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Corporate governance, ownership concentration and performance of European agricultural companies: New empirical evidence

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Abstract: Considering the relevance of the agricultural sectors for the European countries' development, but also the volatile features of agriculture, with unforeseen risks induced by climate, ensuring durable economic progress is foremost for the companies. This paper aims to assess the associations of the key parties in corporate governance (directors, managers, advisers, and shareholders), employees and the independence level with the main outcomes and capacity/size of the European companies operating in agriculture, fishing, and aquaculture activities. Using a newly compiled and complex dataset of 3 184 active companies from Europe, provided by the ORBIS database, advanced modelling approaches were employed, based on the robust regression (RREG) and Gaussian Graphical Model (GGM). The main findings emphasised that: directors, managers, and advisors had a strong positive influence on the firms' size, boosting their turnover, and the shareholders' funds; advisors induced positive connections with the companies' liquidity; the number of employees exerted positive impacts on the firms' size and outcomes of these companies; the independence level exerted a negative impact on the firms' size and outcomes. Finally, specific measures must be addressed to primarily reconsider the number of directors and managers and the shareholders' participation in the ownership of these companies due to their unfavourable exerted effects.

Keywords: agriculture; board structure; econometric modelling; Europe; financial performance; strategy

In a world confronted with serious challenges concerning global competition, food production and security or climate changes, a sustainable future cannot be achieved without paying attention to resource management and the allocation of scarce natural resources towards the most productive endeavours. The agricultural sectors remain very important in the internal matrix of the European Union's (EU) long-term sustain-

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able development and Green Deal, given the current need to boost productivity in all dimensions to provide a stable supply of affordable food under the conditions of the sustainable management of limited resources – land and water (European Commission 2023).

Companies operating in agriculture, aquaculture and fishing have become nodal sources for the long-term food security in the EU area. Thus, when addressing the issue of good management of scarce resources, we must understand that such practices cannot be implemented without a set of good routines or rules which guide human behaviour and the interactions among individuals from the companies exploiting the resources, namely: board members, advisors, shareholders, but also the existing level of independence of such enterprises. In other words, proper practices and rules act as an 'invisible hand' at the firm level and determine a higher financial performance, captured by different variables, or the size of the EU agricultural companies (Tleubayev et al. 2021). Consequently, aspects connected to corporate governance, the structure of ownership, the principle-agent problem with its subsequent positive transaction or agency costs may affect the firms' financial performance, increasing the EU's exposure to current and future challenges. The ownership concentration plays a nodal role in determining the financial performance.

Based on these landmarks, our research objective aim to fill the existing gaps in the literature concerning the nexus between corporate governance, the ownership concentration and the performance of agricultural firms from an in-depth perspective, in terms of both profitability and the size of the firms. In general, the previous research on this topic was based on smaller samples consisting of tens or hundreds of firms from one or a few countries and a limited number of years with the data. Moreover, there is a lack of research conducted on this topic being applied to the entire EU area. Consequently, our endeavour was to investigate the nexus between corporate governance and the financial performance from a broader perspective. First, it gathers data for a large number of 3 184 companies over a wide time span (2015–2022). Second, the entire analysis captures the relevant feedback from all the EU Member States' firms operating in agriculture, aquaculture, and fishing activities. Third, when assessing the influence of the key parties in corporate governance (directors, managers, advisors, shareholders) and the ownership concentration on the main financial outcomes and dimension/size of European companies operating in agricultural activities, we utilised a larger set of variables for each dimension as to provide originality and representativeness to the study.

The sample consists of a total number of 3 184 medium, large and very large active companies in the field of agriculture, fishing and aquaculture activities. The data cover a wider time span from 2015–2022, extracted from the ORBIS database, provided by the Bureau van Dijk (BvD 2022). Following the main objective of the paper, our research methodology combines two econometric procedures, namely robust regression (RREG) models and the Gaussian Graphical Model (GGM).

We are interested in the firms' performance perceived from two separate viewpoints: first, on the indicators related to the performance – based on eight indicators, including some new ones in comparison with the previous research, and second, the size of the company in terms of the total assets. Also, the complex set of selected variables concerning the key parties in the corporate governance and ownership indicators provides additional originality to our dataset. Finally, despite the vast body of literature, no research has yet been applied to the entire European area, most of it being limited to a single country or to the Central and Eastern European (CEE) region.

Literature review. The measurement and evaluation of the financial performance are concepts that have captured the attention of the research agenda applied to agricultural companies in the last decades. Shareholders and advisors engaged in agricultural economic activities, aquaculture and fishery, as well as creditors, but also governments, are interested in getting performance in the following directions: financial performance, captured by Return On Assets (ROA), Tobin's Q factor (Lee 2008; Kyere and Ausloos 2021), Return On Sales (ROS) (Lepore et al. 2017; Tleubayev et al. 2021), Return On Equity (ROE) (Machek and Kubíček 2018; Pirtea et al. 2021), Earnings before interest and taxes (EBIT) (Pirtea et al. 2021), larger assets for the management of the firms, on the one hand, and higher interest rates collected by creditors or larger tax revenues perceived by the state, on the other hand.

