study tests the hypotheses, by analyzing how managerial networks influence SME performance and how governance structures shape these effects. The findings will highlight the strategic role of professional connections for financial growth and stability.

3. Methodology and Data

3.1. The Conceptual Model and Research Hypotheses

This study focuses on the advertising sector in Southern France, where professional relationships are crucial for knowledge sharing, opportunity creation, and reputation building. The sample consists of 116 advertising agencies, selected based on size (5-50 employees), location (Southern France), and financial data availability from 2010 to 2024. This selection ensures sample homogeneity and reflects the industry's reliance on networking. Data were sourced from two primary databases: "*Société.com*" and "*Dirigeant.com*". The former provides comprehensive financial and legal data on French companies, while the latter specializes in corporate governance and managerial network mapping, enabling the reconstruction of professional ecosystems around each firm.

Table 1: Initial variables considered for the analysis (LR=linear regression, PCA= principal component analysis)

Variable	*Description*	*Source*	*Type*	*Method*
Number of employees	Number of employees between 5 and 50 for all companies.	Société.com	Independent	LR, PCA
Company seniority	Number of years the company has been active since its founding.	Société.com	Independent	LR, PCA
Revenues	The total revenue from the sale of goods or services during a fiscal year, excluding taxes. Revenue is a good indicator of a company's activity and size.	Société.com	Dependent	LR, PCA
AV	Added Value: the difference between the value of produced goods and services and the costs incurred in their production. It measures the value created by the company in its production process.	Société.com	Independent	LR
EBITDA	EBITDA (Earnings before Interest, Taxes, Depreciation and Amortization): the company's profit before deducting taxes, interest, depreciation and amortization.	Société.com	Independent	LR
Net profit	The difference between a company's total revenues and expenses. It represents the actual profit made after all production costs and expenses have been deducted.	Société.com	Dependent	LR
Number of indirect connections with other companies (for the company)	The number of indirect links the company has with other companies.	Société.com	Independent	LR, PCA
Number of direct connections with individuals (for the company)	The number of direct links the company has with managers.	Société.com	Independent	LR, PCA
Added value rate	The percentage efficiency of the company's production tool, representing its contribution to the value of the production.	Société.com	Independent	LR
Number of terms	The total number of mandates held by members of the board of directors. In case of multiple board members, the number indicated will be the average for their mandates.	Dirigeant.com	Independent	LR, PCA
Leader's age	The egg of the company's manager.	Dirigeant.com	Independent	LR, PCA
Number of direct connections with other companies (for the manager)	The number of direct links the manager has with other companies (manager-company connections). In case of multiple board members, we considered shared activities only once.	Dirigeant.com	Independent	LR, PCA

Number of indirect connections with individuals (for the manager)	The number of indirect links the manager has with individuals (manager-company-individual connections). These individuals are co-agents of the manager for companies they share. In case of multiple board members, shared connections are counted only once.	Dirigeant.com	Independent	LR, PCA
Number of total connections with other companies	The sum of all direct and indirect connections with companies.	Elaboration	Independent	LR
Number of total (business) connections with individuals	The sum of all direct and indirect connections with individuals.	Elaboration	Independent	LR
Number of total connections	The total sum of connections between companies and individuals.	Elaboration	Independent	LR
ROA (Return on Asset)	The percentage ratio of net profit income to total assets. It is an indicator of the company's profitability, showing its ability to generate profit using its total assets.	Elaboration	Dependent	LR
ROE (Return on Equity)	A measure of the company's profitability, calculated as the ratio of net income to shareholder equity.	Elaboration	Dependent	LR

The analytical approach integrates Granovetter's (1973) weak ties theory and Burt's (1992) structural holes theory. We employed multiple linear regression to examine the relationship between corporate performance (revenue, net profit) and managerial traits (e.g., age, education, direct connections). Principal Component Analysis (PCA) was used to reduce data complexity, indeed robustness checks included Variance Inflation Factor (VIF) for multicollinearity, residual diagnostics for normality and homoscedasticity, and Bayesian Information Criterion (BIC) to ensure parsimony and informativeness.

3.2. Explanation of the Variables and the Correlation Matrix

The two databases can be described as follows. The "*Société.com*", is a leading platform with financial and legal data on over ten million French companies. It aggregates public (RNCS, INSEE, INPI) and private data, offering updated reports and key financial indicators – ratings, balance sheet health, and profitability – for complete company assessment. Complementing this, "*Dirigeant.com*" focuses on corporate governance and managerial networks. It offers interactive visualizations of board members' links across firms, helping trace direct and indirect relationships and reconstruct the professional ecosystems around each company and its leadership.

