Economic Systems 47 (2023) 101072

Contents lists available at ScienceDirect

Economic Systems

journal homepage: www.elsevier.com/locate/ecosys

Blockholdings in closely held corporations: An analysis of ownership coalitions in emerging countries

Velimir Bole[a], Ada Guštin Habuš[b], Matjaž Koman[c], Janez Prašnikar[d,e,*]

[a] EIPF, Ljubljana, Slovenia
[b] School of Economics and Business and Institute for South-East Europe, University of Ljubljana, Slovenia
[c] School of Economics and Business and Institute for South-East Europe, University of Ljubljana, Slovenia
[d] School of Economics and Business and Institute for South-East Europe, University of Ljubljana, Slovenia
[e] CEPR, Slovenia

ARTICLE INFO

JEL classification in this article:
G32
G34

Keywords:
Multiple shareholders
Minimal controlling coalition
Corporate governance
Efficiency of firms

ABSTRACT

Blockholdings in closely held corporations have been examined in the literature to understand the importance of the size and structure of minimal coalitions in a volatile macroeconomic environment. We show, theoretically and empirically, that three-member minimal controlling coalitions provide the best performance results because the portfolio of potential strategies of such coalitions can increase strategic choices in the boom-bust-recovery cycle, but coordination costs are not that high. We also show that "competition" between potential minimal controlling coalitions (of the same firm) with two or more members improves the firm's performance. With respect to the characteristics of the institutional owners of one-member controlling coalitions, we found that firms controlled by foreigners and/or other non-financial firms and financial holdings performed better than the average firm. Our study indicates that the change of ownership structures in emerging countries is determined by the extant economic systems and through administrative interventions.

1. Introduction

Closely held corporations typically have an ownership structure comprising several significant shareholders (Bennedsen and Wolfenzon, 2000). Morck et al. (2005) claim that they exist specifically outside the Anglo-American business environment. Bennedsen et al. (2015) have previously analyzed their performance in China. Lehmann and Weigand (2000), Gutiérrez and Tribo (2004), Kavadis and Castaner (2015), and Russino et al. (2019) have further demonstrated the importance of closely held corporations in Germany, Spain, France, and Italy, respectively. Iwasaki and Mizobata (2018) add that both the predominant role of blockholders and concentrated ownership has been maintained in most Central and Eastern European countries and the former Soviet

Abbreviations: 1., The short of GFC is used for the Global Financial Crisis through the paper.; 2., n is used to denote a number of members of a coalition through the paper.

* Correspondence to: University of Ljubljana, School of Economics and Business, Kardeljeva ploščad 17, 1000 Ljubljana, Slovenia.
E-mail address: janez.prasnikar@outlook.com (J. Prašnikar).

https://doi.org/10.1016/j.ecosys.2023.101072
Received 14 March 2022; Received in revised form 30 July 2022; Accepted 7 November 2022
Available online 21 January 2023
0939-3625/

Union despite the privatization of state-owned enterprises. Most studies assume that blockholders are homogenous and risk-neutral. By contrast, Edmans and Holderness (2017) have proposed that blockholders are heterogeneous and have different risk inclinations. They include financial institutions (e.g., hedge funds, mutual funds, and pension funds), families, individuals, and other corporations. Each has its determinants, incentives, and consequences. Moreover, these considerations are likely to vary by period and country.

What are the mechanisms of change in ownership performance? Stiglitz (2011) argues that economic agents can change their risk appetite through autonomous development. A Global financial crisis (GFC) is a good example of such endogenous processes. By contrast, Iwasaki et al. (2022) claim that the relationship between ownership structure (and risk appetites of owners) and firm performance in Eastern Europe, Russia, and China is affected by shifting historical currents (administrative interventions). Therefore, they have exogenous characteristics. Both studies suggest that dynamic changes in ownership structure should be properly addressed. The problem is acute, particularly in emerging countries where friction (e.g., financial friction) is high. Are dynamic changes in owners' behavior in emerging economies the result of external interventions or are they fabricated by economic systems? This can be answered by analyzing their behavior, both theoretically and empirically.

In this study, we examine ownership coalitions among closely held corporations. Closely held corporations are widely prevalent in both Western Europe and emerging countries. As the risk appetites of owners and changes in ownership structures are especially pronounced in times of great instability, such as a GFC, we constructed a theoretical model of the impact of ownership coalitions on firms' performance during a financial crisis. This model was tested on abounded firm data in Slovenia, an emerging country where closely held corporations represent the bulk of the economy, which was hardly affected by the GFC (Prašnikar et al., 2016). For the empirical part of the study, we collected data on non-financial firms from 2006 to 2018.

A theoretical discussion of the role of large owners (blockholders) in the principal–principal segment of agency theory marks our point of departure in this study.[1] In particular, in building a theoretical model of the ownership coalitions in closely held corporations during a financial crisis, we use the Bennedsen and Wolfenzon (2000) concept of minimal controlling coalition, i.e. the smallest ownership coalition that gives the owners a dominant position in decision-making (over 50% of voting rights). It enables control over the company, which is essential for forming firms' strategic responses in times of financial crisis (Wan and Yiu, 2009; Minichilli et al., 2015; Estrin et al., 2018).

However, our theoretical model differs from the Bennedsen and Wolfenzon (2000) model in several ways. First, our model introduces the heterogeneity of owners with respect to their inclination toward risk. They vary between risk-prone, risk-averse, and normal (prudent) owners. Second, we incorporate into our model the implications of the financial instability literature (Kiyotaki and Moore, 1997; Koo, 2008; Miller and Stiglitz, 2010; Krishnamurthy, 2010), which states that in the financial frictions in economies, investment decisions made by small businesses could lead, through amplification mechanisms of debt accumulation (bank financing), to situations of "balance sheet crisis." Lastly, in Bennedsen and Wolfenzon's (2000) model, large owners compete to form controlling coalitions because of private benefits accrued from control. By contrast, we argue that large owners are aligned to implement a joint project. Proposing their own and monitoring each other solutions helps boost valuation (Pagano and Röell, 1998) by increasing the number of strategic options available to the firm (Bloch and Hege, 2003).

Our study offers some important insights into the literature on the optimal type and structure of ownership as well as the behavior of owners. We show, theoretically and empirically, that firm efficiency improves as minimal controlling coalition membership grows. This is because of the larger portfolio of potential strategies created by different types of owners (risk-prone, risk-averse, and normal), which covers more diverse situations and increases strategic choices in all phases of the boom-bust-recovery cycle. However, the firm's efficiency improves only with coalition size up to a certain point. This means that a two-member minimal controlling coalition could be more efficient than a one-member coalition and a three-member coalition more efficiently than a two-member coalition. A minimal controlling coalition with more than three members could be as efficient or less efficient than a three-member minimal controlling coalition owing to higher coordination costs. Our theoretical model also explains that "competition" between potential controlling coalitions (of the same firm) increases the performance efficiency of the firm if their strategies differ substantially. Empirically, the effect is illustrated for firms with three possible two-member minimal controlling coalitions created from the first three largest owners. Finally, we present interesting findings on one-member minimal controlling coalitions in Slovenia. We discuss our findings in terms of endogeneity (systemic changes) and administrative interventions (external changes), as previously explained.

The remainder of this paper is organized as follows. In the following section, we present the institutional environment of the research subject. Section 3 explains the hypotheses tested in our study. Section 4 discusses the data and variables. Section 5 outlines the operational model of ownership coalitions during a financial crisis. Section 6 presents the empirical results. Finally, we conclude and discuss the results. The theoretical exposition of the model is presented in Appendix 1, while additional tables not presented in the main text are presented in Appendix 2.

[1] Two significant problems dominate economic research on corporate governance thus far. First, as advocated by proponents of the leading agency theory of corporate governance (Jensen and Meckling, 1976; Fama, 1980; Fama and Jensen, 1985), corporate governance is a principal–agent problem. This theory claims that within dispersed ownership each small shareholder lacks the incentives or contractual mechanism/s to align the interests of managers with those of the shareholders (Berle and Means, 1932; Jensen and Meckling, 1976; Grossman and Hart, 1980). Second, large shareholders can create a different agency problem, the so-called principal–principal problem, referring to the counterbalancing forces between the alignment (monitoring) and expropriation effects of ownership concentration on performance (e.g., Shleifer and Vishny, 1986; Stulz, 1988; Burkart et al., 1997, 1998). This discussion is extended in the so-called complex ownership paradigm (a term introduced by Laeven and Levine, 2008) or the issue of large owners (blockholders) and their influence over the firm's performance.

2. Post-independence institutional environment and key policy interventions in Slovenia

During the 1990 s, Slovenia pursued a gradual transition approach, with essential reforms in macro stabilization, trade liberalization, and product market competition. Together with the aggressive development of small and medium-sized firms and the government tightening the budget constraints on large socially owned firms, there was great competition in the domestic market, leading to Slovenia enjoying an improved competitive position in the world markets. The privatization of firms to insiders or outsiders took place in the early to mid-1990 s, relying on a combination of voucher and manager-worker buy-out methods (Prašnikar and Gregorič, 2002). Thus, the organizational landscape was diverse, comprising primarily privatized social-owned companies, growing private firms, and state-owned firms.

The so-called "transparent withdrawal of the state from the economy" was part of the government's program of "The Framework of Economic and Social Reforms for Increasing Welfare in Slovenia," launched at the end of 2005 (Mencinger, 2006). Furthermore, after entering the European Union (EU) (2007), Slovenian companies started to enjoy easier access to the EU market, and hence, their ambitions of achieving higher yields became stronger. Their investment in physical capital, financial investment (especially in the states of the former Yugoslavia), and real estate increased. The fast freeing of (foreign) financial flows, especially through debt instruments in the banking sector, to accelerate the landing process of the real economy (implemented mainly through the final phase of privatization and acquisitions) was the cliché of the day (Prašnikar et al., 2021).

