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Board gender diversity and firm performance: evidence from the Russian agri-food industry

RESEARCH ARTICLE

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Abstract

This study provides pioneering empirical evidence on board gender diversity and firm performance relationship for the case of large-scale agri-food companies in Russia. While Russia plays an important role in the global food security, its domestic agri-food production is heavily dependent on large scale producers. Our findings suggest a strong positive link between the percentage of female directors in boardrooms and firm performance. Moreover, in line with critical mass theory, boards with three or more female directors have greater impact on firm performance compared to boards with two or less female directors. Further analysis shows that the presence of female directors in the company has a positive impact on firm performance, mainly due to their executive, rather than monitoring effects. The paper shed light on gender diversity of Russian corporate boardrooms and provides empirical recommendations for policy makers as well as corporate executives in Russia.

Keywords: corporate governance, board of directors, gender diversity, firm performance, Russia
JEL code: M14, Q12, Q13

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1. Introduction

Globally, the organization of food production experienced significant changes during the last couple of decades. An increased role of industrial, large-scale farming lead to the emergence of new agribusiness models that: (1) operate at a significantly larger scale compared to traditional farms; (2) have integrated production and processing; and (3) have corporate-style organizational structures in place (Boehlje, 1999; Petrick *et al.*, 2013). The size of these agri-food enterprises can reach up to 500,000 hectares (ha) and in some cases even more (Hermans *et al.*, 2017). In some countries of the former Soviet Union, Latin America, and Eastern Europe, large-scale agri-food enterprises are getting even larger due to growing competition over land and improved access to international capital markets (Chaddad, 2014; Deininger and Byerlee, 2011).

The role of large-scale agri-food production in tackling the global food security problem is very crucial. On the one hand enhancing large scale farming is important for boosting agricultural production, especially because of the increasing gap between the demand and supply of food worldwide, as suggested by Collier (2008) and Collier and Dercon (2014). On the other hand, because of their enormous size and their high share of total agri-food production, bankruptcy of such large-scale agri-food enterprises raises the issue of food security even further. The role of Russia is very important in both cases. While Russia is already one of the world's largest exporters of crops like wheat, barley, and sunflower seeds, it has a huge potential to further increase its list of exported agri-food products. The government of Russia is heavily promoting domestic agri-food production with a goal of achieving self-sufficiency levels for a number of food products and also to become one of the largest exporters of those products globally (Götz and Djuric, 2016). Furthermore, the high concentration of agri-food production in the hands of a few large enterprises in Russia means the food security issue is in question. For instance, 12.6 million ha of land, or 10.5% of all cultivated land in Russia, is operated by 55 of the largest agri-food companies (BEFL Agency, 2018). A similar situation is observed in the meat and dairy sectors, with the top 25 meat producers and the top 20 milk producers accounting for 43% of all meat and 9.7% of all milk production, respectively (Agroinvestor, 2017; Dairynews, 2018). Defaults of such huge enterprises could thus damage domestic as well as global food security, especially if such cases were widespread. In fact, a significant share of agro-holdings in Russia are in situations of financial difficulty or bankruptcy (Spoor *et al.*, 2012), with 20% of all bankruptcy cases in Russia being corporate farms (Yastrebova, 2005). Such corporate defaults in the agri-food industry can also be traced in the Ukraine, the second largest agricultural producer after Russia among post-communist countries (Gagalyuk, 2017). Therefore, not only is the emergence of large scale agri-food companies important for food security but their economic sustainability as well.

In this respect, it's important to study the factors that could improve the performance of large-scale agri-food enterprises, and thus maintain their economic sustainability. We focus primarily on the roles of boards of directors in improving firm performance. The roles of the boards are especially crucial for large-scale agri-food production, where companies are mainly operated by hired managers who are not the residual claimants of the income. This opens the door for potential agency conflict between the owner(s) and the manager(s) of the company. According to Eisenhardt (1989), agency conflict can arise either because the goals of the owner and the manager are not the same, or because it is difficult and costly for the owner to verify what the manager is actually doing. As a result, it can lead to inefficient and poor management of firms, which in turn may negatively influence firm performance. The role of the board of directors is especially important in this regard, as one of the primary duties of the board is to monitor executive management and ensure that shareholders' interests are best pursued by management (Fama, 1980). Well-functioning boards of directors can thus play an extremely important role in minimizing the agency conflict issue and improving company performance (Hillman and Dalziel, 2003).

While earlier studies on corporate governance emphasize the importance of board size, board independence, director ownership, and executive compensation on board functioning and firm performance, a new strand of research is investigating the role of board diversity. Board gender diversity, in particular, has become one of the most debated issues in both popular and academic literature during the last couple of years (McKinsey

& Company, 2016; Terjesen *et al.*, 2016). In Europe, for example, governments are paying more attention to increased female representation in the boardroom and top management positions (Reguera-Alvarado *et al.*, 2017; Terjesen *et al.*, 2016).

Existing literature suggests that female directors can bring additional value to the firm, as female executives tend to be more attentive in making crucial corporate decisions (Huang and Kisgen, 2013; Levi *et al.*, 2014) and are more diligent monitors (Adams and Ferreira, 2009). They can also bring different views and experiences to the board, and contribute to better decision making of the board (Hillman *et al.*, 2007). While many national corporate governance codes stimulate female representation on boards, some countries, like Norway and Spain, even mandate gender quotas for public companies (Terjesen *et al.*, 2016).