The underpinnings of the literature emphasise that a firm's performance is influenced by a generous set of determinants, starting from the macro institutional environment within which the companies operate in (Valentinov and Iliopoulos 2012), the degree of internationalisation (Chou et al. 2021), the key parties in corporate governance (Kyere and Ausloos 2021) or even aspects strictly related to the internal matrix and organisation which define the firms, such as: board

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gender diversity, board size, ownership identity and concentration (Machek and Kubíček 2018; Tleubayev et al. 2021), board independence, firm age, leverage, indebtedness ratio, earnings per share, supervisory board, management team or investor relations.

Unfortunately, reality shows that, sometimes, performance is difficult to achieve due to the potential principal-agent problem which may interfere with it given the residual control rights that agents possess (managers are acting like agents for the owners). Shareholders (the principals) may suffer losses due to interest divergences between them and the managers, a situation in which positive agency (transaction) costs appear. Thus, corporate governance, through internal monitoring mechanisms, should solve any potential causes of such conflicts in order to diminish agency costs (Jensen and Meckling 1976). If few shareholders partake in the ownership of a firm, then they have the necessary incentives to supervise and control the management. In other words, a higher ownership concentration means a stronger influence on the management and, consequently, lower chances for the opportunism of the agents (Burkart et al. 1997).

Considering the nexus between the ownership concentration and financial performance, previous results from the literature highlight a non-linear relationship. For instance, the analyses of Lee (2008), Machek and Kubíček (2018) and García-Meca and Sánchez-Ballesta (2011) reveal an inverted U-shape relationship between the ownership concentration and profitability. When the ownership concentration expand, agency costs diminish because the interests of the owners are on the same wavelength as the ones of the managers. However, at a certain point, the performance follows a descending path and the negative effects of the ownership concentration prevail. The same results were pointed out by Tleubayev et al. (2021), who proved that private ownership in the hands of directors reveals an ascending trend for the financial performance captured by ROA and ROS. On the other hand, Lepore et al. (2017) pointed out a negative relationship between the ownership concentration and the firm's performance, but restricted to the effectiveness of the institutional background. So, the performance of the firm declines when the level of ownership concentration is high, but the intensity of such a negative interaction increases in countries with low judicial efficiency, because the protection provided by law to the investors is weak. In countries with less institutional effectiveness, the majority of the shareholders from a company serve as a mechanism of protection for those placed in a position of minority.

When the board independence is addressed, one can observe a strong positive impact on the performance of the firm (Tleubayev et al. 2021), also a positive nexus when the performance was indicated by the ROA, but no significant relationship when Tobin's Q was used (Kyere and Ausloos 2021). If property rights on the assets of the firms are well defined and the activity of the company does not make the object of specific assets, like in our case of agricultural activities, aquaculture and fishery, the risk of enhancing additional divergences is limited (Valentinov and Iliopoulos 2012). The board size is also an important predictor highlighted in the literature with regards to the financial performance of agricultural companies (Pirtea et al. 2021; Tleubayev et al. 2021). Kyere and Ausloos (2021) stressed that the board size has a significant positive impact on both the ROA and Tobin's Q indicator. Kathuria and Dash (1999) underlined that even though performance improves when the size of the board increases, the situation will change when the size of the company expands, where, at that time, every new member of the board will have a lower marginal contribution to the performance of the firm. Chou et al. (2021) showed that when the firm's performance is measured by the ROE, the results point out a negative link with the board size due to the over-pledged ratio of directors and supervisors.

In a world governed by positive transaction costs, where information means power, the role of advisors in agricultural economic activities is very important because they act from an independent, but trust-based position, so they enhance the positive performance outcomes (Russel et al. 2020). Hilkens et al. (2018) went further and emphasised that, in general, owners tend to seek the help of formal advisors like their bankers and accountants, but little openness is available when financial support is needed, because such information is very sensitive, consequently, such potential is not fully explored in favour of the firm.

Therefore, the existing body of literature requires an update consisting of a more complex approach to the nexus between corporate governance and financial performance applied specifically to the companies activating in the agriculture, aquaculture, and fishery sectors from the EU level. Moreover, on the basis of the large dataset, we intend to provide a comprehensive perspective by engaging, in an empirical endeavour, new variables related to the financial performance, such as: the operating revenue, Return On Capital Employed (ROCE), or Earnings Before Interest, Taxes, Depreciation, and Amortisation margin (EBITDA), cash flow, or cash flow margin. Considering the independ-

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ence level of agricultural companies, the novelty is provided by also including ownership indicators of these companies. As opposed to the previous research, where the methodological tools were illustrated by linear regression models, panel data models with fixed or random effects, or even dynamic panels or Ordinary Least Squares (OLS) multiple regressions, we employed a different analysis combining two research methodologies: robust regression (RREG) models and the GGM. Consequently, all the above-mentioned aspects strengthen the original character of our paper, thus enriching the existing body of literature on the topic not only in terms of the variables used, but also by analysing the manner in which corporate governance and the independence level of the companies influence the financial performance, or the size of the firms operating in agriculture, aquaculture, and fishery sectors.