The acquisition of a firm's capital is financed by entrepreneurial wealth (net worth) and bank borrowings. Higher levels of net worth reduce external finance premiums. An anticipated rise in asset prices raised net worth more than proportionately, which stimulated investment and, in turn, further raised prices. The financial accelerator (Bernanke et al., 1999; Miller and Stiglitz, 2010; Krishnamurthy, 2010) was a crucial segment of the firm's debt amplification and propagation mechanism (Bole et al., 2014, 2018).

When the global crisis emerged, these endogenous processes were interrupted by exogenous shocks. Banks in Slovenia were only partly able to refinance their foreign credits and had to curtail the supply of credit to their clients in the domestic retail credit market. Due to increased uncertainty and reduced information capital, they switched their credit policies from a "mark-to-market" approach to a "mark-to-risk" approach and began to increase the necessary credit collateral coverage and considerably enhanced credit rationing (of appropriately collateralized credit). The decrease in real estate prices further decreased the size (value) of companies' collateral and therefore increased their credit squeeze. In addition, the process of increasing credit collateralization, rationing, and accelerated deleveraging was facilitated by the banking regulator's supervision measures. Such procyclical interventions of the banking regulator and the corresponding responses of banks resulted in a prolonged (after crisis) credit crunch period, financial disintermediation (spreading of forced intercompany credit), sub-optimal sequencing and timing of deleveraging, as well as harmful structural effects and very costly banking rehabilitation (Bole et al., 2014). This resulted in much larger macroeconomic losses in Slovenia during the GFC than in other developing EC countries. During the period 2008–2014 Slovenia was among the EU countries with the largest losses in GDP.

3. The hypotheses

Based on the theoretical discussion on multiple owners (blockholders) and the developmental environment of Slovenia, we constructed a model of ownership coalitions covering all phases of a financial crisis, which is presented in Appendix 1. The model forms the basis for the key hypotheses (H1–H4) of our research. However, we also added a few sub-hypotheses (summarized in H5), which point to the ownership structure in post-transitional Slovenia. We investigate different types of ownership within one-member ownership coalition: firms with foreign ownership, business (industrial) ownership relations, financial holdings, and bank ownership of firms that are either remedies for the privatization of socially owned firms in transition or those that have developed during the GFC (e.g., Prašnikar et al., 2016).

3.1. Hypotheses based on the theoretical model

Our theoretical model for ownership coalitions is complex. This shows that the long-term efficiency (net worth) of coalitions that are different in size differ in the composition of members according to their propensity to risk, can formulate different strategies (aggressive, conservative, erratic), and are in different phases of the cycle (boom-and-bust). Depending on the ownership composition, coalitions may change or remain unchanged during the financial cycle. In building the model, we also considered that risk-prone owners, when they do not have a prevalent position in the coalition, must compensate risk-averse and risk-normal owners if they want to implement an aggressive strategy (side payment). Furthermore, our model includes coordination costs that increase as the number of coalition members increases. For the sake of simplification, the model focuses on the following seven types of coalitions: a) three types of one-member coalitions, comprising risk-prone (P), risk-averse (A), or normal owners (N); b) three types of two-member coalitions, comprising risk-prone and risk-averse owners (PA), risk-prone and normal owners (PN), or normal and risk-averse owners (NA); and c) one type of three-member coalition, having a risk-prone, risk-averse, and normal owner as members (the PAN type of coalition). For each coalition, we derive an upper level of net worth reduction in the bust phase of the cycle (β_{ul}), below which the net worth must not fall if the members of the coalition want to avoid an erratic strategy wherein the net worth stagnates (see the first column of Table A1 in Appendix 1). This calculation, along with the previously mentioned mechanisms and the inclusion of the cyclical parameters of the country in consideration (Slovenia), enables a modeled calculation of the expected long-run net worth of each listed coalition (see Figure A1 in Appendix 1), forming the basis for establishing empirical hypotheses. The availability of data, especially the lack of data on the risk propensity of coalition members, does not allow us to fully follow the theoretical results;

Table 1
Model results and notifications of operational hypotheses.

	Model results	Operational hypotheses
Hypothesis 1:	ENW PN > (ENW P + ENW N + ENW A) /3 ENW PA > (ENW P + ENW N + ENW A) /3 ENW AN = (ENW P + ENW N + ENW A) /3	n2 > n1
Hypothesis 2:	ENW PAN > ENW PN ENW PAN > ENW AN ENW PAN > ENW PA	n3 > n2
Hypothesis 3:	ENW (PN, PA, AN) > (ENW PN + ENW PA + ENW AN) / 3	n2_com > n2
Hypothesis 4:	ENW $PAN_+ \leqq$ ENW PAN	no123 $\leqq$ n3

Source: Own work
Notes: ENW, expected net worth; A, one-member coalition of risk-averse owners; N, one-member coalition of normal owners; P, one-member coalition of risk-prone owners; AN, two-member coalition of risk-averse and normal owners; PA, two-member coalition of risk-prone and risk-averse owners; PN, two-member coalition of risk-prone and normal owners; PAN, three-member coalition of risk-prone and risk-averse and normal owners; PAN_+, a coalition of more than three members; n, number of coalition members.

therefore, we derive operational hypotheses assuming a uniform distribution of owner types, which considers the average values for the upper level of net worth reduction in the bust phase of the cycle (see second column of Table A1). Table 1 presents the generic derivations of the operational hypotheses. The first column shows the model results and the second column shows the operational hypotheses.

Based on Figure A1 in Appendix 1 and Table 1, it is clear that, in the model, the expected long-run net worth for two-member coalitions of risk-prone and normal owners, as well as of risk-prone and risk-averse owners, is larger than the average expected long-run net worth for corresponding one-member coalitions. However, a two-member coalition of a risk-normal and risk-averse owner has an expected long-run net worth approximately equal to the average of the values for the corresponding one-member coalitions. Similarly, the expected long-run net worth of a three-member controlling coalition is higher than for any combination of two-member coalitions.

Therefore, the following two hypotheses on the size of coalitions could be proposed:

Hypothesis 1. The estimated efficiency of two-member minimal control coalitions is higher than that of one-member coalitions.

Hypothesis 2. Minimally controlling coalitions of three members perform better than two-member minimal controlling coalitions.

Next, our theoretical model documents that “competition” between minimal controlling coalitions (of the same firm) increases a firm’s performance, especially if the strategies of the different types of owners differ significantly. Such a competitive coalition structure could exist for minimal controlling coalitions of any size except for the smallest, that is, one-member minimal controlling coalitions. As the model shows, such coalitions (of the same firm) could mitigate the large costs of a potential sudden reduction in net worth if the economy is in the bust phase, by implementing the strategy of the coalition with owners tolerating smaller risks. However, since in our sample the number of firms with such competitive coalitions is already too small in the group of firms with three-member minimal controlling coalitions, only competitive two-member minimal controlling coalitions could be used in the model specification. Therefore, a testable hypothesis dealing with the competition of minimal controlling coalitions can be formulated:

Hypothesis 3. Firms with a competitive two-member minimal controlling coalition structure are more efficient than firms with standard two-member minimal coalitions, especially in the bust phase of the cycle.

Finally, our theoretical model determines that if more owners (of different types) are in the minimal controlling coalitions, then the coordination opportunity costs (because of misunderstandings, disagreements, and disputes) are higher. Such opportunity costs could result in a coalition decision blockade or even a collapse of the coalition, and consequently, a transition to the (worst) erratic strategy. In the model, we show that the probability of such a transition increases with the square of the number of coalition members if they are not of the same type. Therefore, the fourth hypothesis is as follows:

Hypothesis 4. The performance efficiency of average controlling coalitions with more than three members is at most as high as but probably lower than that of an average three-member controlling coalition.

3.2. Institutionally based hypotheses

As already mentioned, when studying the effects of the institutional governance of firms in Slovenia, it is necessary to consider the characteristics of the ownership structure within one-member coalitions in post-transitional development. In the following paragraphs, we discuss the most relevant literature on ownership structure within one-member coalitions during post-transitional development in Slovenia and, accordingly, draw our sub-hypotheses.

The theoretical literature on the performance of foreign-owned firms (FOEs) shows the advantages foreign firms enjoy through the ownership of tangible and intangible assets (O advantages) that can be internally transferred to the host market to provide a performance advantage in the host market, as summarized in Dunni’s OLI model (Dunning, 1988; Rugman and Verbeke, 1990). There is ample empirical evidence from developed economies’ host markets that foreign-owned firms display such performance advantages

(Bellak, 2004; Davies and Lyons, 1991). However, it is unclear whether the positive foreign ownership effect holds in transitional, emerging, and developing markets. This is because of the lower institutional environment in these countries, which enhances the liabilities of foreignness (Eden and Miller, 2004; Gaur et al., 2011), and therefore dissipates the advantages of FOEs. Additionally, many FOEs in emerging markets may originate in other emerging markets and hence may lack firm-specific assets that underlie positive performance effects (Ramamurti and Singh, 2009; Rugman, 2009; Gammeltoft et al., 2010; Ramamurti, 2012). Otherwise, the available evidence does point to a positive performance effect of FOEs in CEE transition economies (Estrin et al., 2009), claiming that institutional barriers in these countries are surpassed by advantages of foreign firms from advanced markets. Moreover, Estrin, Nielsen, and Nielsen (2016) show that higher urbanization in CEE countries decreases the transaction costs of foreign investors from CEE countries and makes them more competitive in building internal strengths. Based on the arguments above and the fact that the majority of foreign investments in Slovenian firms are either from advanced markets or CEE countries, we expect majority-owned FOEs in Slovenia to benefit from the internal transfer of valuable intangible assets from their parents. In turn, this provides them with performance advantages. Thus, we argue:

Hypothesis 5a. : Firms with majority foreign ownership display superior levels of economic performance when compared with firms operating in the host economy markets.