Table 2: The table shows the Pearson correlation coefficients

	Number of employees	Turnover	Log(turnover)	Company's seniority	Net income	Direct connections with individuals	Indirect connections with companies	Added value	Value-added rate	EBITDA	Number of mandates	Leader's age	Direct connections with companies	Indirect connections with individuals	Total connections with companies	Total connections with individuals	Total connections	Roa	Roe
Number of employees	1,000																		
Turnover	0,5920	1,000																	
Log(turnover)	0,5834	0,8495	1,000																
Company's seniority	0,0845	0,1488	0,2687	1,000															
Net income	0,2715	0,3400	0,3845	0,0198	1,000														
Direct connections with individuals	0,3307	0,1412	0,1237	-0,1075	0,0881	1,000													
Indirect connections with companies	0,1337	0,2575	0,3256	-0,0545	0,3134	0,0344	1,000												
Added value	0,8197	0,6938	0,7063	0,0841	0,5521	0,2734	0,1988	1,000											
Value-added rate	-0,0295	-0,3789	-0,4532	-0,2357	0,1495	0,1373	-0,2037	0,0430	1,000										
EBITDA	0,3206	0,5754	0,5314	0,0782	0,8456	-0,0133	0,3744	0,6486	-0,0312	1,000									
Number of mandates	0,0480	0,2058	0,2800	-0,0296	0,2815	-0,1544	0,9312	0,1195	-0,2099	0,3605	1,000								
Leader's age	0,0411	0,1928	0,2121	0,1229	-0,0489	-0,0385	-0,0259	0,0189	-0,2438	-0,0574	-0,0280	1,000							
Direct connections with companies	0,0860	0,2189	0,2934	-0,0578	0,3076	-0,0116	0,9610	0,1456	-0,1981	0,3529	0,9685	-0,0253	1,000						
Indirect connections with individuals	0,1023	0,3054	0,2541	-0,1053	0,3604	0,3618	0,5360	0,2155	-0,0217	0,3440	0,5028	-0,0461	0,5469	1,000					
Total connections with companies	0,1111	0,2407	0,3127	-0,0567	0,3136	0,0116	0,9803	0,1741	-0,2029	0,3673	0,9591	-0,0259	0,9901	0,5468	1,000				
Total connections with individuals	0,1696	0,3051	0,2553	-0,1192	0,3414	0,5595	0,4847	0,2566	0,0134	0,3027	0,4103	-0,0502	0,4835	0,9751	0,4889	1,000			
Total connections	0,1369	0,2813	0,3306	-0,0779	0,3526	0,1479	0,9673	0,2123	-0,1704	0,3891	0,9223	-0,0345	0,9968	0,7084	0,9766	0,6650	1,000		
Roa	0,0473	0,0921	1868	-0,0011	0,5384	0,0937	0,1465	0,2039	0,2239	0,3861	0,1232	-0,0434	0,1436	0,1296	0,1465	0,1375	0,1593	1,000	
Roe	0,1129	0,1258	0,1833	0,1345	0,1355	0,0721	0,0174	0,1356	-0,0026	0,1144	0,0101	0,0867	0,0117	0,0791	0,0147	0,0874	0,0341	0,2314	1,000

Source: personal elaboration in R.

Before building the regression models, we examined the linear relationships between variables using a correlation matrix. This tool provided an overview of the associations between professional influence networks and productivity, helping select the variables for inclusion in the regression models. The correlation matrix was not used to directly selecting independent variables solely based on pairwise correlations. Instead, it served as a preliminary diagnostic tool to identify potential multicollinearity issues and assess the consistency of relationships among variables before conducting the regression analysis.

3.3. Theoretical and Empirical Justification for Model and Variable Selection

The choice of models and variables is rooted in established theory and empirical evidence. Linear regression, widely applied in studies on social capital (Nahapiet and Ghoshal, 1998) and social networks (Granovetter, 1973), enables the quantification of managerial network effects on firm performance. Principal Component Analysis (PCA) complements this by addressing the complexity of interrelated network variables, aligning with inter-firm network theory and prior empirical approaches. Dependent variables were selected for both their managerial relevance and economic interpretability. Revenue reflects financial stability and the capacity to attract business

through networks (Gerschewski *et al.*, 2020), while net income, ROA, and ROE assess profitability, acknowledging that revenue alone does not imply operational efficiency (Jackowicz and Kozłowski, 2019). Independent variables were grounded in network theories. Direct connections with other firms reflect Burt's (1992) structural holes, enhancing access to exclusive information and boosting productivity (Ciulli *et al.*, 2019). Indirect connections, as per Granovetter's (1973) weak ties theory, offer access to new opportunities and funding (Muna *et al.*, 2023). Board mandates signal managerial experience and negotiation strength (Nahapiet and Ghoshal, 1998; Capoani and Izzo, 2024), while leader's age proxies for network development capabilities (Marconatto *et al.*, 2022). Company age and number of employees control for firm size and stability (Iurkov and Benito, 2020). Added value rate and EBITDA serve as performance indicators of productivity and efficiency, linked to managerial networks' capacity to streamline operations (Foltean *et al.*, 2019).