MATERIAL AND METHODS

Data employed in the empirical analysis. The data were extracted from the ORBIS database, provided by Bureau van Dijk (BvD 2022), according to the last available year (mainly, 2015–2022), including 3 590 medium, large and very large companies in the fields of agriculture, fishing and aquaculture, located in Europe (Table 1), of which, 3 184 active companies were considered for our analysis. Companies with the status 'inactive companies' (e.g. administratively suspended, in liquidation, bankruptcy, dissolved) and 'unknown situation' were excluded from the sample. Companies were considered 'active' when they started managing investments, carrying on trading activities or received some form of income. In terms of the size, our sample includes medium, large and very large companies.

The variables comprise the following three groups of indicators, as they are provided by the ORBIS database (BvD 2022): *i*) outcomes indicators: operating revenue (turnover) (*OR*) (thousand USD); *ROE* using profit/loss (P/L) before tax (*ROE*) (%), determined as the ratio between the net profit and the shareholders' equity; Return On Capital Employed using P/L before tax (*ROCE*) (%), measured as the ratio between the *EBIT* and capital employed (total assets less current liabilities, or shareholders' equity and long-term debts); *ROA* using P/L before tax (*ROA*) (%), determined by dividing the net profit by the total assets; Earnings Before Interest, Taxes margin (*EBIT*) (%), meaning net income adding interest and taxes, as a percentage of the total revenue; Earnings Before Interest, Taxes, Depreciation, and Amortisation margin (*EBITDA*) (%), meaning *EBIT* adding depreciation and amortisation, as a percentage of the total revenue; Cash flow (*CF*) (thousand USD); Cash flow/operating revenue (*CF*/*OR*) (%) represents the cash flow margin or the ratio of the cash flow-to-operating revenues; *ii*) dimension/size of companies: Total assets (*ASSETS*) (thousand USD); *iii*) key parties in corporate governance, employees and ownership indicators: number of directors & managers (*No_DM*); number of current directors & managers (*No_CDM*); number of advisors

Table 1. Descriptive information of companies

Items	Descriptions
Status	Active companies
NACE Rev. 2 (primary codes)	016 – Support activities to agriculture and post-harvest crop activities, 03 – Fishing and aquaculture
Country (*n*)	Belgium (112), Denmark (284), Finland (58), France (195), Germany (12), Ireland (13), Italy (1 043), The Netherlands (20), Portugal (354), Spain (556), Sweden (90), Bulgaria (21), Croatia (72), Czech Republic (87), Estonia (22), Hungary (72), Latvia (19), Lithuania (42), Poland (96), Slovakia (83), Slovenia (7), Greece (36), Romania (198)
Company size classification	Medium (over 1.3 million USD operating revenue, over 2.6 million USD total assets, or over 15 employees), Large (over 13 million USD operating revenue, over 26 million USD total assets, or over 150 employees), Very large (over 130 million USD operating revenue, over 260 million USD total assets, or over 1 000 employees, or listed companies).

NACE – Nomenclature of Economic Activities; *n* – number of companies
Source: Bureau van Dijk (BvD 2022)

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Table 2. Descriptive statistics

Variables	*n*	Mean	SD	Min	Max
OR	3 184	10 323.09	56 580.2	0.2038681	1 971 965
No_EMPL	2 782	35.00755	128.493	0	3 335
CF	2 932	626.5179	3 715.967	–17 507.74	125 859.8
ASSETS	3 174	9 549.146	45 562.99	4.630863	1 543 201
SHR_F	3 174	3 885.089	21 244.35	–111 780	712 021.1
ROE	2 995	17.33308	58.80162	–889.215	766.184
ROCE	2 420	13.00645	48.70647	–983.333	928.595
ROA	3 149	6.014818	13.8158	–88.965	98.13
EBITDA	2 958	11.94772	17.22678	–98.245	96.548
EBIT	3 115	6.02634	16.22317	–98.4	97.707
CF/*OR*	2 883	10.49506	16.41963	–95.432	97.74
No_DM	3 184	6.228957	8.333454	0	123
No_SHR	3 184	2.249058	10.68098	0	392
No_CDM	3 184	4.016018	4.676939	0	57
No_ADV	3 184	1.369347	2.151039	0	26
No_CADV	3 184	0.7854899	1.207174	0	17
BIND	3 176	5 233 627	1 053 924	1	11
n	3 184	–	–	–	–