The former Yugoslav system of social ownership was built on large conglomerates called COALs. However, the process of disintegration of large conglomerates had already started in Yugoslavia, as large organizations were split into smaller units. In many cases, this was based on a firm's (industrial, i.e., mother-daughter) ownership relations (Prašnikar and Svejnar, 1988). This continued later on as well, when building a market economy became a strategic orientation of the newly established countries and when social ownership was officially abandoned (Domadenik et al., 2003; Pahor et al., 2004). Moreover, a firm's (industrial) ownership became a very appropriate tool for the privatization of social ownership, as existing firms often establish new firms as special purpose vehicles (SPVs) used to finance the purchase of (social) ownership shares through bank loans (Prašnikar et al., 2016). The process of creating industrial ownership indicates that the governance of such firms should not deviate from that of the corresponding enterprise owner. Thus, the next sub-hypothesis can be stated as:

Hypothesis 5b. : Firms wherein industrial owners are in the minimal controlling one-member coalition have better or at least an average performance compared to firms operating in the host economy markets.

Further, specific results can also be expected for financial holdings, as owners of Slovenian firms. Most often, their main concern as owners is to take over a firm below the market and sell it later at a higher price, thereby earning a profit in the short term (Prašnikar and Gregorič, 2002; Prašnikar et al., 2016). We can say that financial holding ownership could be like risk-prone ownership in the analyzed theoretical model, and its application to Slovenian data is represented by P in Figure A1 in Appendix 1. Based on this argument, we can speculate that firms owned by financial holdings (with their risk-prone biased portfolio of strategies) underperform in terms of combined short- and long-term performance efficiency.

Hypothesis 5c. : Firms wherein financial holdings are in the minimal controlling one-member coalition are at least of average performance in the host economy markets.

A much less active role in managing the firm, especially in the long run, can also be expected from banks taking over the management of firms. As a rule, such actions are the consequence of extracting the remaining value from nonperforming loans (claims against the corresponding firm). After the bust in 2009, such temporary caretaking of firms by banks was applied in Slovenia on a large scale with huge macroeconomic costs (see, for example, Bole et al., 2014). In a sense, the performance of banks as owners can be compared to the theoretically studied performance of passive risk-averse owners, and its application to Slovenian data is represented by A in Figure A1 in Appendix 1. We could argue that:

Hypothesis 5d. : Firms wherein banks are in the minimal controlling coalitions are not superior to other firms operating in host economy markets.

4. Description of data and variables

4.1. Sample of firms and types of coalitions

For the empirical part of the study, we collected rich data on Slovenian firms for the period 2006–2018. We focused on nonfinancial firms that employed at least 50 people or had at least two million euros in total assets. The lowest criterion prevailed if the criteria were contradictory, meaning that a firm with at least two million euros of total assets was selected even if it employed less than 50 people, and vice versa. Therefore, our sample comprised an unbalanced panel with an average of 4408 firms per year for the period 2006–2018. In 2008, for example, the database contained data on 4907 firms, representing 9.4% of all business entities operating in Slovenia that year. These firms controlled 89.3% of total assets, generated 82.3% of total revenue, and had a share of 74.5% of employment in the Slovenian business companies.[2]

[2] Annual data on the exact number of firms we took into consideration and the share of their total assets, revenues, and the number of employees compared to the total population of firms in Slovenia is available from the corresponding author upon reasonable request.

For every year, each observed firm was included in the sample, and we collected the types, names, and percentage shares of the first ten largest owners,[3] which were then matched with the financial data. We skipped state-owned firms and other firms with ownership in the public domain (municipalities) because our dataset does not clearly distinguish between firms managed at the state and local levels. The former primarily serves the national market or even global markets, while the latter serves local markets and is in the hands of local communities (municipalities). The behavior of both groups of firms is likely different.[4]

Due to the missing data on ownership structure, negative values of value added, total fixed capital, and costs of labor, and negative values of the liquidity indicator (EBITDA) and outliers,[5] our number of firm-year observations decreased from 55346 to 32986. Thus, in 2008, the number of available firms with complete data was 2608, representing 5% of all firms operating in business companies that year, controlling 43% of total assets, generating 58% of total revenue, and having a share of 47% employment in the Slovenian business companies. Moreover, because of the use of instrumental variables (which are lagged variables), we lost additional firm-year observations, and ended up with 4680 firm-year data in the boom (2007–2008) period, compared to 5575 complete firm-year data for the period 2007–2008.[6] Hence, the final number of firms that were effectively used in the operational model's empirical estimations in 2008 was 2323, which represented 4.5% of firms in the whole economy, provided 33% of total assets, generated 46% of total revenue, and had a share of 38% employment in the Slovenian business companies. To avoid confusion regarding the number of companies, the tables below show data only for the sub-sample of observations (firms) that are effectively used in the empirical estimations of the operational model.

Table 2 contains data on the types of coalitions and institutional owners in four observed periods: 1) boom (2007–2008); 2) bust (2009–2012); 3) recovery (2013–2015), and 4) trend (2016–2018). Following our discussion in Section 2, such a division of sub-periods makes sense for Slovenia. Most firms have one-member minimal controlling coalitions (76.9% on average), followed by firms with two-member minimal controlling coalitions (18.4%), a sub-sample of firms with two-member competitive minimal controlling coalitions (4.6%), firms with three-member minimal controlling coalitions (2.7%), and firms with minimal controlling coalitions with four members or more (2.0%).

Interestingly, the share of firms with one-member minimal controlling coalitions is growing in recovery and trend sub-periods, while the share of firms with minimal two-member controlling coalitions is falling (the same trend, although less pronounced, is also observable for other types of coalitions), representing the tendency toward an increasing concentration of ownership after the GFC.

Regarding one-member coalitions, the share of Group O decreases throughout the entire period. The shares of firms with a single firm (P) or foreign (F) controlling owner are increasing through the analyzed GFC episode, while the shares of firms owned by financial holdings (H) and bank-owned firms (B) are decreasing.

The intensity of changing the minimal controlling coalition types is illustrated in Table 3.[7] The Table presents the frequency (in percentages) of the minimal controlling coalition types of change for specific periods. More precisely, for every minimal controlling coalition type and sub-period analyzed except trend,[8] the average percentage of exits in other coalition types in the one year period is shown. Except for firms with foreigners as a single controlling owner, the trajectory of the frequency of the minimal controlling coalition types "exits" was similar for all other coalition types. The frequency of the minimal controlling coalition types "exits" increased in the bust, and especially in the recovery sub-period, when in several types of the minimal controlling coalition in one year, on average, "exits" to other types faced more than 10% of all firms. By far the most frequent were "exits" from bank-controlled minimal coalitions. In the recovery sub-period every year, on average, the type of controlling ownership changed in half of the firms (observations) wherein banks figured as single controlling owners. In the trend sub-period, frequencies of the minimal controlling coalition type "exits" fell considerably. On average, they become even lower than in the boom sub-period. The only visible exception from the described trajectory of the frequency of the minimal controlling coalition type "exits" were firms wherein a single foreigner had a controlling share. In this firm segment the frequency of the minimal controlling coalition type "exits" was falling in all sub-periods.

4.2. Description of remaining variables

After presenting the sample of companies and their structures according to the types of coalitions (in the empirical model, they appear as explanatory variables), it is necessary to present the remaining variables used in our empirical work, that is, the measure of efficiency (dependent variable) and market power (independent variable).

[3] The ownership data was gathered from the following sources: 1) the GVIN.com company ownership web database; 2) the annual reports of the observed companies, and 3) reliable sources published on the Internet. Financial data from balance sheets and income statements were provided by the Agency of the Republic of Slovenia for Public Legal Records and Related Services (AJPES).

[4] The market power variable, for example, would have to be specified differently and quantified with an additional variable.

[5] Values of less than half of the first percentile (0.5%) and over half of the last percentile (99.5%) for the variables value added, labor cost and total fixed assets are declared as outlying.

[6] In the period 2006–2008, there are 8091 complete firm-year observations, but data from 2006 are used only for instruments. In the case of the model being estimated by OLS or by using different instruments for which lagged values hadn't been necessary, the model could have been estimated with all 5575 observations (from the period 2007–2008), but because lagged values are used as instruments only 4680 observations are effectively used in estimating the model for the period 2007–2008.

[7] More profound documentation shows that segmentation of firms by the minimal controlling coalition types is really very large in the statistically strict sense as well. Table A2 in Appendix 2 presents the results of testing differences in the entire distributions (not only in means) of the efficiency for pairwise comparison of analyzed segments of firms (determined by the type of the minimal controlling coalition).

[8] For trend subperiod yearly averages are calculated only for 2016–2017 and not 2016–2018, because of a lack of data for 2019 coalition types.

Table 2
Structure of the sub-sample.

	Boom (2007–2008)	Bust (2009–2012)	Recovery (2013–2015)	Trend (2016–2018)
Estimation sub-sample	4680	8865	6128	5867
Types of coalitions (in%):				
n1	75.5	75.5	76.5	79.1
H $_{(n1)}$	2.7	2.3	2.2	1.9
F $_{(n1)}$	13.1	13.5	16.1	18.8
B $_{(n1)}$	0.2	0.2	0.0	0.0
P $_{(n1)}$	17.4	18.3	19.2	20.4
O $_{(n1)}$	42.1	41.1	38.9	37.9
n2	20.4	19.9	19.0	16.6
n2_com	5.1	4.9	4.7	4.5
n3	2.6	2.6	2.7	2.5
no123	1.5	2.1	1.8	1.7
Total	100%	100%	100%	100%

Source: Own calculations
Notes: Structure of the data sample; sample of all observations effectively used in the panel model estimation; n1: minimal controlling coalition of one-member; n2: minimal controlling coalition of two members; n2_com: competitive minimal controlling coalition of two members; n3: minimal controlling coalition of three members; no123: minimal controlling coalition with more than three members; H: holding is minimal controlling owner; F: foreigner is minimal controlling owner; B: bank is minimal controlling owner; P: firms controlled by a single non-financial firm (industrial ownership); O: other types of single controlling ownership.

Table 3
Intensity of changing the size of the minimal controlling coalition.