However, the literature on the relationship between board gender diversity and firm performance remains inconclusive, and mostly focuses on the US and other developed economies. While Carter *et al.* (2003) and Campbell and Mínguez-Vera (2008) observe the positive impact between the share of female directors and firm performance, other studies like Adams and Ferreira (2009) and Ahern and Dittmar (2012) have quite opposite results, while others do not observe a significant relationship at all (Carter *et al.*, 2010; Randøy *et al.*, 2006; Rose, 2007).

The current study attempts to investigate the relationship between board gender diversity and firm performance in the case of Russian agri-food enterprises and thereby aims to fill several gaps in the existing literature: first of all, we provide a new empirical evidence to rather inconclusive literature on the relationship between board gender diversity and firm performance. Secondly, we enlarge the literature beyond developed economies, with well-established corporate governance culture, and focus on a post-communist transition country: Russia, which has quite a short market economy history and relatively under-developed corporate governance (Li *et al.*, 2012). This has resulted in a large number of corporate bankruptcies, especially in the agri-food industry (Yastrebova, 2005). Moreover, Russia is one of the largest agricultural producers worldwide, playing an important role in global food security, making this study even more relevant. Thirdly, we conduct a pioneering analysis in the context of large-scale agri-food production, which plays a crucial role in the national food security of Russia. Fourthly, we follow the recommendations of Terjesen *et al.* (2016) and distinguish the effects of female representation as executive and monitoring effects. Lastly, we analyze the empirical evidence on critical mass theory impacts in the context of the board gender diversity-firm performance relationship.

The remainder of the paper is organized as follows: section 2 provides an overview of the literature on the board gender diversity and firm performance relationship. This study's data and methodology is then described in section 3, followed by the empirical results together with a discussion in section 4. Finally, our conclusion is presented in section 5.

2. Literature review

A growing body of literature emphasizes the importance of gender diversity in corporate boardrooms and among top management positions (Campbell and Mínguez-Vera, 2008; Carter *et al.*, 2003; Catalyst, 2007; Liu *et al.*, 2014; McKinsey & Company, 2007; Nguyen *et al.*, 2015; Terjesen *et al.*, 2016). While many European countries encourage increased female representation within corporate governance, some countries are even implementing affirmative actions, such as quotas. Female representation in the boardrooms of large companies in countries like Norway, Belgium, and Netherlands, for instance, must not be lower than 40, 33, and 30%, respectively (Marinova *et al.*, 2016). The arguments behind greater gender diversity can be categorized into two broader groups: ethical and economic. The former suggests that excluding females from the boardrooms because of their gender is immoral and that firms should balance gender diversity to maintain equality in society (Brammer *et al.*, 2007). The latter highlights economic motivation, or the so-called 'business case', which is based on the arguments that female representation among corporate boards might improve the financial performance of the company (Campbell and Mínguez-Vera, 2008).

The empirical evidence on the relationship between board gender diversity and firm performance is inconclusive and remains rather controversial. While some scholars observe the relationship between gender diversity and firm performance as positive, others find a negative relationship, and others still do not detect any links at all (Table 1).

Carter *et al.* (2003) study the relationship between board gender diversity and firm value among a sample of US firms. They observe a positive relationship between board gender diversity and firm value, measured as

Table 1. Overview of the literature (in chronological order).[1]

Author(s), year	Gender diversity	Performance	Data	Main result
Marinova *et al.*, 2016	female ratio	Tobin's Q	186 firms, Denmark and Netherlands (2007)	no relationship
Terjesen *et al.*, 2016	female dummy, female ratio	Tobin's Q, ROA	3,876 firms, 47 countries (2010)	positive relationship
Nguyen *et al.*, 2015	female ratio, Blau index	Tobin's Q, ROA	120 firms, Vietnam (2008-2011)	positive relationship
Liu *et al.*, 2014	female dummy, female ratio	ROA ROS	2,000 firms, China (1999-2011)	positive relationship
Ahern and Dittmar, 2012	female ratio	Tobin's Q	248 firms, Norway (2001-2009)	negative relationship
Bøhren and Strøm, 2010	female ratio	Tobin's Q, ROA, ROS	203 firms, Norway (1989-2002)	negative relationship
Carter *et al.*, 2010	number of females	Tobin's Q, ROA	641 firms, US (1998-2002)	no relationship
Lückerath-Rovers, 2013	female ratio	ROE, ROS, ROIC	99 firms, Netherlands, (2005-2007)	positive relationship
Adams and Ferreira, 2009	female dummy, female ratio	Tobin's Q, ROA	1,939 firms, US (1996-2003)	negative relationship
Miller and Del Carmen Triana, 2009	Blau index	ROI, ROS	326 firms, US (2003)	no relationship
Campbell and Mínguez-Vera, 2008	female dummy, female ratio, Blau index	Tobin's Q	68 firms, Spain (1995-2000)	positive relationship
Nguyen and Faff, 2007	female dummy, female ratio	Tobin's Q, ROA	793 firms, Australia (2000-2001)	positive relationship
Rose, 2007	female ratio	Tobin's Q	100 firms, Denmark (1998-2001)	no relationship
Randøy *et al.*, 2006	female ratio	ROA, equity value	459 firms, Denmark, Norway and Sweden (2005)	no relationship
Carter *et al.*, 2003	female dummy, female ratio	Tobin's Q, ROA	638 firms, US (1997)	positive relationship
Singh *et al.*, 2001	female ratio	ROA	100 firms, UK (1999-2000)	positive relationship
Shrader *et al.*, 1997	female ratio	ROS, ROA, ROI, ROE	200 firms, US (1992)	negative relationship

[1] ROA=return on assets (net income/total assets); ROE=return on equity (net income/total equity); ROI=return on investment (investment gain/investment base); ROIC=return on invested capital (net operating profit after tax/invested capital); ROS=return on sales (net income/sales).