4. Linear Regression

4.1. The Model

To analyze the role of managerial networks in business performance, we applied a multiple regression model using the Ordinary Least Squares (OLS) method. This approach enabled us to examine how the characteristics of professional connections influence the economic and financial dynamics of firms. We compared different model specifications using the Bayesian Information Criterion (BIC) to identify the most suitable structure for the analysis. To ensure the robustness of the estimation, we assessed multicollinearity and tested for heteroscedasticity in the residuals. The analysis aims to determine whether and to what extent direct and indirect managerial connections affect firms' growth opportunities and financial stability, distinguishing between immediate effects and potential long-term strategic advantages. The model is defined as follows:

$$p = B_1 D + B_2 A + \varepsilon$$

The dependent variable p represents business performance (e.g., revenue, ROA, etc.), D refers to a set of independent variables related to the board member (such as age, connections, etc.), and A represents another set of in-

dependent variables related to the company (like number of employees, company age, etc.). B_1 and B_2 are the corresponding coefficients.

4.2. Choice of Variables

We tested multiple models using a business performance indicator as the dependent variable. Our analysis found that ROA and ROE were not suitable for a predictive model, as they did not yield significant regression parameters (i.e., F-test with $p > 0.01$). Regression results show that managerial networks boost revenue but have no impact on profitability. This suggests that while connections drive business growth and financial stability, they don't directly improve operational efficiency or return capital. Their main role lies in attracting opportunities, contracts, and funding, aligning with social capital theory. Profitability, however, depends on internal factors, such as cost control, pricing, and resource optimization. While networks open doors to new markets, turning opportunities into profits requires efficient operations. For example, a SME may grow revenue through managerial connections, but if costs rise proportionally, profitability remains unchanged. Additionally, highly connected managers prioritize expansion, reinvesting earnings into growth rather than maximizing short-term profits, a pattern seen in studies of growing SMEs. The best model uses the log of revenue *[log(revenue)]* as the dependent variable, incorporating selected managers and company attributes. The logarithmic transformation improves distribution symmetry and allows coefficient interpretation in percentage terms (West, 2021). We tested multiple models and selected one with the lowest Bayesian Information Criterion (BIC) value. Based on the criteria outlined previously, we chose to analyze model (4), which has been highlighted in the preceding section.

The final equation for this model is as follows:

$$log\,(Turnover) = \beta_0 + \beta_1(number\ of\ employees) + \beta_2(Company\ seniority) + \beta_3(Added\ value\ rate) + \beta_4(Leader's\ age) + \beta_5(Direct\ connections\ with\ companies) + \beta_6(Indirect\ connections\ with\ individuals)$$

To maintain data consistency, we excluded three data points (*Mediacite, Rouge et Noir Image,* and *FunandSmile*) due to anomalous residual values they produced. Following this adjustment, the recalculated R2 coefficient increased from 0,5795 to 0,6706, and the new BIC value was -6.99. In this

regression, the marginal effect of one more unity of the independent variables is associated with an increase, or decrease, of the dependent variable equal to $\beta * 100\%$.

Table 3: Estimates of the coefficients using linear regression between the dependent variables (columns) and the independent variables (rows). The t-values are shown in parentheses

	(1) Roa	(2) Roa	(3) Roe	(4) Revenues	(5) Revenues	(6) Revenues	(7) Net Income	(8) Net Income
Number of employees	-8,025e-03 (0,341)	-1,945e-03 (-0,914)	0,09487 (0,877)	0,027358 (8,690)	2,147e-03 (0,383)	0,027345 (8,570)	4591,2 (2,870)	4076 (2,795)
Company's seniority		-3,707e-04 (-0,237)	0,11278 (1,368)	0,005931 (2,389)	7,943e-03 (3,315)	0,006045 (2,414)	470,7 (0,410)	
Added value	1,435e-07 (-2,246)				4,295e-07 (5,761)			
Value-added rate				0,007049 (-5,396)		-0,007267 (-5,708)		
EBITDA		3,835e-07 (4,066)						
Number of mandates							-13516,0 (-0,943)	4500 (1,384)
Leader's age		-2,208e-04 (-0,140)	0,06376 (0,767)	0,003803 (1,515)	7,182e-03 (2,989)		-782,9 (-0,633)	
Direct connections with individuals					-4,202e-02 (-0,815)		-43480,5 (-1,443)	
Indirect connections with companies					8,777e-03 (0,409)		3793,1 (0,369)	
Direct connections with companies				0,010147 (1,388)	8,867e-03 (0,399)		12526,8 (0,783)	
Indirect connections with individuals				0,030010 (2,135)	1,322e-02 (0,844)		21320,0 (2,862)	17203 (2,729)
Total connections with companies		-2,314e-04 (-0,102)						
Total connections with individuals		2,277e-03 (0,291)	0,34989 (0,969)					
Total connections	2,008e-03 (2,952)					0,008755 (3,286)		
Intercept	1,009e-02 (1,170)	3,889e-02 (0,412)	-9,3892 (-1,885)	5,668975 (30,480)	5,122 (32,083)	5,877793 (53,460)	56049,3 (0,699)	-25710 (-1,211)
BIC	-73,9	-67,7	846	29,7	38,3	30	3073	3052
Adjusted R-squared	0,07214	0,1108	0,006584	0,5795	0,5737	0,5707	0,1615	0,1777
Observations	116	116	116	116	116	116	116	116

Source: personal elaborations in R.