	Boom (2007–2008)	Bust (2009–2012)	Recovery (2013–2015)	Trend (2016–2017)
n1	0.93	0.72	2.05	0.52
n2	3.46	3.92	8.08	4.08
n3	3.33	9.96	11.66	5.05
no123	5.56	4.92	7.83	14.49
n2_com	4.64	6.24	10.14	4.47
F	10.24	8.56	6.48	5.19
P	10.95	10.97	11.04	6.90
B	11.11	27.78	50.00	0.00
H	15.20	10.73	17.04	9.09
O	7.91	9.45	10.11	5.10

Source: Own calculations
Notes: Changing the size of the minimal controlling coalition; percent of the observations (firm-year) in the specific minimal controlling coalition type for which the firm's minimal controlling coalition type changed in the following year–differs from the corresponding size in the current year; yearly averages of the analyzed sub-periods except in trend where yearly averages for (2016–2017) are presented; minimal controlling coalition: n1 – of one-member, n2 – of two members, n3 –of three members, no123 –with more than three members, n2_com – competitive minimal controlling coalition of two members; one-member minimal controlling coalition of: H – holding; F – foreigner; B – bank; P – non-financial firm; O – other types of single controlling ownership.

In modeling the effects of ownership on firm performance, the dependent variable is firm efficiency. Since our efficiency measure will be explained in more detail in the next chapter, at this point, we draw attention to the fact that the economic shock at the onset of the GFC did not only have a one-off direct effect on the operation of companies (sudden stop), but an indirect effect as well, because of the operation of the financial accelerator in both directions—in the formation of corporate debt before (because of investment) the onset of the crisis and because of deleveraging and the reduction of liquidity after the onset of the financial crisis (see, discussions on macro-financial linkages, by Stiglitz, 2011, and Classens and Kose, 2018). Therefore, the measure of efficiency must encompass both the short- and long-run sustainability of a firm's performance; that is, indicators of productivity, liquidity, and corporate indebtedness (see, Miller and Stiglitz, 2010). To eliminate potential heteroscedasticity in the empirical evaluation, we normalized these indicators by the value of total assets.

Table 4 shows the average sub-period values of the variables used in the calculation of the efficiency measure (productivity: value added per unit of total assets; liquidity: EBITDA per unit of total assets; sustainability: total balance sheet less debt per unit of total assets) as well as the average values of the calculated efficiency measure[9] for each sub-period and each type of coalition. This shows that the productivity indicator (value added per unit of total assets) of the average firm fell in the bust sub-period and attained its pre-crisis value in recovery; then, it grew to a higher level in the period 2016–2018. Similarly, the value of the liquidity indicator (EBITDA per unit of total assets) for the average firm decreased in bust and remained lower than that before the crisis. The value of the sustainability indicator (own funds – total balance less debt per unit of total assets) for the average firm fell in the bust sub-period (because of the increasing indebtedness of firms before the crisis) and then steadily increased.

[9] The calculation of efficiency is explained in detail in the next chapter.

Table 4
Summary statistics (mean values).

	Boom (2007–2008)	Bust (2009–2012)	Recovery (2013–2015)	Trend (2016–2018)
Value Added	0.334	0.313	0.335	0.361
Liquidity	0.122	0.100	0.105	0.110
Sustainability	0.711	0.695	0.761	0.801
Efficiency measure:				
All firms	0.755	0.783	0.854	0.860
n1	0.758	0.784	0.856	0.864
$\mathbf{H}_{(n1)}$	0.763	0.823	0.866	0.895
$\mathbf{F}_{(n1)}$	0.841	0.879	0.938	0.920
$\mathbf{B}_{(n1)}$	0.603	0.525	0.083	0.665
$\mathbf{P}_{(n1)}$	0.800	0.806	0.869	0.890
$\mathbf{O}_{(n1)}$	0.714	0.742	0.816	0.822
n2	0.741	0.773	0.839	0.839
n2_com	0.743	0.798	0.845	0.862
n3	0.808	0.830	0.893	0.884
no123	0.758	0.770	0.847	0.851
Market power	0.075	0.079	0.083	0.083

Source: Own calculations
Notes: Summary statistics; all observations effectively used in the panel models estimation; mean values; productivity, value added per unit of total assets; liquidity, EBITDA per unit of total assets; sustainability, total balance sheet less debt per unit of total assets; efficiency = (1 - distance from efficiency frontier); n1: minimal controlling coalition of one-member; n2: minimal controlling coalition of two members; n2_com: competitive minimal controlling coalition of two members; n3: minimal controlling coalition of three members; no123: minimal controlling coalition with more than three members; single owner controlling coalitions: H – holding; F – foreigner; B – bank; P – domestic non-financial firm (industrial ownership); O –other types of single controlling ownership.

Our efficiency measure shows that firms with three- and four-member coalitions (mean values) outperform firms with one or two-member coalitions in most years. Except for recovery, the efficiency measure is also higher in firms with a one-member coalition than in firms with two-member coalitions.

Table 4 also explains that differences in the (mean) efficiency between different minimal controlling coalitions are substantial. Among a single member coalitions, foreign-owned firms stand out throughout the entire period. This is followed by firms owned by financial holdings, which display a distinctive upward trend. A growing trend is also observed for firms with other firms' (industrial) ownership. The efficiency indicators of bank-owned firms are the worst and most volatile. Since their share declines after the bust sub-period, these indicators also reflect the late process of bank rehabilitation in Slovenia, as mentioned in Chapter 2.

Regarding the variable of market power, it is assumed that Slovenian firms do not have any market power in foreign markets. Thus, the indicator of the overall market power of a firm is defined as its share of total domestic sales in the domestic sales of the three-digit NACE numerical code sectors (groups) to which the analyzed firm belongs multiplied by the firm share of domestic sales relative to its total (domestic and foreign) sales. Table 4 shows that the indicator for the mean firm is relatively small. During the boom period, the average annual value of the indicator was 0.078. In the bust and recovery sub-period, it increased by approximately 5% but stayed at that level afterward until the end of the analyzed episodes.

Although Group O (other types of single controlling ownership) has the largest share in the structure of single-member coalitions (as well as in the entire sub-sample), we saved its presentation for the end. This group includes companies with a single (100%) individual owner (unique firms), which are usually taken as a part of family-owned firms (see, for example, Russino et al., 2019). For firms with individual owners, for which the ownership structure includes several members of the same last name, we can assume that they are family-related. Table 5 shows that unique firms make up around 60% of Group O in individual years. Most of the rest are probably just mentioned as family businesses and individual-owned firms, where the first member has more than 50% of the total

Table 5
Other types of single controlling ownership (O): Individuals, families.

	Boom (2007–2008)	Bust (2009–2012)	Recovery (2013–2015)	Trend (2016–2018)
Unique:	27.3	24.7	21.7	20.6
% share	0.706	0.734	0.808	0.810
Efficiency				
O (other types of single controlling ownership)**:**				
% share	42.1	41.1	38.9	37.9
Efficiency	0.714	0.742	0.816	0.822
Family-owned in total:				
% share	45.9	44.6	41.7	40.0
Efficiency	0.709	0.739	0.812	0.816

Source: own calculation
Notes: O = other types of single controlling ownership; Unique firms (firms, 100% owned by an individual); Family-owned firms = unique firms + firms where an individual is the owner of more than 50%, and possible remaining owners with the same last name + firms where two or three individuals with the same name build a control coalition % share – share in the estimation sub-sample (sample of observations effectively used in the model estimation).

share, and the rest is owned by other individuals. However, depending on the criterion used, family businesses can also be found among two-member and three-member coalitions. Group O will therefore be called family/individual-owned firms based on the dominant ownership share (over 50%), but we are aware that it does not include all family businesses (family firms with two- and three-member coalitions are excluded). It is clear from Tables 4 and 5 that the efficiency of the average firms in the sub-groups above (O group of firms, Unique firms, Family-owned firms in total), is lower than the efficiency of the average firm in the whole sub-sample of one member coalitions firms.

5. Operational model

5.1. Specific methodological problems

In addition to the already described fact that we study the performance of companies (coalitions) for a period of 12 years, because of which a studied coalition preference function must have several dimensions (the performance indicator should encompass the short-run success as well as the long-run sustainability of a firm's performance), it should be noted that our dataset includes firms from different industries using a variety of technologies. It is not only their scale economies but also their functional form or behavioral characteristics that are likely to vary in complex ways. Following the extant literature (see, Biesebroeck, 2007; Beveren, 2012; Bournakis and Mallick, 2018), no production function should be used to quantify performance in such an environment. Instead, the performance of a firm in our econometric evaluation is quantified using a nonparametric method that implements a model with two inputs (labor and capital) and three outputs (value added, liquidity, and indebtedness). The distance from the efficiency frontier is used as an indicator of performance. The lower the distance from the efficiency frontier (efficiency frontier denotes 1), the higher the performance score of the company. To avoid the known shortcomings of standard nonparametric methods of efficiency analysis, such as DEA and FDH (see, Charnes et al., 1978; Deprins et al., 1984; Daraio and Simar, 2007), that is, sensitivity to outliers, the effects of measurement errors, and the absence of a well-defined data-generating process, a partial frontier analysis of order α was applied (see, Aragon et al., 2005).

As the financial crisis was so divergent with respect to institutional changes, changes in policy direction, macroeconomic changes, and agents' behavior, we look for coherent analytical sub-periods and break the entire panel data on four sub-panels, representing boom, bust, recovery, and after-crisis (trend) sub-periods.

Due to the intensive dynamics of policy, as well as the macro- and micro-economic performance-driven changes in the ownership landscape (the minimal controlling coalition structure and the institutional structure of ownership; see Tables 2 and 3), the well-known endogeneity problem (Laeven and Levine, 2008; Becker et al., 2011; Edmans, 2014; Edmans and Holderness, 2017) was a crucial problem in the final step of our study of the relationship between ownership and performance. Specifications through instrumental variables were used to avoid the endogeneity of structural changes in ownership in terms of the size of the coalitions and the type of institutional ownership variables. We assumed that all model coalition size variables were endogenous. The set of instruments comprised lagged coalition size variables and lagged share of the largest owner. In the panel models for the bust, recovery, and trend sub-periods, the above-mentioned variables, figuring as instruments, are lagged by two periods. For the (two year) panel model of the boom sub-period (2007–2008), instruments are constructed differently because data are available only from 2006 onwards. Two instruments were constructed for each endogenous variable, and the corresponding variable values for 2006 were used. The first instrument figures the direct product (Kronecker product) of the yearly dummy for 2008 with 2006 values, and the second instrument figures the direct product of the yearly dummy for 2007 with the same 2006 values.