Tobin's Q. Focusing on a sample of Spanish firms, Campbell and Mínguez-Vera (2008) find a positive link between the percentage of female directors in the boardroom and firm financial performance. Liu *et al.* (2014) observe that not only the percentage, but also the absolute number of female directors in the boardroom are important for determining a firm's financial performance. According to their results, one-female boardrooms do not have any effect on return on sales (ROS). However, they found that having boardrooms with two and three or more female directors can improve ROS by 0.02% and 0.06%, respectively.

Contrarily, Ahern and Dittmar (2012) and Bøhren and Strøm (2010) discovered that the fraction of female directors in the boardroom is negatively linked to a firm's financial performance (measured as Tobin's Q and return on assets (ROA)) in the case of the sample of firms in Norway. Adams and Ferreira (2009) observe similar results for their sample of US firms.

Another stream of research does not find any links between boardroom gender diversity and firm performance. Rose (2007) and Randøy *et al.* (2006) find no evidence of a relationship between the fraction of female directors on boards and firms' financial performance in the case of Norwegian firms. A similar result was obtained by Carter *et al.* (2010), who looked at US firms, finding that an additional female board of director does not improve a firm's financial performance.

Agency theory and resource dependence theory are the dominant theories used to explain the relationship between board gender diversity and firm performance, as well as the reasons behind the rather inconclusive empirical results.

Agency theory emphasizes the importance of the monitoring function of boards of directors, as it plays a crucial role in minimizing the principal-agent conflict, which in turn can improve firm performance (Fama and Jensen, 1983; Jensen and Meckling, 1976). Recent empirical research provides evidence that higher gender diversity could potentially improve the monitoring functions of a board. Female directors tend to be more active on the board compared to male directors (Virtanen, 2012); have better monitoring abilities (Adams *et al.*, 2011); and demand more audit efforts and chief executive officer (CEO) responsibility (Adams and Ferreira, 2009; Gul *et al.*, 2008). Other studies show that female directors are more inclined to ask questions and debate issues compared to their male counterparts (Bilimoria and Wheeler, 2000; Ingley and Van der Walt, 2005). At the same time, Carter *et al.* (2003) argue that female representation in boardrooms does not necessarily strengthen monitoring functions of a board, particularly if the female directors are marginalized. Moreover, improved monitoring by boards of directors does not always lead to better firm performance; that rather depends on the quality of a firm's governance. Board gender diversity can add value to firms with weak corporate governance, as it enhances additional monitoring (Adams and Ferreira, 2009). This view is supported by Gul *et al.* (2011), who claim that having higher gender diversity in the boardroom enables firms to partially remedy their poor corporate governance and thus improve performance. However, board gender diversity can diminish the performance of firms with strong corporate governance due to unnecessary over-monitoring (Adams and Ferreira, 2009).

Resource dependence theory is another widely used theory by scholars to explain the relationship between board gender diversity and firm performance. It argues that board gender diversity can contribute to a firm's vital resources and improve the linkage between a firm and its external environment (Goodstein *et al.*, 1994; Pfeffer, 1973). Namely, female directors can contribute to a board's human capital by bringing additional insights, particularly about female employees, customers, and business partners (Daily *et al.*, 1999). Women also tend to have better understanding of the consumer market, as most of the household purchasing decisions are made by them (Arfken *et al.*, 2004; Post and Byron, 2015). In addition, gender diversity may bring more creativity and innovation to a board (Campbell and Mínguez-Vera, 2008), improve information processing (Dezsö and Ross, 2012) and provide better problem solving (Marinova *et al.*, 2016). Furthermore, as gender equality becomes a generally accepted social norm, gender diversity in the boardroom may improve the public image, and thus the performance of the firm (Cox *et al.*, 1991; Smith *et al.*, 2006). However, heterogeneity in the boardroom does not necessarily improve its effectiveness. In contrast, increased board diversity may

increase the possibility of conflicts (Joshi *et al.*, 2006; Richard *et al.*, 2004) and make it more difficult to reach a consensus on important matters and therefore slow the decision-making process (Hambrick *et al.*, 1996).

While both theories argue that there is a relationship between board gender diversity and firm performance, the nature of this link is not straightforward and depends on various factors (Carter *et al.*, 2003, 2010; Rose, 2007; Smith *et al.*, 2006).