OR – operating revenue (turnover); *No_EMPL* – number of employees; *CF* – Cash flow; *ASSETS* – Total assets; *SHR_F* – shareholders' funds; *ROE* – Return on Equity; *ROCE* – Return On Capital Employed; *ROA* – Return On Assets; *EBITDA* – Earnings Before Interest, Taxes, Depreciation, and Amortization margin; *EBIT* – Earnings Before Interest and Taxes margin; *CF*/*OR* – Cash flow/operating revenue; *No_DM* – number of directors & managers; *No_SHR* – number of shareholders; *No_CDM* – number of current directors & managers; *No_ADV* – number of advisors; *No_CADV* – number of current advisors; *BIND* – BvD Independence indicator; *n* – number of companies

Source: Authors' own elaboration

(*No_ADV*); number of current advisors (*No_CADV*); number of shareholders (*No_SHR*); number of employees (*No_EMPL*); shareholders' funds (*SHR_F*) (thousand USD); BvD Independence indicator (*BIND*) (codes from 1–11, for levels: A, A+, A–; B, B+, B–; C, C+, C–; D, U, respectively).

BvD Independence indicator, engendered by BvD (2022), earmarks the independence level of a company, reflected by its shareholders' participation in the ownership. As Horobet et al. (2019) summarised, BvD Independence indicator may be of: *i*) level A, with low ownership concentration, independent companies, with A–, A and A+; *ii*) level B, with medium-low ownership concentration, no majority ownership, with B–, B, and B+; *iii*) level C, with medium-high ownership concentration, indirect majority ownership, with C–, C, and C+; *iv*) level D, with high ownership concentration, direct majority ownership; *v*) level U for unknown level of independence.

Descriptive statistics (Table 2) of the data included in the sample show a low number of employees (average value is 35), directors and managers (mean value of the current situation is 4), shareholders (average value is 2) and advisors (average value is 1) for the companies operating in agricultural fields (overall, the mean values for these variables are nearest to the minimum one). As regards to the ownership concentration, the average level is medium-low ownership concentration (mean code 5 indicates B+ level).

Research methodology. We applied two research methodologies, aligned with our two-fold objective, namely robust regression (RREG) models and the GGM.

Robust regression takes the advantage of detecting influential outliers in the sample/set of variables that negatively affect the regression model and thus provide consistent estimates that bypass the spurious regression, being based on Cook's D and two types of iterations, namely Huber and bi-weight. The general configuration of the robust regression models designed for the current research is presented in the set of Models (1–10).

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$$ASSETS = \beta_0 + \beta_1 No\_EMPL + \beta_2 No\_DM + \beta_3 No\_CDM + \beta_4 No\_SHR + \beta_5 No\_ADV + \\ + \beta_6 No\_CADV + \beta_7 BIND + \theta_i + \varepsilon \quad (1)$$

$$OR = \beta_0 + \beta_1 No\_EMPL + \beta_2 No\_DM + \beta_3 No\_CDM + \beta_4 No\_SHR + \beta_5 No\_ADV + \\ + \beta_6 No\_CADV + \beta_7 BIND + \theta_i + \varepsilon \quad (2)$$

$$CF = \beta_0 + \beta_1 No\_EMPL + \beta_2 No\_DM + \beta_3 No\_CDM + \beta_4 No\_SHR + \beta_5 No\_ADV + \\ + \beta_6 No\_CADV + \beta_7 BIND + \theta_i + \varepsilon \quad (3)$$

$$SHR\_F = \beta_0 + \beta_1 No\_EMPL + \beta_2 No\_DM + \beta_3 No\_CDM + \beta_4 No\_SHR + \beta_5 No\_ADV + \\ + \beta_6 No\_CADV + \beta_7 BIND + \theta_i + \varepsilon \quad (4)$$

$$ROE = \beta_0 + \beta_1 No\_EMPL + \beta_2 No\_DM + \beta_3 No\_CDM + \beta_4 No\_SHR + \beta_5 No\_ADV + \\ + \beta_6 No\_CADV + \beta_7 BIND + \theta_i + \varepsilon \quad (5)$$

$$ROCE = \beta_0 + \beta_1 No\_EMPL + \beta_2 No\_DM + \beta_3 No\_CDM + \beta_4 No\_SHR + \beta_5 No\_ADV + \\ + \beta_6 No\_CADV + \beta_7 BIND + \theta_i + \varepsilon \quad (6)$$

$$ROA = \beta_0 + \beta_1 No\_EMPL + \beta_2 No\_DM + \beta_3 No\_CDM + \beta_4 No\_SHR + \beta_5 No\_ADV + \\ + \beta_6 No\_CADV + \beta_7 BIND + \theta_i + \varepsilon \quad (7)$$

$$EBITDA = \beta_0 + \beta_1 No\_EMPL + \beta_2 No\_DM + \beta_3 No\_CDM + \beta_4 No\_SHR + \beta_5 No\_ADV + \\ + \beta_6 No\_CADV + \beta_7 BIND + \theta_i + \varepsilon \quad (8)$$