The sample of firms with available data is not small, but it still limits the scope of the explicitly studied (modeled) minimal controlling coalitions and institutional owners. The studied sizes of minimal controlling coalitions were limited to four groups of minimal controlling coalitions since firms with minimal controlling coalitions of four or more members/owners represent only 2% of the studied sample.[10] All firms with minimal controlling coalitions greater than three are aggregated into one group, while smaller minimal controlling coalitions are analyzed separately. In the presented simple theoretical model (see Appendix 1), an important factor of coalition performance is the type of owner (risk-prone, risk-averse, or normal) that constitutes the coalition. In the present phase of our research, we were not able to include any appropriate data on owners' type structure to neutralize the possible effects of ownership types; we conduct an empirical analysis on the actual mix of owner types and explicitly distinguish only sizes of coalitions and types of institutional owners.

5.2. The model specification

As already mentioned, in modeling the effects of ownership on firm performance, the dependent variable is specified by firm efficiency, which is determined by the nonparametric model of partial frontier analysis of order α for the model of two inputs and three outputs. The inputs are labor costs and total fixed assets per unit of total assets, while the output variables are value added,[11] EBITDA, and own funds per unit of total assets.

[10] See Table 2. There are, for example, only 0.7% of firms with minimal controlling coalitions of 4 members and only 0.3% of with minimal controlling coalitions of 5 members.

[11] In the paper, value-added is defined as net sales plus change in inventories plus capitalized own products and services plus other operating revenues less costs of merchandise, material and services.

The model distinguishes between four groups of minimal controlling coalitions. It explicitly includes dummies for coalitions of two members (n2) for competitive two-member coalitions (n2_com), three-member coalitions (n3), and coalitions with more than three members (no123). Except for the competitive two-member minimal controlling coalitions, the other groups of coalitions are self-evident. In the group of two-member competitive minimal controlling coalitions, there are firms wherein the three largest owners can make three minimal controlling coalitions of two members (i.e., a coalition of the first and second owners, a coalition of the first and third owners, and a coalition of the second and third owners). It is coded as coalition n2_com for short and is designated as a competitive two-member coalition.

Firms with one-member minimal controlling coalitions form the basis of the comparison of effects for the analyzed coalition groups (dummies) and, therefore, do not figure explicitly in the model.[12]

Our model of the effects of ownership characteristics on firm performance explicitly encompassed dummies for four types of owners within a one-member coalition: holding (H), foreigners (F), firms (P), and banks (B).

Because the market power of a firm could affect (i.e., increase) the measured performance efficiency, the model also features a variable indicator of firm market power.

For all four sub-periods, the impact of ownership coalitions, institutional owners, and market power on efficiency is specified by the following model:

$$\ln\_E_{it} = \alpha_0 + \alpha_1 n2_{iT} + \alpha_{12} n2\_com_{iT} + \alpha_2 n3_{iT} + \alpha_3 no123_{iT} + \alpha_4 H + \alpha_5 F + \alpha_6 B + \alpha_7 P + \alpha_8 \ln\_MP_{iT} + \varepsilon_{iT} \quad (1)$$

where the indexes (i, T) denote the firm and the year, respectively, ln_E denotes the logarithm of performance efficiency, and ln MP denotes the logarithm of market power.

The model was estimated using two variants. The first focuses on coherent analytical sub-periods. Four equations are estimated, each representing different sub-periods: boom, bust, recovery, and trend. The second variant deals with the most granulated (annual) analysis. The first variant of the model is denoted as “basic” and the second variant is used to check the robustness of Eq. (1).

6. Empirical results

6.1. Model results

Table 6 presents the results of the model estimations. The estimated models for all four sub-periods are of admissible statistical quality, as corroborated by the corresponding values of the Wald test, as well as tests of over- and under-identification of instruments. The Wald test is highly significant, while the Sargan test is insignificant, and the Anderson test is highly significant. The quality of the instruments used was additionally demonstrated by the fit of the first-stage regressions for the instrumentalized explanatory variables. The corresponding values are listed in Table A3 of Appendix 2).[13]

Compared to one-member minimal controlling coalitions (which serve as a base of comparison), the best results give three-member minimal controlling coalitions (denoted by n3), which have the highest positive coefficient values. The coefficient in each sub-group is higher and at a higher level of significance than for the group of two-member minimal controlling coalitions. This confirms H_2, that the minimal controlling coalitions of the three members perform better than the two-member minimal controlling coalition. The second place belongs to the group of minimal controlling coalitions, with more than three members (denoted by no_123). In three sub-periods (boom, bust, and recovery), the coefficient is lower and in one (trend) non significantly higher than in the group of three-member coalitions. Its coefficient is higher than that in the group of two-member coalitions in all sub-periods. The results are in line with the H_4 hypothesis, which states that the performance efficiency of average controlling coalitions with more than three members is at most as high as, but probably lower than, average three-member controlling coalitions. Next, two-member minimal controlling coalitions (denoted by n2) have the lowest but still systematically positive coefficient values, which are in two cases (boom and trend sub-periods) significantly different from zero. These results are in line with the H_1 hypothesis, which states that the estimated efficiency of two-member minimal controlling coalitions is higher than that of one-member coalitions.

Table 6 also illustrates the trajectories of the performance efficiency effects of competitive two-member minimal controlling coalitions in comparison with previously studied groups of minimal controlling coalitions (consisting of two members, three members, and more than three members). However, the coefficients in Table 6 show how the effects of competitive two-member coalitions differ from the corresponding effects of average two, and one-member coalitions. The coefficient is negative and insignificant in the boom sub-period. Its effects are, therefore, insignificantly smaller than the effects of average two-member coalitions, however, they are larger than the effects of average one-member coalitions (subtracting 0.036 from 0.050 still yields a positive value of the n2_com coefficient). By contrast, the coefficient is positive in the rest of the sub-periods and significant in the bust and trend periods. Therefore, in the rest of the sub-periods, the effects of competitive two-member coalitions are higher (in the bust and trend sub-periods are also significantly higher) than the effects of average two-member coalitions, partly confirming our H_3 hypothesis.

The market power variable is highly significant only in the boom-and-bust sub-periods. Subsequently, the coefficient of market power became low and insignificant.

[12] Model effects (coefficients) of coalition size variables are, therefore, deviations from the effects of the group of one-member minimal controlling coalitions.

[13] Complete results of the first stage regressions for the instrumentalized explanatory variables are available from the authors upon request.

Table 6
Controlling coalition effects on performance efficiency based on Eq. (1).

	Boom (1)	Bust (2)	Recovery (3)	Trend (4)
n2	0.050 * **	0.017	0.015	0.028 *
	(0.017)	(0.016)	(0.012)	(0.014)
n2_com	-0.036	0.076 * *	0.030	0.045 *
	(0.030)	(0.030)	(0.022)	(0.026)
n3	0.172 * **	0.142 * **	0.108 * **	0.053 * *
	(0.039)	(0.038)	(0.026)	(0.027)
no123	0.053	0.079 * *	0.045	0.094 * **
	(0.057)	0.040	(0.032)	(0.035)
F	0.165 * **	0.164 * **	0.152 * **	0.123 * **
	(0.179)	(0.015)	(0.011)	(0.011)
P	0.112 * **	0.098 * **	0.068 * **	0.081 * **
	(0.017)	(0.014)	(0.011)	(0.010)
H	0.063	0.120 * **	0.032	0.101 * **
	(0.038)	0.036	(0.027)	(0.029)
B	-0.633 * **	-1.049 * **	-2.255 * **	-0.170 * **
	(0.137)	(0.135)	(0.195)	(0.023)
Market power	0.013 * **	0.009 * **	0.003	0.002
	(0.003)	(0.002)	(0.002)	(0.002)
cons.	-0.342	-0.323 * **	-0.230 * **	-0.225 * **
	(0.159)	(0.013)	(0.010)	(0.010)
Number of observations	4680	8865	6128	5867
Under-identification test $\chi2(2)$ P-val.	0.0000	0.0000	0.0000	0.0000
Sargan statistic $\chi2(1)$ P-val.	0.9356	0.2892	0.9989	0.9914
R2 – overall	0.0396	0.0440	0.0577	0.0324
Wald-$\chi2$ P-val.	0.0000	0.0000	0.000	0.0000

Source: Own calculations.
Notes: Controlling coalition effects on performance efficiency; extended model (1); five groups of minimal controlling coalition types: n1-one-member coalitions (base of comparison), n2-two members coalitions, n3-three members coalitions, no123 coalitions with more than three members, n2_com competitive two members coalitions; four institutional owner types in one-member controlling coalition: F–foreign owner, P-firm owner, H-holding owner and B-bank owner; 2SLS regression; set of instruments consists of lagged coalition size variables as well as lagged share of the largest owner; for the bust, recovery, and trend sub-periods the above-mentioned variables, figuring as instruments, are lagged two periods; for the (two year) boom sub-period (2007–2008) instruments are constructed differently, because data are available only from 2006 onwards; two instruments are constructed for every endogenous variable, and in both corresponding variable values for 2006 are used; as the first instrument figures direct product (Kronecker product) of yearly dummy for 2008 with those 2006 values, and as the second instrument, direct product of yearly dummy for 2007 with the same 2006 values;* **, * *, * statistical significance at 1%, 5% and 10%, respectively; standard errors in parenthesis.

Regarding one-member minimal coalitions of institutional owners, Table 6 shows that foreign-controlled firms have better results than any other one-member controlled coalition of institutional owners (Hypothesis 5a is thus confirmed). Firms controlled by other non-financial firms (industrial ownership) and firms controlled by financial holdings were also more efficient than the group of average one-member coalition-controlled firms (Hypothesis 5b was confirmed, while Hypothesis 5c was rejected). The coefficients of firms controlled by other non-financial firms (industrial ownership) are consistently higher than zero as well as highly significant. The positive values of the coefficients also hold for firms controlled by financial holdings but are significant only in the bust and trend sub-periods. Banks were the worst institutional owners throughout the study period (Hypothesis 5d is confirmed).