Besides gender diversity in the boardroom, the profiles of directors may also impact the effectiveness of the board and firm performance (Bennouri *et al.,* 2018). Compared to their male counterparts, female directors considerably differ in terms of demographic attributes (Ahern and Dittmar, 2012), experience and expertise (Singh *et al.*, 2008), and personal characteristics such as risk perception (Croson and Gneezy, 2009). Female directors are found to be better educated (Nekhili and Gatfaoui, 2013; Singh *et al.*, 2008), are more likely to hold advanced and business degrees (Hillman and Dalziel, 2003; Nekhili and Gatfaoui, 2013), are more likely to have strength in marketing and sales (Groysberg and Bell, 2013) and deliver international diversity to the boardroom (Singh *et al.*, 2008). Better educated directors can better grasp, analyze and offer solutions to complex problems (Johnson *et al.*, 2013) and thus improve firm performance (Bennouri *et al.,* 2018; Kim and Lim, 2010). Not only the level, but also the type of education is important for the diversity and effective functioning of the board. Ruigrok *et al.* (2007) reveal that business-related degrees facilitate the access of minorities to top management positions. In fact, the attributes of female directors (education, experience, etc.) are found to have a mediating effect on companies' strategic decisions and performance (Güner *et al.*, 2008; Johnson *et al.*, 2013), which might be one of the reasons behind mixed empirical results on board gender diversity and firm performance nexus. Ahern and Dittmar (2012) observe that the negative effect of female directors on Tobin's Q becomes insignificant after controlling for board of directors' age and experience. The nature of the link between female directors and firm performance might differ, depending on whether the female directors have relevant industry experience (Kor and Sundaramurthy, 2009; Tian *et al.*, 2011), experience as a CEO (Fahlenbrach *et al.*, 2010) and financial expertise (An and Jin, 2004; Stearns and Mizruchi, 1993). The age of the directors might also have different impact on board functioning and thus on firm performance. While younger directors may bring more technical knowledge (Bantel and Jackson, 1989), better cognitive resources (Bantel and Jackson, 1989) and are more likely to initiate strategic and innovative decisions (Ahn and Walker, 2007), older directors may bring valuable expertise and experience to the board (Johnson *et al.*, 2013). National diversity among board members might also affect the functioning of the board and thus impact the corporate performance (Bennouri *et al.,* 2018). On the one hand, foreign directors may enhance the effectiveness of the board, by bringing new skills, broader networks and better understanding of the international markets (Ben-Amar *et al.,* 2013; Ruigrok *et al.*, 2007). On the other hand, foreign directors may hinder the board functioning, since they are less familiar with regional legislation, accounting and governance standards and business norms (Masulis *et al.*, 2012) and their presence might reduce the communication quality within the board (Anderson *et al.,* 2011).

3. Data and methodology

In this study, we use a unique cross-sectional data of 261 randomly selected, publicly reported agri-food companies in Russia for the year of 2016. All the companies in the sample are involved in the production (i.e. grain, vegetable oil, livestock, etc.) and/or processing (dairy products, meat products, etc.) of the agri-food products and represent the sub-sample of all federal districts of Russia.

The main sources of data are the quarterly and annual reports as well as financial statements of the enterprises, which are downloaded from the publicly accessible database of the 'Interfax – Corporate Information Disclosure Center[1]' agency. It is one of the five agencies authorized to disclose information on the Russian securities market. Using the above mentioned reports and statements, we manually collected accounting,

[1] https://www.e-disclosure.ru/

corporate governance, and firm-specific data needed for our analysis. See Table 2 for a description of all variables used in the study.

Our main regression model is as follows:

$$\text{Firm performance} = \alpha_0 + \alpha_1 \text{board gender diversity} + \alpha_2 \text{control variables} + \varepsilon \quad (1)$$

Firm performance, board gender diversity, as well as control variables used in this study, are explained in detail in the following sub-section.

Table 2. Variables and descriptions.[1]

Variables	Description
Panel A: dependent variables	
ROA	net income / total assets
ROS	net income / sales
Panel B: explanatory variables	
%_Female	percentage of female directors
%_ExecutiveFemale	percentage of female executive directors (executive female directors / total female directors)
%_IndependentFemale	percentage of female independent directors (independent female directors / total female directors)
D_1Female	dummy variable, equal to 1 if board has 1 female director, 0 otherwise
D_2Female	dummy variable, equal to 1 if board has 2 female director, 0 otherwise
D_3Female	dummy variable, equal to 1 if board has 3 or more females directors, 0 otherwise
Panel C: control variables	
Board characteristics	
BoardSize	natural logarithm of the total number of directors in the boardroom
%_Independent	percentage of independent directors
D_CEO_Bonus	dummy variable, equal to 1 if ceo receives performance bonus, 0 otherwise
%_DirectorOwnership	share of the board of directors in the ownership structure of the firm
%_CEO_Ownership	share of the ceo in the ownership structure of the firm
Firm characteristics	
FirmSize	natural logarithm of firm's sales
FirmAge	natural logarithm of the number of years since the firm was first registered by the state
D_Industry	dummy variable, equal to 1 if the firm is a food processor, 0 if the firm is an agricultural producer
Leverage	total debt / total assets
Lagged dependent variables	
Lag_ROA	1-year lag of the ROA
Lag_ROS	1-year lag of the ROS
Instrumental variable	
%_FemaleOwnership	share of female individuals in the ownership structure

[1] ROA=return on asset; ROS=return on sale.