$$EBIT = \beta_0 + \beta_1 No\_EMPL + \beta_2 No\_DM + \beta_3 No\_CDM + \beta_4 No\_SHR + \beta_5 No\_ADV + \\ + \beta_6 No\_CADV + \beta_7 BIND + \theta_i + \varepsilon \quad (9)$$

$$CF/OR = \beta_0 + \beta_1 No\_EMPL + \beta_2 No\_DM + \beta_3 No\_CDM + \beta_4 No\_SHR + \beta_5 No\_ADV + \\ + \beta_6 No\_CADV + \beta_7 BIND + \theta_i + \varepsilon \quad (10)$$

where: *ASSETS* – Total assets; *OR* – operating revenue (turnover); *CF* – Cash flow; *SHR_F* – shareholders' funds; *ROE* – Return On Equity; ROCE – Return On Capital Employed; *ROA* – Return On Assets; *EBITDA* – Earnings Before Interest, Taxes, Depreciation, and Amortisation margin; *EBIT* – Earnings Before Interest and Taxes margin; *CF*/*OR* – Cash flow/operating revenue; *No_EMPL* – number of employees; *No_DM* – number of directors & managers; *No_CDM* – number of current directors & managers; *No_SHR* – number of shareholders; *No_ADV* – number of advisors; *No_CADV* – number of current advisors; *BIND* – BvD Independence indicator; θ_i – variable that captures the country/company effects; ε – error term (residual variable).

Network analysis is another modern econometric procedure applied in this research through the GGM to comprehensively capture the positive and negative (partial) correlations/links (entailed through blue and red lines/edges) between the variables (presented as circles/nodes of the network). GGMs are networks of conditional associations and allow one to provide a robust image of the connections between all the variables employed in the study.

In line with the main purpose of our research, the working hypotheses are:

H_1: There are direct and favourable impacts of the key parties in corporate governance on the dimension of the European agricultural companies.

H_2: There are direct and favourable impacts of the key parties in corporate governance on the representative outcomes of the European agricultural companies.

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H_3: There are direct and favourable impacts of the number of employees on the dimension of the European agricultural companies.

H_4: There are direct and favourable impacts of the number of employees on the representative outcomes of the European agricultural companies.

H_5: There are direct and favourable impacts of independence level on the dimension of the European agricultural companies.

H_6: There are direct and favourable impacts of independence level on the representative outcomes of the European agricultural companies.

H_7: There are global interlinkages between the key parties in corporate governance (directors, managers, advisors, shareholders), number of employees and main company outcomes/dimension of the European agricultural companies.

H_8: There are global interlinkages between the independence level and the main company outcomes/dimension of the European agricultural companies.

RESULTS AND DISCUSSION

Results of the robust regression models. The results of RREG models (Tables 3 and 4) reveal that the key parties in corporate governance, reflected by the total or current number of directors and managers (*No_DM*, *No_CDM*) and advisors (*No_ADV*, *No_CADV*), have a favourable and statistically significant influence on the size of the agricultural companies (Model 1), on their turnover (Model 2) and on the shareholders' funds (Model 4). The number of advisers, also positively, and statistically significant shaped the cash flow (Model 3), the profitability related to the assets (Model 7) and the cash flow margin (ratio of the cash flow-to-operating revenues – Model 10). These findings are in line with those obtained by Russel et al. (2020) that showed the enhanced positive role of advisors in agricultural activities as they act from an independent, but trust-based position. Unfavourable impacts of the key parties in corporate governance, measured by the number of managers and directors, were induced on the prof-

Table 3. Results of robust regression models (RREG) (Models 1–5)

Variables	Model 1 *ASSETS*	Model 2 *OR*	Model 3 *CF*	Model 4 *SHR_F*	Model 5 *ROE*
No_EMPL	6.891*** (0.604)	13.97*** (0.501)	0.281*** (0.0557)	0.281 (0.199)	0.00738** (0.00254)
No_DM	61.10*** (15.92)	16.67 (11.97)	–0.389 (1.479)	26.83*** (6.034)	–0.203* (0.104)
No_CDM	205.5*** (28.11)	235.5*** (21.02)	3.783 (2.619)	5.005 (10.60)	–0.385* (0.181)
No_SHR	2.137 (4.310)	–2.887 (3.181)	1.659** (0.529)	1.694 (1.637)	0.000677 (0.0277)
No_ADV	202.9*** (46.04)	197.8*** (34.18)	8.133 (4.272)	113.4*** (17.48)	0.101 (0.297)
No_CADV	180.1* (80.13)	–44.02 (59.29)	21.38** (7.480)	117.0*** (30.30)	–0.784 (0.517)
BIND	–176.9*** (47.44)	125.6*** (34.97)	–11.97** (4.474)	–93.74*** (18.04)	–0.552 (0.312)
_CONS	2 225.5*** (252.7)	358.4 (186.5)	196.1*** (23.80)	902.3*** (96.16)	17.64*** (1.666)
n	2 767	2 774	2 580	2 767	2 630
R^2	0.377	0.539	0.068	0.219	0.047