6.2. Robustness check

To obtain a more detailed overview of the impact of ownership coalitions on the efficiency of companies in the studied volatile period and to prove the relevance of the study by sub-period, we tested the robustness of the results by analyzing annual data. The specification of the model is the same as in (1), but instead of sub-periods, the analysis is performed for each year separately, as shown in Table 7, where the statistical quality of the yearly models (test of the relationship significance) and corresponding instrumental variables (under- and over-identification tests) is admissible in all cases.[14] A comparison of the empirical results of two similar models, the first where sub-periods are defined according to the phases of the GFC in Slovenia (see description in Section 2), and the second using annual estimates, reveals that the results in both models are almost identical. Table 7 shows the advantages of the n3 coalition over the entire period, as the coefficients on variable n3 mostly deviate upward relative to other presented non-institutional coalitions during the entire crisis period (only in 2011 did the competitive two-member coalitions outperform three-member coalitions).

The n2 coalition has a coefficient greater than zero throughout the period but is statistically significant for only a few years. This also applies to coalition no123.

[14] Results of the first stage regressions for the instrumentalized explanatory variables are available from the authors upon request.

Table 7
Controlling coalition effects on performance efficiency based on Eq. (1): alternative model.

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Cons.	-0.321 * **	-0.369 * **	-0.345 * **	-0.299 * **	-0.333 * **	-0.290 * **	-0.253 * **	-0.226 * **	-0.185 * **	-0.211 * **	-0.214 * **	-0.228 * **
	(0.022)	(0.022)	(0.021)	(0.020)	(0.019)	(0.019)	(0.017)	(0.017)	(0.016)	(0.017)	(0.016)	(0.017)
n2	0.037	0.073 * **	0.026	0.011	0.025	0.022	0.027	0.019	0.032 *	0.003	0.025	0.045 * *
	(0.023)	(0.024)	(0.023)	(0.022)	(0.021)	(0.021)	(0.020)	(0.019)	(0.019)	(0.022)	(0.020)	(0.023)
n2_com	-0.031	-0.010	0.069 *	0.081 * *	0.080 * *	0.041	0.022	0.033	-0.010	0.058	0.023	0.036
	(0.041)	(0.043)	(0.041)	(0.039)	(0.040)	(0.038)	(0.036)	(0.034)	(0.034)	(0.037)	(0.034)	(0.048)
n3	0.148 * **	0.151 * **	0.103 * *	0.091 * *	0.062 *	0.094 * *	0.106 * **	0.086 * *	0.049	0.096 * *	0.044	0.047
	(0.049)	(0.049)	(0.047)	(0.044)	(0.044)	(0.047)	(0.039)	(0.037)	(0.038)	(0.042)	(0.037)	(0.041)
no123	0.072	0.055	0.051	0.044	0.059	0.051	0.058	0.011	0.044	0.051	0.080 *	0.081
	(0.060)	(0.058)	(0.055)	(0.046)	(0.047)	(0.049)	(0.044)	(0.044)	(0.042)	(0.043)	(0.048)	(0.050)
F	0.141 * **	0.177 * **	0.167 * **	0.161 * **	0.159 * **	0.156 * **	0.166 * **	0.149 * **	0.141 * **	0.128 * **	0.117 * **	0.123 * **
	(0.023)	(0.024)	(0.024)	(0.023)	(0.022)	(0.021)	(0.019)	(0.018)	(0.017)	(0.018)	(0.016)	(0.018)
P	0.111 * **	0.123 * **	0.112 * **	0.071 * **	0.091 * **	0.067 * **	0.070 * **	0.076 * **	0.058 * **	0.083 * **	0.083 * **	0.083 * **
	(0.023)	(0.022)	(0.022)	(0.020)	(0.020)	(0.019)	(0.018)	(0.017)	(0.017)	(0.018)	(0.016)	(0.017)
H	0.062	0.107 * *	0.088 *	0.080 *	0.119 * *	0.132 * **	0.057	0.015	0.065	0.089 * *	0.092 * *	0.082 *
	(0.051)	(0.050	(0.051)	(0.047)	(0.046)	(0.049)	(0.044)	(0.042)	(0.042)	(0.044)	(0.042)	(0.046)
B	-0.582 * **	-0.620 * **	-0.664 * **	-0.997 * **	-0.671 * **	-2.279 * **	-2.132 * **	-1.712 * **	-0.570 * *	-0.165		
	(0.182)	(0.188)	(0.140)	(0.121)	(0.149)	(0.324)	(0.301)	(0.196)	(0.262)	(0.276)		
Market power	0.013 * **	0.013 * **	0.010 * **	0.011 * **	0.003	0.004 * **	0.005	0.004	0.007 * *	0.006 *	0.002	0.005
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Under-identification test Chi-sq(2) P-val	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sargan statistic Chi-sq(1) P-val	0.312	0.413	0.548	0.782	0.872	0.743	0.612	0.942	0.948	0.830	0.596	0.491
F-stat. P-val	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Centered R2	0.0377	0.0416	0.0406	0.0583	0.0371	0.0492	0.0569	0.0674	0.0400	0.0369	0.0295	0.0287
Number of obs.	2442	2608	2582	2532	2468	2411	2325	2278	2176	2129	2145	2151

Notes: Controlling coalition effects on performance efficiency; extended model (1); five groups of minimal controlling coalition types: n1-one-member coalitions (base of comparison), n2-two members coalitions, n3-three members coalitions, no123 coalitions with more than three members, n2_com competitive two members coalitions; four institutional owner types in one-member controlling coalition: F – foreign owner, P–firm owner, H-holding owner, and B–bank owner; 2SLS regression; yearly estimates. instruments are lagged explanatory coalition size variables and the lagged share of the largest owner. ***, **, * indicate statistical significance at 1%, 5% and 10%, respectively; standard errors in parentheses.

The values of the coefficients of the key variables (n2, n2_com, n3, no123) are greater than zero, which indicates the subordination of one-member coalition performance efficiency throughout the period. Table 7 also confirms the strong performance of the competitive two-member coalitions. The coefficient of the n2_com variable appears to be negative only twice (in 2007 and 2008) but statistically insignificant. On the contrary, the values of this coefficient are positive, higher than for the average two-member coalitions, and significant in the bust period. This means that competitive minimal two-member coalitions are more efficient than average minimal two-member coalitions, or at least as efficient as them. These results are consistent with those in Table 6.

We can also determine the similarity of results for sub-groups of institutional one-member coalitions (firms owned by foreigners, non-financial firms, financial holdings, and banks) and variable market power, which justifies the rationale for choosing the analysis by sub-period in the previous chapter.

7. Conclusions and discussion

Three important conclusions can be drawn from our study. First, a growing number of members of a minimal coalition is beneficial as long as the benefits of a large number of minimal coalition members prevail over the costs of coordination. We have shown theoretically and empirically that two-member minimal coalitions are more efficient than one-member ones, and three-member minimal coalitions are more efficient than two-member coalitions. The efficiency of four or more member coalitions is less than or at most equal to the efficiency of three-member coalitions. Second, we showed that an ownership structure of roughly the same size (the so-called competitive ownership structure) outperforms other ownership structures within the standard of two- or more member coalitions, particularly in the bust phase of the cycle. Third, the efficiency of institutional owners (foreigners, non-financial firms, and financial holdings) is greater than the efficiency of the rest of the firms within a single ownership type of coalition.

Although the GFC seems distant today, the results remain important. First, the general feature of coalition coordination in the blockholding ownership structure reveals a systemic meaning. The greater efficiency of multi-member minimal coalitions (three-member coalitions prevail over two-member and two-member coalitions over one-member), firms owned by foreigners, by non-financial (industrial ownership) or financial firms/holdings in comparison to average one-member coalitions indicates the importance of strategic links for the efficiency of coalitions. More precisely, external investors are willing to join the initial entrepreneur, who needs additional resources to carry out the project, as they believe that the project (initial strategic option) will succeed and achieve a reasonable return on the invested capital. Therefore, they agree that it should be managed by those who form a coalition with at least 50% ownership (minimal ownership coalition). In our view, the essential motive of investors (including the initial entrepreneur) is to implement a project (i.e., alignment effect) under the strong impact of competitive forces. The conflict between board members (determined by the owners of a coalition) and non-members of the coalition (i.e., the formation coalition effect or the expropriation effect) is of secondary importance. We do not underestimate the effect of coalition formation (i.e., expropriation). The lower efficiency of the four-member coalitions compared to the three-member coalitions demonstrates this effect. However, this can be limited by the implementation of coalition formation legislation, which ensures full transparency and care for non-members. By monitoring each other, multiple large shareholders eventually boost valuation by increasing strategic options, which is crucial for their survival in a volatile business environment.

During a financial crisis, business conditions are particularly volatile; hence, the risk attitude of control coalitions (blockholders) and the ability to adjust are even more important. The GFC was insightful in this regard. Managing risk and risk-sharing arrangements are crucial. As Miller and Stiglitz (2010) show, even risk-averse investors may become riskier if they adopt herd behavior toward bank credit. In the Slovenian case, this happened because of the government's action to accelerate privatization, and the willingness of banks to finance buyouts of state property (Prašnikar et al., 2016). Intensive changes resulted in firm ownership and, therefore, also controlled coalition formation. Hence, this result is a combination of a systemic factor (lack of risk-sharing mechanisms) and government interventions. However, our research shows that competitive coalition structures (of the same firm) tend to mitigate the high costs of a firm's strategy because of the broader portfolio of competitive strategies (preferred by different owners). For instance, different minimal coalitions are available to tolerate larger risks during the boom period as well as smaller risks in the bust period. This undoubtedly indicates the flexibility of such coalitions, which are advantageous in crisis environments (for example, in a pandemic crisis, the Ukrainian crisis.).