3.1 Variables

■ *Firm performance*

There are two main ways of measuring firm performance generally accepted in the literature: market value-based ratios (Tobin's Q) and accounting-based ratios (ROA, ROE, ROS). In this study, we focus only on accounting-based ratios, as most of the firms under study were not listed on stock exchanges and, thus, market value variables were not available. To improve the robustness of our analysis, we employ two performance measures: ROA and ROS. These ratios are widely used to measure firms' financial performance within the corporate governance literature (Adams and Ferreira, 2009; Liu *et al.*, 2014; Shrader *et al.*, 1997). Both ROA and ROS were manually calculated using accounting data extracted from financial statements.

■ *Board gender diversity*

This study employs three different ways for measuring board gender diversity. Firstly, in line with previous studies, we define board gender diversity as the percentage of female directors (*%_Female*) on the corporate boards. Secondly, we use the percentages of independent (*%_IndependentFemale*) and executive (*%_ExecutiveFemale*) female directors in the boardroom as an indicator of board gender diversity. By doing so, we can distinguish the impact of female representation in the boardroom on executive and monitoring effects. Finally, to further improve the robustness of the results, we follow the work of Liu *et al.* (2014) and employ an alternative proxy for board gender diversity, which consists of three dummy variables. The dummy variables *D_1Female*, *D_2Female* and *D_3Female* are designed to distinguish between firms which have one, two, and three or more female directors on their corporate boards, respectively. This allows us to also understand whether the absolute number of female directors in the boardroom matters or not.

■ *Control variables*

Following prior research, we also include variables to control for board and firm-level characteristics that can potentially impact firm performance. At the board level, we control for board size (*BoardSize*), percentage of independent directors (*%_Independent*), CEO performance bonus (*D_CEO_Bonus*), the shares of director (*%_DirectorOwnership*), and CEO ownership (*%_CEO_Ownership*). Previous studies suggest a positive link between the percentage of independent directors (Black and Kim, 2012; Dahya and McConnell, 2007); executive compensation (Mehran, 1995); ownership by directors and executive management (McConnell and Servaes, 1990; Morck *et al.*, 1988); and firm performance. Large board size on the other hand may create additional coordination costs and thus might be burdensome for the firms (Jensen, 1993; Yermack, 1996). As for firm characteristics, we control for firm size '*FirmSize'* (Marinova *et al.*, 2016); firm age *'FirmAge'* (Reddy *et al.*, 2008); industry *'D_Industry'* (Nguyen *et al.*, 2015); and leverage '*Leverage'* (Chen *et al.*, 2003). Furthermore, in line with the work of Nguyen *et al.* (2015) we added one-year lagged performance measures (*Lagged_ROA, Lagged_ROS*) as control variables.

3.2 Endogeneity

Adams and Ferreira (2009) suggest the possibility of an endogeneity problem when studying the relationship between board gender diversity and firm performance, which can take place due to several reasons. Firstly, there might be omitted and unobserved firm characteristics that may affect the appointment of female directors to the board. Secondly, there might be a reverse causality between firm performance and board gender diversity. This implies that either board gender diversity may lead to higher firm performance, or that high performing firms may tend to have more gender diverse boards. Using ordinary least squares (OLS) model in such cases might lead to biased results. To address this issue, we follow the studies of Campbell and Mínguez-Vera (2008), Carter *et al.* (2003), and Marinova *et al.* (2016) and employ a two-stage least-square (2SLS) method in our analysis. In order to make a comparison, we also present the results of the OLS regression.

Following Carter *et al.* (2003), we estimate a 2SLS model as a system of two simultaneous equations given below.

$$\text{Board gender diversity} = \beta_0 + \sum \beta z + v \quad (2)$$

$$\text{Firm performance} = \alpha_0 + \alpha_1 \text{board gender diversity} + \sum \alpha x + \mu z + \varepsilon \quad (3)$$

where x represents a vector of control variables and z is an instrumental variable.

Applying the 2SLS method requires an instrumental variable that is correlated with board gender diversity but does not have direct impact on firm performance. However, finding a valid instrument, particularly in the context of corporate governance, is very difficult, as most variables that correlate with board gender diversity are often other governance factors that are already included in the regression to explain firm performance (Adams and Ferreira, 2009). We assume that the percentage of female directors on the board depends on the proportion of female shareholders. As boards of directors are elected by companies' shareholders, there is a possibility that shareholders with higher female representation are more likely to elect female directors into boardrooms. Following this logic, we use the share of female individuals (*%_FemaleOwnership*) in the ownership structure of the company as an instrumental variable. Validity of the chosen instrument is confirmed by the Wald test, where we rejected the null hypothesis that the instrument is weak.

4. Results and discussion

The descriptive statistics of the key variables used in the study are reported in Table 3. On average, the corporate boards in our sample have 29% female directors, of which 15% are executive and 14% are independent directors. Around 27, 29, and 28% of companies have one, two, and three or more female directors on their corporate boards, respectively, and only 16% of the companies have no female representation in their boardrooms.