4.3. Statistics on Multicollinearity

To determine the presence of multicollinearity, we analyze the variance inflation factors (VIF), which measures the extent to which an explanatory variable can be explained by the other explanatory variables in the equation. If the VIF is greater than 10, multicollinearity is considered high. In our case, the VIF is low for all variables (Table 4), confirming the absence of multicollinearity.

Table 4: VIF values of the individual variables

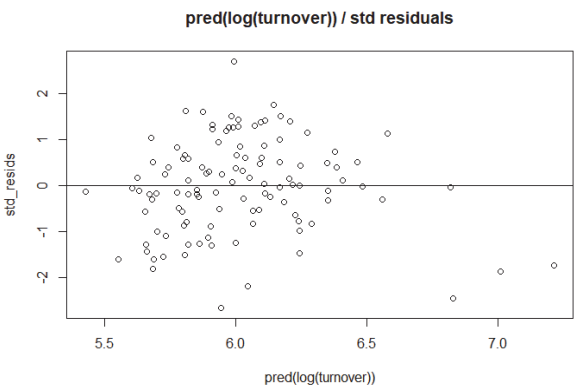
Variable	*VIF*
Number of employees	1.033296
Company seniority	1.114423
Added value rate	1.237757
Leader's age	1.078670
Direct connections with companies	1.450812
Indirect connections with individuals	1.433867

Source: personal elaborations in R.

4.4. Residual Diagnosis

A regression residual is the difference between an observed and an estimated *y value*. A residual plot helps assess whether residuals follow a pattern. The plot confirms homoscedasticity meaning the errors have constant, unpredictable variance. The random scatter of points suggests the model is appropriate and reliable.

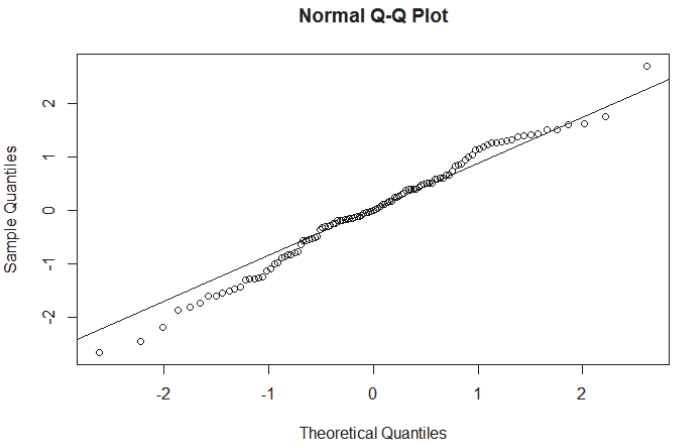
Figure 3: Residuals scatter plot



Source: personal elaborations, graph produced in R.

In heteroscedasticity, residual variability increases, making the relationship between variables inconsistent. The error structure narrows at the origin and widens outward (the *Megaphone Pattern*) with the variance decreases as Y increases. Figure 4 (the "quantile-quantile plot") checks model validity by comparing residuals to a normal distribution. If the residuals align closely, the linear model assumption holds.

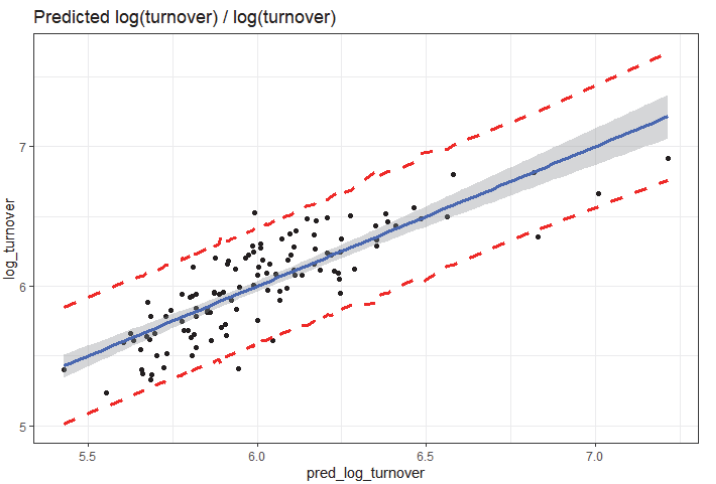
Figure 4: Graph Q-Q



Source: personal elaboration, graph produced with R.