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; *ASSETS* – Total assets; *OR* – operating revenue (turnover); *CF* – Cash flow; *SHR_F* – shareholders' funds; *ROE* – Return On Equity; *No_EMPL* – number of employees; *No_DM* – number of directors & managers; *No_CDM* – number of current directors & managers; *No_SHR* – number of shareholders; *No_ADV* – number of advisors; *No_CADV* – number of current advisors; *BIND* – BvD Independence indicator; *_CONS* – constant/intercept; *n* – number of companies; R^2 – coefficient of determination; standard errors in parentheses

Source: Authors' own elaboration

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Table 4. Results of robust regression models (RREG) (Models 6–10)

Variables	Model 6	Model 7	Model 8	Model 9	Model 10
	ROCE	*ROA*	*EBITDA*	*EBIT*	*CF/OR*
No_EMPL	0.00520**	0.00234*	0.00183	0.00209*	0.00168
	(0.00201)	(0.000923)	(0.00174)	(0.000980)	(0.00164)
No_DM	–0.102	–0.0528	–0.0463	–0.0198	–0.0196
	(0.0722)	(0.0372)	(0.0710)	(0.0397)	(0.0642)
No_CDM	–0.227	–0.137*	–0.409**	–0.227**	–0.366**
	(0.127)	(0.0651)	(0.124)	(0.0693)	(0.113)
No_SHR	–0.00726	0.00860	0.0167	0.0258*	0.00783
	(0.0252)	(0.0101)	(0.0190)	(0.0107)	(0.0230)
No_ADV	0.151	0.222*	0.144	0.108	–0.0559
	(0.222)	(0.108)	(0.205)	(0.115)	(0.185)
No_CADV	–0.478	–0.0439	0.312	0.227	0.775*
	(0.387)	(0.187)	(0.356)	(0.199)	(0.324)
BIND	–0.347	–0.112	–0.862***	–0.319**	–0.660***
	(0.235)	(0.111)	(0.214)	(0.120)	(0.197)
_CONS	11.49***	4.358***	15.64***	6.340***	12.88***
	(1.251)	(0.594)	(1.139)	(0.638)	(1.047)
n	2 118	2 747	2 606	2 727	2 542
R^2	0.035	0.031	0.053	0.045	0.050

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; *ROCE* – Return On Capital Employed; *ROA* – Return On Assets; *EBITDA* – Earnings Before Interest, Taxes, Depreciation, and Amortization margin; *EBIT* – Earnings Before Interest and Taxes margin; *CF/OR* – Cash flow/operating revenue; *No_EMPL* – number of employees; *No_DM* – number of directors & managers; *No_CDM* – number of current directors & managers; *No_SHR* – number of shareholders; *No_ADV* – number of advisors; *No_CADV* – number of current advisors; *BIND* – BvD Independence indicator; *_CONS* – constant/intercept; *n* – number of companies; R^2 – coefficient of determination; standard errors in parentheses

Source: Authors' own elaboration

itability related to the equity (Model 5), performance related to the assets (Model 7), but also on the percentage of the profitability to total revenue, expressed by *EBITDA* (Model 8) and *EBIT* (Model 9). Similar results were revealed by Chou et al. (2021) who pointed out a negative link of the *ROE* with the board size, due to the over-pledged ratio of directors and supervisors. An unfavourable impact, exerted by the current number of directors and managers, was also induced on the cash flow margin (Model 10).

Therefore, H_1 is validated, while the H_2 is partially validated.

Instead, the number of employees (*No_EMPL*) exerted only a favourable and statistically significant influence on the total assets (Model 1), on the turnover (Model 2), on the cash flow (Model 3) and on the profitability expressed by the *ROE* (Model 5), ROCE (Model 6), *ROA* (Model 7), and *EBIT* (Model 9).

Consequently, the H_3 and H_4 are validated. Still, there are companies with no employees or missing data (in Table 2, the minimum value is 0), therefore, this situation must be considered with caution, for each company.

As regards to the independence level of the agricultural companies (*BIND*) (Tables 3 and 4), mostly, unfavourable impacts were attained on the considered credentials of the companies' dimension and outcomes, namely, the size of the companies (Model 1), the cash flow (Model 3), the shareholders' funds (Model 4), profitability, expressed by the *EBITDA* margin (Model 8) and *EBIT* margin (Model 9), and the cash flow margin (Model 10). These results are in line with those obtained by Lepore et al. (2017), but opposite to Tleubayev et al. (2021), which pointed out that private ownership induces an ascending trend for financial performance, captured by the *ROA* and *ROE*.

Accordingly, H_5 and H_6 are not validated.