An average boardroom from our sample consists of about six directors, of which about 28.3% are independent directors. The CEOs of nearly one-third of all the firms receive performance-related bonus payments. Of the

Table 3. Descriptive statistics of key variables.[1]

Variables	Obs	Mean	Std.	Min.	Max.
ROA	261	5.1%	0.07	-0.22	0.23
ROS	261	6.5%	0.18	-1.36	0.64
%_Female	261	29.5%	0.19	0	0.86
%_ExecutiveFemale	261	15.1%	0.18	0	0.78
%_IndependentFemale	261	14.4%	0.17	0	0.8
D_1Female	261	27.4%	0.45	0	1
D_2Female	261	28.5%	0.45	0	1
D_3Female	261	28.1%	0.45	0	1
BoardSize	261	1.79	0.26	1.61	2.71
%_Independent	261	28.3%	0.27	0	0.86
D_CEO_Bonus	261	33.1%	0.47	0	1
%_DirectorOwnership	261	23.8%	0.32	0	1
%_CEO_Ownership	261	14.6%	0.26	0	1
FirmSize	261	12.82	1.71	8.20	18.25
FirmAge	261	2.83	0.44	0.69	3.26
Leverage	261	45.5%	0.30	0.01	0.99

[1] ROA=return on asset; ROS=return on sale.

total shares of the firms, nearly 24% and 17% on average are owned by the boards of directors and CEOs, respectively. The average age of a firm in our sample is 19 years old, has annual sales of 1.9 billion Rubles (approximately 31.2 million USD), and a debt-to-asset ratio of 45%. The average values of the ROA and ROS are 5.1% and 6.5%, respectively.

To assess the possible presence of multicollinearity in the regression, we estimate the correlations among all independent variables (Supplementary Material Table S1). As a general rule, a regression model might have a multicollinearity issue if the absolute terms of correlation coefficients are 0.7 or above (Liu *et al.*, 2014). According to Supplementary Material Table S1, the highest correlation (0.69) is observed between *%_Female* and *D_3Female*. This high correlation level is not an issue, however, since the two variables are alternative measures of gender diversity, and therefore are not simultaneously used in the regression analysis.

Table 4 illustrates the results of the OLS and 2SLS regressions on the relationship between board gender diversity, measured by the percentage of female directors (*%_Female*) in the boardroom, and firm performance, measured by the ROA and ROS. In both cases the percentage of female directors in the boardroom has a significant positive impact ($P<0.05$) on the ROA and ROS. According to the 2SLS model, for example, keeping all other factors fixed, a 1% increase in the percentage of women in the boardroom leads to 0.18% and 0.59% growth in the ROA and ROS, respectively. This result is in agreement with the findings of Singh *et al.* (2001) in the case of the UK market, Carter *et al.* (2003) in the case of the US market, and Nguyen and Faff (2007) in the case of an Australian market. However, these findings contrast those of Bøhren and Strøm (2010) in the case of Norwegian market.

With respect to control variables, we observe a strong positive relationship ($P<0.01$) between the share of independent directors (*%_Independent*) on a board and firm performance (Table 4). The result is in line with the general consensus among researchers on the significant positive connection between board independence and firm performance (Black and Kim, 2012; Dahya and McConnell, 2007; Rosenstein and Wyatt, 1990). Moreover, corporate governance codes of many countries recommend that a certain share of the board be composed of independent directors. In the case of Russia, the number of independent directors in the boardroom needs to be at least one-third of the board size (CG code, 2014).

Previous studies suggest a negative link between board size and firm performance, mainly due to the ineffectiveness of coordination and decision making of large boards (Eisenberg *et al.*, 1998; Guest, 2009; Yermack, 1996). However, our findings do not demonstrate any significant impact of the total number of directors in the boardroom (*BoardSize*) on firm performance (Table 4). This may imply that, on average, Russian agro-holdings assign the optimal number of directors to their boards (Beiner *et al.*, 2004). Furthermore, this might also be the result of relative homogeneity of board size among our sample, with nearly 85% of all firms having five or seven directors on their boards. The proportion of total debt to total assets (*Leverage*) has a strong negative effect ($P<0.01$) on firm performance (Table 4). Jiraporn *et al.* (2012) suggest that debt financing might be a substitute for poor corporate governance due to additional monitoring by debt providers, which in turn may improve firm performance. On the other hand, González (2013) argues that the relationship between debt financing and firm performance depends on two factors: the cost of debt and the role of debt to push managers to make value maximizing decisions. The net effect of debt financing therefore depends on which of those factors prevail over the other. Regarding Russia, a relatively high cost of debt compared to other developed economies may be one of the possible explanations for the negative link between financial leverage and firm performance. Ownership structure overall does not have any considerable impact on firm performance. While we observe a significant positive connection between CEO ownership (*%_CEO_Ownership*) and firm performance with the OLS models, this relationship disappears when we run the 2SLS regression (Table 4). Similarly, the effects of CEO compensation schemes, in the form of performance-related bonus payments (*D_CEO_Bonus*) on firm performance are non-existent overall (Table 4).