In our case, the key property of homoscedasticity appears to be satisfied. This condition can be assessed through the *F-test*, which checks whether the variables under analysis exhibit the same variance. In Figure 5, we observe the confidence interval for the predicted values compared to the observed ones: nearly all the points lie within the expected range and are very close to the line.

Figure 5: Prediction interval for the expected values



Source: personal elaboration, plot created with R.

4.5. Results

The analysis shows that revenue is positively influenced by managerial connections and company size with additional variables, such as accounting indicators, company age, and leader's seniority. However, board members' networks only partially impact performance and financial stability, as indicated by the regression results. Rather than exploratory, the regression tested established hypotheses from social network and social capital theories, ensuring alignment with prior research. The findings confirm that managerial networks primarily drive revenue growth by generating business opportunities rather than immediate profitability, reinforcing the theoretical framework and empirical evidence on network-driven business performance.

5. Principal Component Analysis

5.1. Objectives and Stages of the Method

We applied Principal Component Analysis (PCA) to reduce dataset dimensionality and identify underlying patterns in managerial networks. By analyzing the correlation matrix, PCA grouped correlated variables into key factors, minimizing redundancy and optimizing interpretability. This technique groups correlated variables into key factors, thereby minimizing redundancy and optimizing interpretability. The PCA was combined with multiple regression to assess the impact of managerial networks on SME performance, particularly revenue growth and financial stability. This integrated approach simplified the dataset, improved model interpretability, and mitigated multicollinearity.

Table 5: Analysis of the relationships between observed variables (partial)

	employees_number	turnover	company_age	mandates_number	leader_age	dir_links_w_companies	indir_links_w_individuals	dir_links_w_individuals	indir_links_w_companies
employees_number	1,00000								
turnover	0,59202	1,00000							
company_age	0,08453	0,14880	1,00000						
mandates_number	0,04804	0,20577	-0,02962	1,00000					
leader_age	0,04114	0,19281	0,12295	-0,02797	1,00000				
dir_links_w_companies	0,08600	0,21891	-0,05783	0,96850	-0,02526	1,00000			
indir_links_w_individuals	0,10232	0,30541	-0,10533	0,50282	-0,04613	0,54690	1,00000		
dir_links_w_individuals	0,33074	0,14124	-0,10752	-0,15441	-0,03853	-0,01161	0,36183	1,00000	
indir_links_w_companies	0,13368	0,25750	-0,05447	0,93122	-0,02594	0,96098	0,53596	0,03435	1,00000

Source: personal elaborations in R.

Since the variables in the rows and columns are identical, the diagonal of the matrix contains all values equal to 1. Each row variable shows either a positive or negative correlation, with varying strengths (high or low) relative to the column's variables.

5.2. Selection of Eigenvalues and Eigenvectors

Eigenvalues indicate the variance explained by each principal component. Each eigenvalue corresponds to a component, and their sum equals the total variance of all variables. The associated eigenvectors form the rotation matrix V, used to compute the new variables, and these eigenvectors must have unit length and be orthogonal (dot product = 0).

Table 6 displays the eigenvalues, total variance and the cumulative percentage variance. The eigenvalues are arranged in descending order highlight the most significant factors explaining data variability. In total, the cumulative variance of the first 3 factors accounts for 71.913% of the total variance. In the analysis of a correlation matrix, the sum of the eigenvalues is equal to the number of variables from which these factors were derived. In our case, there are 9 eigenvalues, with the average eigenvalue being 1.

Table 6: correlation matrix: eigenvalues, percentage of total variance and cumulative percentage

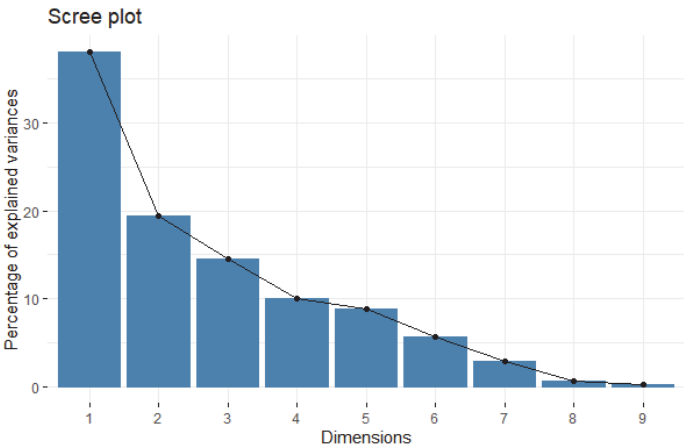
Dimensions	Eigenvalues	Percentage variance	Cumulative percentage variance
Dim.1	3.422	38.024	38.024
Dim.2	1.744	19.377	57.401
Dim.3	1.306	14.512	71.913
Dim.4	0.899	9.989	81.901
Dim.5	0.789	8.762	90.663
Dim.6	0.513	5.700	96.363
Dim.7	0.258	2.866	99.229
Dim.8	0.0505	0.562	99.790
Dim.9	0.0189	0.210	100

Source: personal elaborations in R.