Therefore, based on the direct impacts of the considered variables on the main outcomes and size of the agricultural companies (H_1–H_6), specific measures

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must be addressed, to primarily reconsider the number of directors and managers and the shareholders' participation in the ownership of these companies, due to their unfavourable exerted effects.

Results of the Gaussian Graphical Model. To appraise H_7 and H_8, namely the global interconnections between the considered credentials related to the key parties in corporate governance (directors, managers, advisors, shareholders), the number of employees, on the one hand, and the ownership concentration, on the other hand, related to the main companies outcomes/dimension of the European agricultural companies, we set up a GGM (Figure 1), for which the centrality and clustering plots are given in the Electronic supplementary material (ESM, Figures S1 and S2).

The results (Figure 1) foreground favourable interconnections between the key parties in corporate governance – the total and current number of directors, managers (*No_DM*, *No_CDM*), and advisors (*No_ADV*, *No_CADV*) – and the main outcomes of agricultural companies – turnover (*OR*), cash flow (*CF*), shareholders' funds (*SHR_F*), but also with the size of these companies (*ASSETS*). The opposite, unfavourable connections were established between the number of directors and managers and the financial profitability (expressed by *ROA*, *ROE*, *ROCE*, *EBIT*, and *EBITDA*), but also with the cash flow margin (*CF*/*OR*), being in line with the findings of Chou et al. (2021).

The number of employees (*No_EMPL*) positively and strongly acted on the cash flow, total assets, operational revenue and the shareholders' funds, while the influence on the financial profitability was not significant.

Consequently, the H_7 is partially validated.

The independence level of the agricultural companies (*BIND*) established interconnections with very low intensity with the main outcomes/dimension of these

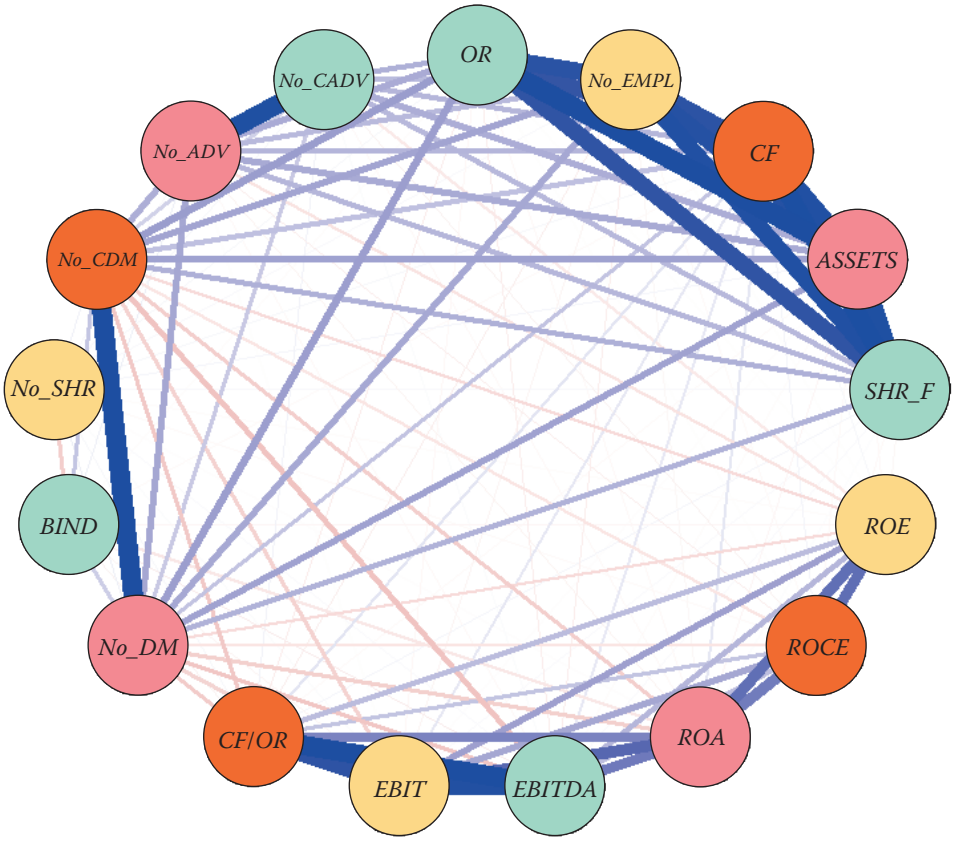

Figure 1. Gaussian graphical model (GGM) results

ASSETS – Total assets; *OR* – operating revenue (turnover); *CF* – Cash flow; *SHR_F* – shareholders' funds; *ROE* – Return On Equity; *ROCE* – Return On Capital Employed; *ROA* – Return On Assets; *EBITDA* – Earnings Before Interest, Taxes, Depreciation, and Amortization margin; *EBIT* – Earnings Before Interest and Taxes margin; *CF*/*OR* – Cash flow/operating revenue; *No_EMPL* – number of employees; *No_DM* – number of directors & managers; *No_CDM* – number of current directors & managers; *No_SHR* – number of shareholders; *No_ADV* – number of advisors; *No_CADV* – number of current advisors; *BIND* – BvD Independence indicator

Source: Authors' own elaboration in RStudio 4.2.2

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companies, namely a weak unfavourable relationship with the *ROA*, being opposite to the findings obtained by Tleubayev et al. (2021).