Third, the backlog of firms in Group O within a member coalition requires consideration. With respect to these firms, which are often classified as family businesses (see, for example, Russino et al., 2019), our results demonstrate a socio-emotional wealth approach in family firms (Gomez-Mejia et al., 2007, 2011; Berrone et al., 2012). This is rooted in behavioral agency theory, which states that family principals may respond to claims that protect and enhance socio-emotional wealth, even if they are not financially rewarding. They might be more risk-averse in the boom period and hence borrow less. This results in fewer problems during the bust and recovery periods to repay debt. Thus, the ability to invest during boom periods is lost. However, Oblak (2021) observed interesting behavior within this group of owners in Slovenia during the pandemic. She showed that many family- or individually-owned companies in the pre-pandemic crisis period in Slovenia were reactivated during the pandemic crisis to obtain state aid. This indicates that a member coalition includes owners with highly speculative motives. Hence, we believe that our results reveal this to be the general (systemic) feature of family business (family ownership might exert lower efficiency, see Burkart et al., 2003; Morck et al., 2005; Lins et al., 2013); however, because of institutional backlogs in Slovenia, even family/individual owners may be more represented by speculative motives, as in advanced countries.

Overall, it would be wrong to attribute dynamic changes in the profiles of owners in emerging countries only to administrative interventions (external factors). Our study indicates that these are a combination of systemic effects and administrative interventions.

Our study has some limitations. Our theoretical model documents that the type of minimal controlling coalition members (i.e., risk-prone, risk-averse, and normal owners) could be crucial for the strategy of the coalitions. We do not have precise data on the type of controlling owner/s; hence, our results are for an actual mix of coalition member types. Our results could not be improved by including the differences in strategies of different owner types, only if the owner types were distributed uniformly (as is assumed in the illustration of our theoretical model and tacitly assumed in our comment on the empirical results). In this scenario, it is unnecessary to collect additional information on the firm owners. Alternatively, it is necessary to collect the appropriate additional data to test for such owner-type effects on minimal controlling coalition strategies. However, we believe that our study nevertheless represents an important step forward.

Conflict of interest

The authors do not have any conflict of interest.

Acknowledgment

Research for this paper was in part supported by Slovenian Research Agency's grants no. J5–8231 and P5–0128.

Appendix 1. Theoretical model of ownership coalitions in a financial crisis

Suppose that a firm operates in an economy wherein the boom-and-bust cycles are driven by the stochastic process of independent Bernoulli distributed variables {U}, such that the probability of a boom is P (U = 1) = p. The firm has three performance strategies or policy stance options: aggressive, conservative, or erratic. Taking a conservative stance results in an increase in the firm's net worth by a stable long-run increase in ε in every period, independent of the economic performance (boom or bust). The aggressive variant results in an increase in the firm's net worth over its conservative (long-run) performance by α (the total increase would therefore be α + ε) if the economy is booming or in a reduction of its net worth by β if the economy is in the bust phase (the resulting change in the net worth would therefore be ε – β). An erratic stance results in a drop in a firm's long-run growth to zero.

In the long run, the bust drop β changes (independent of U) according to the exponent distribution exp (1/ β_0) so that the expected long-run ("normal") value is β_0; however, extremely rare, drastic (century-type) drops in economic performance are also possible.

Firm owners can be categorized into three types: risk-prone, risk-averse, and normal (prudent). Risk-prone owners are actively engaged in firm policymaking and use all, even risky, business opportunities. As such, they prefer an aggressive stance, but their risk appetite is limited – they do not tolerate any non-zero probability that the value of their shares could be wiped out in the policy horizon. Risk-averse owners are passive owners, and they expect lower but stable increases in the value of their investment (they behave like fixed-income investors). They stick to the conservative policy option. Prudent (normal) owners are also actively engaged in firm policymaking but choose less risky opportunities relative to risk-prone owners. Owners determine the policy stance of their firms separately for each period. At the start of every term, the net worth of the firm was 1.

In every period, risk-prone and normal owners choose their strategy to maximize their expected short-run payoff:

$$Max(\varepsilon + p(\alpha + \beta_0) - \beta_0, \varepsilon). \tag{1}$$

Risk-prone and normal owners would choose an aggressive policy stance only if the expected drop in profit in the bust period is "low enough," that is,

$$\frac{p\alpha}{(1-p)} > \beta_0. \tag{2}$$

If not, both would opt for a conservative strategy.

As risk-prone owners do not tolerate the possibility that their share of net worth could be wiped out in the short-run policy horizon, that is, they do not tolerate that the probability of the firm defaulting could be non-zero in the policy horizon, their sustainability condition is

$$P(default) = 0 \tag{3}$$

For the risk-prone owner to avoid default in the short-run policy horizon, it follows that

$$P(\varepsilon + U(\alpha + \beta) - \beta > -1) = 1 \tag{4}$$

therefore

$$\beta < \varepsilon + 1 \tag{5}$$

As β is randomly distributed, Eq. (5) is p.p. for β. Without any additional notice, the p.p. notice also pertains to all the following relations for β.

Normal owners are also prepared to aggressively manage the firm, but their risk appetite is lower than that of the risk-prone owners. Therefore, their sustainability condition is stricter: they do not tolerate any drop in the accumulated net worth in the current period.

$$\text{P(drop in accumulated net worth)} = 0 \tag{6}$$

that is

$$P(\varepsilon + U(\alpha + \beta) - \beta > 0) = 1 \tag{7}$$

or

$$\beta < \varepsilon \tag{8}$$

For risk-averse owners, the expected payoff function is constant and equal to ε in every period, but they can leave the firm (sell their shares) if they believe that the probability that the net worth will not increase by ε in the policy horizon is too high.

A minimal controlling coalition comprises a coalition of owners with a common majority in the capital, and at least as few members (owners) as all other potential coalitions with the common majority. Evidently, a single firm can have several minimal controlling coalitions.

In every term, the policy stance for the next period is chosen, and the strategy is determined by the owners in every minimal controlling coalition. The acting minimal controlling coalition is determined by a comparison ("competition") of the strategy effects of all minimal controlling coalitions. The strategy of the coalition with the best net worth of the firm is applied.

Members of the minimal controlling coalition determine the strategy for the current period, with a common majority of their capital shares. If some members of the controlling coalition are not satisfied with the chosen strategy, they can remain in the coalition or leave. If they leave, the coalition ceases to become a controlling coalition. If owners in the controlling coalition disagree about strategy but do not leave the coalition, the worst (erratic) stance is enacted in the policy horizon.

If the members of the minimal controlling coalition are of the same type, the coalition chooses a common strategy and sustainability condition. If they are not, this is not a case. Take, for example, that in the minimal controlling coalition, there are risk-prone and risk-averse owners and that the capital share of the risk-prone members of this coalition is smaller than the share of its risk-averse members, that is, $\pi_p < \pi_a$. Since the risk-prone owners are aware of their smaller share and expect the risk-averse owners to vote for a conservative policy strategy or leave the coalition, simply voting for an aggressive policy strategy would result in a (for risk-prone owners sub-optimal) conservative strategy payoff function, a collapse of the acting coalition, or erratic policy decisions with an even lower expected payoff function.

Risk-prone owners, therefore, must compensate the risk-averse owners for their potential loss if an aggressive strategy is implemented. They have to offer side payments to all risk-averse members of the minimal controlling coalition for them to vote for an aggressive strategy; otherwise, if left unpaid, they would leave the coalition (since in the bust phase, their profit would be lower than ε) and the coalition would no longer be a controlling one. Side payments must compensate risk-averse members for any drop in profits under ε. However, the size of such side payments is limited by the sustainability conditions of risk-prone members of the coalition.

The same activity of the more risk-loving members of the minimal controlling coalition for coalition strategy enforcement could also be expected in the case of coalitions comprising risk-prone and normal owners or normal and risk-averse owners.

To simplify the formal exposition, we first assume that the coordination opportunity costs of the activity of a larger number of coalition members are negligible and that minimal controlling coalitions contain only one-member of every type. As such, only the following seven types of minimal controlling coalitions will be analyzed: a) three types of one-member coalitions, consisting of either a risk-prone (P), a risk-averse (A), or normal owner (N); b) three types of two-member coalitions, consisting of either a risk-prone and risk-averse owner (PA), a risk-prone and normal owner (PN), or a normal and risk-averse owner (NA); and c) one type of three-member coalition, having a risk-prone, risk-averse, and normal owner as members (the PAN type of coalition).

The sustainability condition for the risk-prone member of the PA coalition after side payment (constraint on his/her side payments) is, therefore,

$$P(\pi_p[\varepsilon + U\alpha - (1-U)\beta] + \pi_a[U\alpha - (1-U)\beta] < -\pi_p) = 0$$

$$P([\pi_p + \pi_a]U(\alpha + \beta) < [-\pi_p - \pi_p\varepsilon] + [\pi_p + \pi_a]\beta) = 0$$

$$\beta < \frac{\pi_p}{\pi_p + \pi_a} + \frac{\pi_p\varepsilon}{\pi_p + \pi_a} \tag{9}$$

Using the same procedure, a constraint on side payment can be found for the side payments of risk-prone members to normal members in the minimal controlling coalition of risk-prone and normal members (with the corresponding shares $\pi_p < \pi_n$), and side payments of normal members to risk-averse members of the corresponding minimal controlling coalition (with the corresponding shares $\pi_n < \pi_a$).