5.3. Selection of Principal Components (Axes of Factors)

Principal Component Analysis begins with the synthesis of the variables *p*. This data synthesis involves considering only the factors with eigenvalues greater than 1 (*the Eigenvalue-one Criterion or Kaiser Criterion*). To determine the number of factors to interpret, we can also refer to the '*Scree Plot*' (generated using *Factoextra*).

Figure 6: Scree plot



Source: personal elaborations, plot created in R.

The graph, shown in Figure 6, indicates the percentage of variances explained, from the highest value to the lowest, with respect to the number of factors. In our case, the leveling point occurs at dimension 3.

5.4. Factor Coordinates of the Variables (Factor-Variable Correlation) and Their Contributions

The Table 7 shows the relationship between variables.

In Table 8, the variables "Direct links with companies", "Indirect links with companies" and "Number of mandates" represent a primary dimension based on the correlation between the original variables and the components derived from the analysis. These can be considered the variables with the greatest "weight" in representing the factor. The company's strength/size (defined by the number of employees, turnover and direct links with individuals) and its years of operation represent the second and third factors. Addi-

tionally, seniority plays a crucial role in the company's composition. To assess the quality of the representation provided by the values in relation to the actual data, absolute and relative contributions of the variables are used. These are obtained by comparing the observed variable with the predicted variable. The absolute contribution indicates the role of the variable in reconstructing the variation along the factor axis, as expressed by the eigenvalue.

Table 7: Relationship between the respective variable and its factor

Variables	**Comp.1**	**Comp.2**	**Comp.3**	**Comp.4**	**Comp.5**	**Comp.6**	**Comp.7**	**Comp.8**	**Comp.9**
Employees_number	0.135	0.602	0.254	0.365	0.355	0.542			
Turnover	0.226	0.532	0.227		0.264	-0.516	-0.523		
Company_age		0.568	0.420	-0.685					
Mandates_number	0.501	-0.223	0.131		0.103			-0.547	-0.606
Leader_age	0.187	0.468	-0.840		0.160	0.106			
Dir_links_w_companies	0.516	-0.171			0.190			-0.262	0.768
Indir_links_w_individuals	0.379	0.111	-0.297	-0.162	-0.377	-0.575	0.501		
Dir_links_w_individuals		0.433	-0.544	-0.148	-0.422	0.385	-0.368	-0.142	
Indir links w companies	0.514	-0.126			0.226	-0.163		0.778	-0.185

Source: personal elaborations in R.

Table 8: Contribution of the variables in percentage (partial)

Variables	**Dim.1**	**Dim.2**	**Dim.3**
Employees_number	1.83	36.286	0.053
Turnover	5.109	28.259	5.131
Company_age	0.096	2.521	32.301
Mandates_number	25.11	4.966	1.717
Leader_age	0.004	3.483	21.883
Dir_links_w_companies	26.608	2.923	0.272
Indir_links_w_individuals	14.391	1.223	8.847
Dir_links_w_individuals	0.393	18.752	29.637
Indir_links_w_companies	26.46	1.588	0.161

Source: personal elaborations in R.

The relative contribution shows how accurately the variable is represented on the axis: the more accurate the representation, the closer the angle

value is to 1. As seen in Table 9, the variables closest to a good representation are “Direct links with companies” and “Indirect links with companies”.

Table 9: Square of the cosines (partial, only the first 4 dimensions)

Variables	**Dim.1**	**Dim.2**	**Dim.3**	**Dim.4**
Employees_number	0.063	**0.633**	0.001	0.058
Turnover	0.175	**0.493**	0.067	0.003
Company_age	0.003	0.044	**0.422**	0.159
Mandates_number	**0.859**	0.087	0.022	0.002
Leader_age	0	0.061	**0.286**	0.634
Dir_links_w_companies	**0.911**	0.051	0.004	0
Indir_links_w_individuals	**0.493**	0.021	0.116	0.024
Dir_links_w_individuals	0.0134	0.327	**0.387**	0.02
Indir_links_w_companies	**0.906**	0.028	0.002	0

Source: personal elaborations in R.