Consequently, the H_8 is not validated.

CONCLUSION

Agricultural sectors play a key role in the development of European countries, serving as nodal landmarks for the EU policies concerning food security and sustainable economic development. Accordingly, such topics have become increasingly attractive for both governments and companies themselves. Furthermore, the volatile features of agricultural fields dominated by uncertainty, and unpredicted risks generated by climate changes, make the nexus between key parties in corporate governance, the number of employees or/and the independence level of the companies operating in this domain extremely important for their profitability, liquidity, or capacity/size. In this paper, we assessed a two-fold research direction, namely, the impact of the key parties in corporate governance (directors, managers, advisors, shareholders) and employees, and the ownership concentration on the representative financial outcomes and dimension/size of European companies operating in agricultural activities. The data were gathered from the ORBIS database (BvD 2022) for over 3 000 active companies (medium, large and very large) operating in the fields of agriculture, fishing and aquaculture.

Our results emphasise that the directors, managers, and advisors have a strong influence on the size of the companies (H_1), boosting their turnover, but are also placed in a positive nexus with the funds of the shareholders. Unfortunately, unfavourable impacts were induced by the number of directors and managers on the profitability related to the equity of the companies, economic performance (related to assets), margins of the *EBITDA* and *EBIT*, but also on the liquidity capacity (cash flow-to-operating revenues) (H_2). Conversely, when advisors were addressed, the analysis pointed out a positive connection with the companies' liquidity (cash flow and cash flow margin). Considering the number of employees, the results emphasise a positive impact on firm size reflected by the total assets, the turnover of the firm, cash flow, *ROE*, *ROCE*, *ROA* or *EBIT* (H_3 and H_4 were fully validated). Concerning the independence level of the companies operating in agricultural activities, the results were the opposite as expected, revealing a negative impact on the size of the firm (H_5), cash flow, cash flow margin, the funds of the shareholders, *EBITDA* or *EBIT* margins.

Also, the GGM revealed a complex perspective. On the one side, favourable interconnections were found with the key parties of corporate governance (managers, directors, and advisors) and the number of employees with the turnover, cash flow, shareholders' funds, and the firm's size. However, on the other side, unfavuorable connections were induced by the managers and directors on the performance, measured by the *ROA*, *ROE*, *ROCE*, *EBIT*, and *EBITDA* margins (H_7). Overall, the level of independence of these companies appears to have low interconnections with the performance indicators and company size (H_8).

Generally, we can state that the results emphasise a keen need for specific measures to be taken in order to reconsider the size of the key parties in corporate governance (especially, the number of directors and managers) and the shareholders' participation in the ownership of these companies, due to their unfavourable implications. Therefore, specific measures must especially address the reconsideration of the number of directors and managers and their relationship to the profitability and liquidity (cash flow). Considering the medium current number of directors and managers for these companies, which is 4 (Table 2) and the optimal number recommended by the theory (Price 2017) – between 6–8 for medium companies, and 8–12 for large companies – attention should be directed to increasing the number of directors and managers with very good skills and expertise. The positive effects of large boards are underpinned by their 'potential to provide an increased pool of expertise' gathered by various and specific 'knowledge and skills' (Levrau and Van den Berghe 2007). On the other hand, a large number of managers and directors might determine unfavourable consequences, due to the potential difficulties in coordinating and overcoming problems which may arise, even in terms of communication, being more demanding in establishing interpersonal connections.

Concerning the ownership, property is, generally, well defined for the case of agricultural activities, being placed under private ownership, but the situation might change when fishing and aquaculture activities are addressed. Consequently, new property regimes may arise in the allocation of aquaculture sites, circumscribed to governmental policies (Marshall 2001), with implications on the ownership concentration. Such 'free gifts' of nature (land and water) must be properly used to generate incentives, namely financial performance for the firms operating in these areas (Furnivall 1909).

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Therefore, stable systems of rules, practices, and policies adopted in a concerted effort by companies belonging to the member states are necessary more than ever to meet the current challenges.

The current research also faces some limitations related to the relatively reduced availability of data for certain indicators. Future research should target the role of human capital features (experience and skills) on the corporate governance, with managerial implications and constraints, and, in this way, on the performance of companies in this sector. Another future research direction is to study those relationships implicitly considering the quality of the institutional environment (rule of law, private property rights, institutional fragility index, or worldwide governance indicators) that circumscribe the economic activity in the agricultural, aquaculture and fishing sectors. Also, we will focus on the analysis of the investment risk in a company where the shareholder is also the manager, and thus the company's dependence on a single key person may appear.

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