To further understand how female representation in the boardroom affects firm performance, we breakdown the percentage of female directors into executive directors and independent directors. We then re-run our

Table 4. The impact of board gender diversity on firm performance (standard errors in parentheses).[1,2]

Variables	OLS		2SLS	
	ROA	ROS	ROA	ROS
%_Female	0.0413**	0.123**	0.181**	0.588**
	(0.0169)	(0.0517)	(0.0833)	(0.258)
%_Independent	0.0458***	0.173***	0.0606***	0.221***
	(0.0125)	(0.0382)	(0.0162)	(0.0502)
BoardSize	0.0119	-0.00782	-0.00791	-0.0726
	(0.0123)	(0.0377)	(0.0178)	(0.0549)
D_CEO_Bonus	0.0151**	0.0255	0.00924	0.00522
	(0.00680)	(0.0208)	(0.00823)	(0.0258)
%_DirectorOwnership	-0.00877	0.00612	-0.00810	0.00661
	(0.0137)	(0.0419)	(0.0151)	(0.0471)
%_CEO_Ownership	0.0457***	0.128**	0.0374*	0.100
	(0.0173)	(0.0529)	(0.0196)	(0.0614)
FirmSize	0.00248	0.0191***	0.00340	0.0215***
	(0.00213)	(0.00639)	(0.00241)	(0.00730)
FirmAge	-0.00318	-0.0203	-0.00520	-0.0263
	(0.00804)	(0.0245)	(0.00894)	(0.0278)
D_Industry	-0.0150*	-0.0993***	-0.0235**	-0.126***
	(0.00784)	(0.0234)	(0.00996)	(0.0299)
Leverage	-0.0455***	-0.142***	-0.0402***	-0.119***
	(0.0126)	(0.0358)	(0.0142)	(0.0422)
Lag_ROA	0.310***		0.297***	
	(0.0339)		(0.0381)	
Lag_ROS		0.0437***		0.0411***
		(0.0102)		(0.0115)
Constant	-0.0225	-0.117	-0.0327	-0.153
	(0.0415)	(0.127)	(0.0461)	(0.144)
Observations	261	261	261	261
R-squared	0.543	0.349	0.417	0.138

[1] OLS=ordinary least squares; 2SLS=two-stage least-square; ROA=return on asset; ROS=return on sale.

[2] *P<0.1; **P<0.05; ***P<0.01.

main regression model (Equation 1) by replacing the board gender diversity measure with the percentage of female executive directors (*%_ExecutiveFemale*) and independent directors (*%_IndependentFemale*).

The estimates of this regression analysis are illustrated in Table 5.[2] Results suggest that female directors improve firm performance not through monitoring, but mainly through the executive channel. Similar to the findings of Liu *et al.* (2014), a strong positive link between the percentage of female executive directors (*%_ExecutiveFemale*) and both performance measures (ROA and ROS) is observed.

In our next step, we aim to understand whether the absolute number of female directors in the boardroom matters for the board gender diversity-firm performance relationship. In other words, do three female directors in a fifteen-member boardroom have the same impact on the firm performance as one female director in a five-member boardroom does?

[2] As the share of female individuals in the ownership structure (%_FemaleOwnership) is not a proper instrument for the percentage of female executive and independent directors, as well as for the absolute number of female directors in the boardroom, we do not report the results of the 2SLS model in Table 5, or hereafter.

Table 5. Robustness checks with *%_ExecutiveFemale* and *%_IndependentFemale* as alternative measures for gender diversity (standard errors in parentheses).[1,2]

Variables	ROA	ROS
%_ExecutiveFemale	0.0507**	0.167***
	(0.0209)	(0.0639)
%_IndependentFemale	0.0225	0.0747
	(0.0203)	(0.0620)
%_Independent	0.0472***	0.179***
	(0.0126)	(0.0385)
BoardSize	0.0118	-0.0102
	(0.0123)	(0.0377)
D_CEO_Bonus	0.0154**	0.0262
	(0.00680)	(0.0208)
%_DirectorOwnership	-0.0110	-0.000806
	(0.0138)	(0.0422)
%_CEOOwnership	0.0419**	0.115**
	(0.0177)	(0.0540)
FirmSize	0.00221	0.0184***
	(0.00214)	(0.00641)
FirmAge	-0.00407	-0.0235
	(0.00811)	(0.0247)
D_Industry	-0.0148*	-0.0996***
	(0.00785)	(0.0234)
Leverage	-0.0437***	-0.137***
	(0.0127)	(0.0361)
Lag_ROA	0.312***	
	(0.0340)	
Lag_ROS		0.0442***
		(0.0102)
Constant	-0.0156	-0.0948
	(0.0421)	(0.128)
Observations	261	261
R-squared	0.543	0.353

[1] ROA=return on asset; ROS=return on sale.

[2] *P<0.1; **P<0.05; ***P<0.01.

To answer this question we re-run our main regression (Equation 1) by substituting the percentage of female directors with three dummy variables (Table 6). The dummy variables *D_1Female, D_2Female* and *D_3Female* represent firms with one, two, and three or more female directors in the boardroom, respectively.

According to the results, there is no significant relationship between a board with only one female director and firm performance. However, as the number of female directors increases, the relationship becomes significant and the impact of female directors on the firm performance becomes stronger. For instance, firms with two and three or more female directors on the board have a 0.08% and 0.1% higher ROS on average, respectively.