5.5. Information on Observations: The Calculation

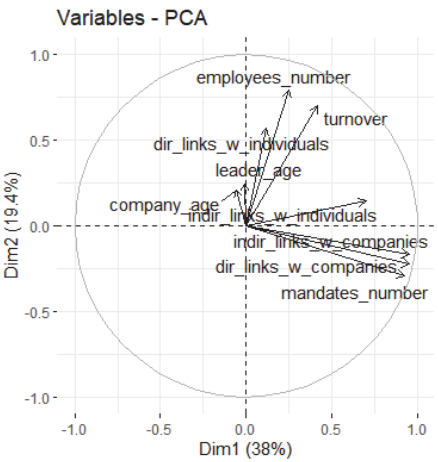
To determine the position of a dimension that synthesizes the informational structure contained in the original data matrix, one must analyze both the positions of the companies (or “observations”) and the positions of the variables. The former interprets the significance of each variable, while the latter helps manage the order in which they appear relative to each unit. As with the variables, the calculation of observations begins with analyzing the values in the correlation matrix, arranged in descending order such that the values for Dim.1 are greater than those for Dim.9. At this stage, it is crucial to determine which eigenvalue satisfies the orthogonality and unity criteria. Once this is done, the coordinates of the observations can be calculated as the result of the row-column product between the matrix of transformed data *x* and the matrix of observations on the new axes (Dim.1 and Dim.2).

5.6. Factorial Coordinate Graphs

In the factorial coordinate graphs, variables pointing in the same direction along the circumference indicate a positive correlation, when one increases

the others follow. Perpendicular variables are independent, while those in the opposite directions are negatively correlated. Figure 7 shows the projection of the factorial coordinates onto the plane corresponding to the first two principal components (Dim.1 and Dim.2), which together explain 57.4% of the total variance. The unit circle represents the highest value of the factorial coordinates, ensuring their total does not exceed 1. A more precise representation can be achieved using the Varimax rotation (Table 10), which optimizes the alignment between the original variables and the factors.

Figure 7: Factors coordinate graph



Source: personal elaborations, graph produced in R.

Table 10: Contribution of the variables after Varimax rotation

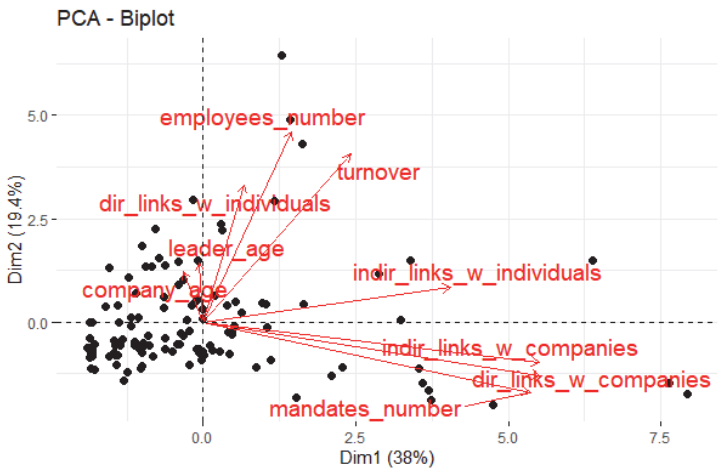
Variables	RC1	RC2
Employees_number	2.28	97.72
Turnover	14.03	85.97
Company_age	16.64	83.36
Mandates_number	97.64	2.36
Leader_age	3.93	96.07
Dir_links_w_companies	99.38	0.62
Indir_links_w_individuals	87.70	12.30
Dir_links_w_individuals	0.22	99.78
Indir_links_w_companies	99.96	0.04

Source: personal elaborations in R.

5.7. Observations: A Graphical Representation

We evaluate the distribution of the points (i.e., the 116 companies) within the previously proposed factorial design 1-2 (see Figure 8). The further a point is located to the right or left within the graph, the more it deviates positively or negatively from the mean. Points situated at the top of the graph represent the best values for the considered factor, while those at the bottom represent the worst values.

Figure 8: PCA – graphical representation of variables and observations.



Source: personal elaborations, chart produced in R.

5.8. Conclusions Regarding the Model

The model reveals two main dimensions: Dim.1 includes "Direct connections with companies", "Indirect connections with individuals", "Indirect connections with companies", and "Number of mandates", representing managerial characteristics. Dim.2 includes "Company age", "Board member age", "Turnover", "Number of employees", and "Direct connections with individuals", summarizing company characteristics. The factor analysis thus confirms the initial hypothesis by identifying two distinct dimensions: one related to the managers and the other to the company. However, it is important to note that this process results in an information loss of approximately 43%. Finally, the analysis of the segmented variables reveals a positive correlation between the managers' professional relationships and the company's financial stability.