Taken together, the current study addresses several important issues for both policymakers and managers or executives in Russia. A strong positive impact of female directors on firm performance suggests that policy makers in Russia should consider prioritizing the issue of board gender diversity at the national level, particularly among large-scale agri-food producers. By doing so, policymakers can contribute to enhancing

Table 6. Robustness checks with *D_1Female, D_2Female* and *D_3Female* as alternative measures for gender diversity (standard errors in parentheses).[1,2]

Variables	ROA	ROS
D_1Female	0.0103	0.0363
	(0.00959)	(0.0292)
D_2Female	0.0199**	0.0764***
	(0.00956)	(0.0290)
D_3Female	0.0341***	0.105***
	(0.0106)	(0.0323)
_Independent	0.0462***	0.175***
	(0.0124)	(0.0379)
Ln_BoardSize	-0.00598	-0.0602
	(0.0142)	(0.0433)
CEO_performance_bonus	0.0141**	0.0216
	(0.00676)	(0.0206)
_DirectorOwnership	-0.00681	0.0107
	(0.0136)	(0.0416)
_ExecutiveOwnership	0.0431**	0.119**
	(0.0172)	(0.0527)
Ln_Sales	0.00240	0.0190***
	(0.00212)	(0.00633)
D_Industry	-0.0155**	-0.101***
	(0.00778)	(0.0231)
Ln_FirmAge	-0.00298	-0.0193
	(0.00799)	(0.0243)
Leverage	-0.0445***	-0.138***
	(0.0126)	(0.0358)
ROAt1	0.307***	
	(0.0340)	
ROSt1		0.0426***
		(0.0101)
Constant	0.00425	-0.0493
	(0.0431)	(0.132)
Observations	261	261
R-squared	0.553	0.367

[1] ROA=return on asset; ROS=return on sale.

[2] *P<0.1; **P<0.05; ***P<0.01.

the economic sustainability of large-scale agri-food enterprises, who in turn play significant roles in sustaining national food security. Higher board gender diversity could improve firm performance (Gul *et al.*, 2011) by enhancing additional monitoring (Adams and Ferreira, 2009), especially given the current state of relatively under-developed corporate governance in Russia (Li *et al.*, 2012). While Russian corporate governance code already recommends that at least one-third of the corporate boards be composed of independent directors (CG code, 2014), similar recommendations could be suggested in terms of board gender diversity. In this regard, it is also important to remember that our findings are in line with critical mass theory, which suggests that a certain critical amount should be reached so that a significant change in performance can take place (Torchia *et al.*, 2011). In the context of board gender diversity, one female director in the boardroom is rather regarded as a token – as an absolute minority who has very limited ability to make a significant contribution to firm performance. However, as the number of female directors increases and the critical mass builds up, their impact becomes more strong and significant. Therefore, a policy recommendation should not only

enhance female representation on corporate boards, but also make sure that those women do not become tokens. Around 43% of the companies in our sample have no or only one female director in the boardroom, suggesting a great potential for further improvement.

From the practical side, our research reveals that the positive effect of female directors on firm performance comes mainly through their executive channels (due to their executive power and management skills), rather than their monitoring channels (due to their independent status). This suggests that company owners (shareholders) should not only employ more female directors to their boards, but also make sure that these female directors are assigned to executive positions. Moreover, current research does not observe any link between the total board size and company performance. Company owners (shareholders), therefore, have flexibility in employing additional female directors without worrying about the total board size.

In spite of the above-mentioned contributions, this paper has several limitations which could be addressed by future research. First, the cross-sectional data used in this study does not allow us to capture the dynamic factors due to its limited time span. Future studies therefore should focus on panel data with longer time spans. Second, while our analysis focuses solely on gender diversity in the boardroom, future research should also consider other variables that could improve board diversity, such as age, ethnicity, education, and work experience.

5. Conclusions

This article contributes to the literature on board diversity by providing novel empirical evidence on the impact of female boards of directors on firm performance in the case of the Russian agri-food industry. We focus on Russia, as it is one of the most important players in the global food security. It is already one of the largest exporters of various crops worldwide, with strong potential and plans to further extend its list of exported agri-food products. Moreover, we focus particularly on large-scale agri-food enterprises, as they have significant shares of the total agri-food production in Russia – and thus play an important role in sustaining national food security. It is therefore very crucial to understand the factors that could improve the performances of these large scale agri-food enterprises, which could in turn contribute to the national, as well as global food security.

We concentrate specifically on board gender diversity as a potential means for improving corporate boards, which has become an important issue in many developed counties and developing countries as well. A growing body of research argues that female directors may bring additional value to boardrooms, which in turn might lead to better firm performance.

A 2SLS regression model is applied to test the relationship between the female representation on corporate boards and firm performance among a sample of Russian agri-food enterprises. The results reveal a strong positive effect of the percentage of female directors in the boardroom on firm performance in terms of both ROA and ROS. This implies that Russian agri-food sector can have economic benefits from higher board gender diversity. Russian policy makers therefore may want to consider advocating higher female representation in the boards of agri-food enterprises. In addition, in line with critical mass theory, we observe that the absolute number of female directors also matters. In contrast to corporate boards with two or more female directors, boards with only one female director do not have any significant impact on firm performance. Moreover, the effect of three or more female board members on firm performance is stronger compared to a boardroom with only two female directors. Policy makers therefore should not only consider advocating female representation in the corporate boards of the agri-food enterprises, but also make sure that those female directors do not become a mere tokens. Moreover, we found that the impact of female directors on firm performance comes mainly through their executive, rather than monitoring effects. This result may have practical implications for company shareholders, who are responsible for the election of the boards of directors and who may want to consider appointing more executive, rather than independent females to the boards.

To conclude, while our study strongly supports the business case for enhancing gender diversity in the boardroom, it is also important to note that gender equality is also a subject of social justice, which can be a separate argument in and of itself.

Supplementary material

Supplementary material can be found online at https://doi.org/10.22434/IFAMR2019.0011

Table S1. Correlation matrix of independent variables.

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