6. Results and Interpretation in Relation to the Theoretical Framework

6.1. Impact of Managerial Networks on Business Growth

The results confirm the critical role of managerial networks in SME growth, identifying two mains' dimensions. The first, including board mandates ($\beta = 0.21$, $p < 0.05$) and direct company ties ($\beta = 0.34$, $p < 0.01$), positively correlates with revenue, supporting the idea that structured networks enhance access to strategic resources. The second dimension, reflecting indirect ($\beta = 0.07$, $p = 0.31$) and individual connections ($\beta = -0.05$, $p = 0.42$), showed no significant immediate effect on revenue. While networking drives revenue growth, it does not significantly impact on profitability (ROA, ROE), suggesting their primary value lies in expansion rather than efficiency. Regression analysis confirm the strong effect of direct connections on revenue, validating Hypothesis 1, and indicated that professional connections have a stronger effect in companies with structured governance systems, thus supporting Hypothesis 3. These findings align with the concept of collaborative business ecosystems described by Graça and Camarinha-Matos (2015), highlighting that SMEs thrive within interconnected systems where cooperation is essential for success. Managerial networks provide SMEs access to shared resources, knowledge, and expertise, reducing costs and enhancing adaptability to market changes, critical factors for sustained growth. Thus, direct ties positively correlate with revenue by helping SMEs overcome structural limitations and strengthen competitiveness, positioning SMEs as active contributors to collective innovation and growth within entrepreneurial ecosystems.

6.2. Strategic Value and Limits of Managerial Networks

The empirical findings provide strong support for the structural social capital theory (Nahapiet and Ghoshal, 1998), confirming that well-connected managers access strategic resources and opportunities more easily. The significance of direct connections aligns with Burt's (1992) structural holes theory, whereby managers bridging disconnected firms gain privileged access to information and advantageous market positions. Likewise, the number of board mandates emerges as a key factor in attracting investment and building partnerships, supporting the idea that broader networks lead to business expansion. These findings confirm Hypothesis 1, reinforcing Granovetter's

(1973) weak ties theory: external connections help increase firm revenue and access new opportunities. However, the analysis reveals no significant effect of managerial networks on profitability indicators, such as ROA ($\beta = 0.02$, $p = 0.78$) and ROE ($\beta = -0.03$, $p = 0.65$). This suggests that while professional ties support revenue generation, they do not translate into improved operational efficiency. Profitability is more influenced by internal factors like cost control and strategic resource allocation. Firms may also reinvest network-generated revenues in long-term growth rather than short-term margin maximization. This partially validates Hypothesis 3, as companies with larger and more structured Boards of Directors (BoD) appear better equipped to capitalize on social capital, consistent with governance literature (Cisi *et al.*, 2018). Lastly, Hypothesis 2 receives weaker support: indirect connections show only limited impact on financial stability. Their benefits may materialize in the long term, favoring innovation and adaptability more than immediate financial returns. The combined regression and PCA results thus distinguish between direct firm-to-firm ties, which influence short-term performance, and indirect or individual-level connections, which play longer-term strategic roles. They show that direct managerial ties, especially firm-to-firm links and board mandates, drive revenue growth, confirming Burt's (1992) structural holes theory. Managers with multiple mandates contribute to strategic collaboration, knowledge sharing, and access to resources, driving business expansion. In contrast, the limited statistical significance of indirect ties supports Granovetter's (1973) weak ties theory, which suggests that such connections generate economic value over the long term, particularly through innovation and adaptability rather than immediate revenue gains.

7. Conclusions

This study demonstrates the critical role of managers' professional networks in enhancing SME performance, particularly within the advertising sector. Our findings confirm that both direct and indirect board connections facilitate access to strategic resources, supporting Granovetter's (1973) weak ties theory and Burt's (1992) structural holes concept. The analysis reveals that managerial networks primarily foster growth and resilience rather than just financial access, consistent with Jackowicz and Kozłowski (2019). Using Principal Component Analysis (PCA), we identified two dimensions: managerial characteristics (e.g., board mandates, direct company connections) and financial health (e.g., company age, turnover, employees). While managerial resources positively correlate with turnover, though the link be-

tween professional relationships and profitability is weaker. Linear regression confirms that board networks influence stability in turnover and net profit but have limited impact on broader financial performance. This indicates that SMEs must balance technical competencies with social capital development. To achieve sustainable competitive advantages, SMEs should invest on board training, encourage cross-functional collaboration, and integrate digital networking tools for faster access to resources and market opportunities. Our study provides two key insights: first, managerial competencies are essential for resource management and strategic planning. Second, professional networks provide critical access to financing and market intelligence but require ongoing investment to maintain. Several limitations must be considered. The study's focus on advertising SMEs in southern France restricts its broader applicability, as network dynamics vary by regions and sectors. Additionally, the sample reduction, from approximately 150 to 116 companies due to missing data, introduces potential selection biases and self-reported managerial network data could affect accuracy. Despite these limitations, our findings confirm a positive correlation between managerial networks and SME performance, emphasizing the importance of strategically nurturing professional relationships. Managers should actively identify network "bridges", foster diverse connections, invest in networking skills, particularly digital, and continuously monitor network effectiveness to adapt strategies accordingly.

In conclusion, our analysis supports the strategic value of maximizing the effectiveness and breadth of managerial professional networks to enhance SME stability and growth. Alongside traditional methods, digital technologies increasingly represent a vital networking component. This study lays a foundation for future research aimed at identifying effective managerial strategies to strengthen SME competitiveness globally.

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