In a general situation, if the minimal controlling coalition comprises all three types of owners, that is, risk-prone, risk-averse, and normal members, then the risk-prone member has to compensate for the potential loss of risk-averse and normal members if an aggressive strategy is implemented and the probability of profit drops below 0 (is not zero). The corresponding sustainability condition for the risk-prone (paying) member is

$$P(\pi_p[\varepsilon + U\alpha - (1-U)\beta] + \pi_a[U\alpha - (1-U)\beta] + \pi_n[1-U][\varepsilon - \beta] < -\pi_p) = 0$$

or

$$P(U[\pi_p\alpha + \pi_a\alpha + \pi_p\beta + \pi_a\beta + \pi_n\beta] < -\pi_p - \pi_p\varepsilon - \pi_n\varepsilon + \beta[\pi_p + \pi_a + \pi_n]) = 0$$

Table A1
Upper limit β for the analyzed minimal controlling coalitions.
Source: Own calculations

Minimal coalition	Theoretical β	Mean β
Risk-prone	$1+\varepsilon$	$1+\varepsilon$
Risk-prone & normal	$\frac{\pi_p}{(\pi_p+\pi_n)}+\varepsilon$	$\frac{1}{2}+\varepsilon$
Normal	ε	ε
Risk-averse & normal	$\frac{\pi_n}{(\pi_n+\pi_a)}\varepsilon$	$\frac{1}{2}\varepsilon$
Risk-prone & risk-averse	$\frac{\pi_p}{(\pi_p+\pi_a)}(1+\varepsilon)$	$\frac{1}{2}+\frac{1}{2}\varepsilon$
Risk-averse	0	0
Risk-averse & risk-prone & normal	$\frac{\pi_p+\varepsilon(\pi_p+\pi_n)}{(\pi_p+\pi_a+\pi_n)}$	$\frac{1}{3}+\frac{2}{3}\varepsilon$

Note: Upper limit β for the analyzed minimal controlling coalitions; first column: theoretical value; second column: mean value for the uniform distribution of shares that enable minimal control.

Therefore

$$\beta < \frac{\pi_p}{(\pi_p+\pi_a+\pi_n)}+\varepsilon\frac{\pi_p+\pi_n}{(\pi_p+\pi_a+\pi_n)} \tag{10}$$

The evaluated sustainability (p.p.) determined upper limits for the bust drop β (denoted by β_{ul}) are given in the first column of Table A1 for minimal controlling coalitions with one, two, and three members. It is obvious that β_{ul} in (10) presents a compact general result for all alternatives of minimal control coalitions. In other words, all seven coalition type structures are special cases of the last structure (a coalition with three types of owners). For every specific coalition type structure, the bust drop upper limit β_{ul} given in Table A1 is a special case of the former coalition if the specific coalition type shares are replaced in (10). Normal and risk-averse (NA) types of coalition, for example, have a zero share of risk-prone members $\pi_p = 0$; substituting this in (10) gives the same value as presented in Table A1 for the coalition of risk-averse owners and normal owners.

For illustration, in the second column of Table A1, the mean values (across firms in the hypothetical economy) of β_{ul} are presented. In the calculation of corresponding values, it is assumed that the shares of different owner types are uniformly distributed over all possible values, conditional on the assumed minimal controlling status of the specific (studied) coalitions and that the types of owners are uniformly and independently distributed.

The actual value of $\beta = \beta_t$ in a specific cycle divides all potential minimal control coalitions into two segments. In the first segment, there are minimal controlling coalitions for which β_{ul} is higher than β_t, whereas, in the second segment, there are coalitions for which the upper limits β_{ul} are lower than the actual value of β_t. Coalitions from the first segment are more efficient in the boom phase of the corresponding cycle, whereas those from the second segment are more efficient in the bust period of the cycle.

To compare the long-run performance efficiency of different controlling coalitions, it is necessary to consider the volatility (distribution) of β, that is, to calculate the expected value (over β) of the achieved net worth for every analyzed controlling coalition type. The net worth for a coalition with the upper limit of β equal to β_{ul} is given by

$$\begin{aligned} &1+\varepsilon+p\alpha-(1-p)\beta \qquad \beta \le \beta_{ul} \quad \text{(aggressive strategy)} \\ &1+\varepsilon \qquad \beta > \beta_{ul} \qquad \text{(conservative strategy)} \end{aligned} \tag{11}$$

Considering that β is distributed according to exp (1/ β_0), the expected long-run net worth for such a controlling coalition is:

$$ENW_0(\beta_{ul}) = 1+\varepsilon+p\alpha\left[1-\exp\left(-\frac{\beta_{ul}}{\beta_0}\right)\right]-(1-p)\left[-\beta_{ul}\exp\left(-\frac{\beta_{ul}}{\beta_0}\right)+\beta_0\left(1-\exp\left(-\frac{\beta_{ul}}{\beta_0}\right)\right)\right] \tag{12}$$

The long-run net worth attains its maximum at $\beta_{ul} = p\alpha/(1\text{-}p)$; it rapidly increases in the interval (0, $p\alpha/(1\text{-}p)$) and slowly decreases afterward.[15] Controlling coalition types of "risk-loving" members (with β_{ul} in Table 1 fulfilling the relation $\beta_{ul} > p\alpha/(1\text{-}p)$) could, therefore, only very slowly increase the efficiency of performance by reducing the riskiness of measures, while controlling coalition types with "risk-hating" members (for which $\beta_{ul} < p\alpha/(1\text{-}p)$) could increase performance efficiency very fast by implementing riskier measures. Note that in general, β_{ul} is equal to $\frac{\pi_p+\varepsilon(\pi_p+\pi_n)}{(\pi_p+\pi_a+\pi_n)}$ (see Table A1).

So far, the presented effects have been analyzed under the assumption that there are no coordination costs of coalition activity, and that no two members of the controlling coalition are of the same owner-type. The analysis distinguishes only types of owners, implicitly assuming that in a controlling coalition, every active type of owner can be represented with only one coalition member. The question then is what changes if we drop these assumptions?

[15] In symmetric points around the maximum (at $p\alpha/(1\text{-}p)+\beta_0$ and $p\alpha/(1\text{-}p)\text{-}\beta_0$), the expected long-run net worth function, for example, decreases 7.3 times slower than it increases.

More specifically, the question is what happens to the calculated long-run net worth (12) if the share of the assumed risk-prone owner π_p is actually a common share of several risk-prone members of a controlling coalition, and similarly for the share of the risk-averter π_a and the share of the normal owner π_n.

A larger number of coalition members necessarily increases the coordination costs of the coalition activity. Since coalition members of the same type are focused on a common strategy, the possible coordination opportunity costs associated with harmonizing their views on operative actions seem to be of minor importance, but disagreements, misunderstandings, and disputes between coalition members of different types could present an important problem because of their differing views on the appropriate strategy and their merely conditional (side payment-based) cooperation. In an n-member coalition communication network,

$$n^2\left[\frac{(\pi_p\pi_a + \pi_p\pi_n + \pi_n\pi_a)}{(\pi_p + \pi_n + \pi_a)^2}\right] \tag{13}$$

interaction channels (member pairs) between "foreign" members,[16] that is, pairs of members of different types, where possible misunderstandings, disagreements, or even disputes could arise. The probability of incurring coordination opportunity costs would, therefore, increase, as documented by relation (13), by the square of the number of controlling coalition members, and it would also depend on the coalition type (on the relative size of the common shares of all risk-prone owners, all risk averters, and all normal owners).

However, misunderstandings, disagreements, or even disputes between coalition members could result in a decision-making blockade or even a collapse of the coalition, in both cases leading to the worst, that is, erratic strategy, wherein net worth stagnates (is equal to 1). If the probability of disputes increases (from 0) with the number of interactions between "foreign" coalition members, and if the number of foreign member pairs in expression (13) is denoted by $n^2\gamma(\pi_p,\pi_a,\pi_n)$, then $\Phi(n^2\gamma(\pi_p,\pi_a,\pi_n))$ denotes the long-run probability of coalition diversion into an erratic strategy.[17] The expected long-run net worth (ENW) of a controlling coalition with n members is

$$ENW(\beta_{ul}, n) = ENW_0(\beta_{ul})(1 - \Phi(n^2\gamma(\pi_p, \pi_a, \pi_n)) + \Phi(n^2\gamma(\pi_p, \pi_a, \pi_n)) \tag{14}$$

where ENW_0 is the expected long-run net worth of the coalition with only one owner per every type it consists of.

If we consider that β_{ul} is equal to $\frac{\pi_p + \varepsilon(\pi_p + \pi_n)}{(\pi_p + \pi_a + \pi_n)}$ (see Table A1), then it is easy to show that the long-run net worth of any controlling coalition, defined by relation (14), depends only on the size of the coalition (n = number of members), its type (π_p, π_a, π_n – the common shares of all, that is, risk-prone owners, risk-averse owners, and normal owners) and the parameters of the business cycle driving process (p, α, β_0). We can summarize that relation (14) presents in a compact way the ENW for the general type of controlling coalition activity, that is, the performance efficiency for any structure of coalition member/owner types, any size of the controlling coalition (minimal or not), and for any macroeconomic environment phase.

To reveal the possible effects of coalition size on performance efficiency, it is sufficient to rewrite Eq. (14) as follows:

$$ENW(\beta_{ul}, n) = \Phi(n^2\gamma(\pi_p, \pi_a, \pi_n))(1 - ENW_0(\beta_{ul})) + ENW_0(\beta_{ul}), \tag{15}$$

and to consider that for both aggressive and conservative strategies, $ENW_0(\beta_{ul})$ is larger than 1. The ENW would fall if the size of the controlling coalition (its membership) was to be increased for all coalition structure types except for those with only one type of owner (that is, only risk-prone owners, only risk averters, or only normal owners), in which case performance efficiency would remain the same (i.e., $ENW_0(\beta_{ul})$).

Therefore, we could expect that the performance efficiency of an average controlling coalition with more than three members would be at most as high as, but probably lower than, that of an average three-member controlling coalition.

The theoretical model shows that in the empirical analysis, it cannot be expected that minimal coalitions with one-member will have clear effects on the firm's performance efficiency if data on the types of owners are not available. As documented by the values of β_{ul} in Table A1 and our discussion of the ENW functions having characteristics (relation (12)), minimal coalitions with one-member have very different values for different upper limits of β, and therefore very different and business-cycle-phase-dependent performances. Risk-prone owners have, by far, the highest values of β_{ul}, whereas risk-averse and normal owners have very low values. This means that in boom years, minimal coalitions with normal and risk-averse owners will (theoretically) perform badly, while those with risk-prone owners will perform well, and vice versa in bust years. Therefore, non-separated data on the types of coalition members/owners (if there is no data on member types) could blur the effects of these three types of controlling one-member coalitions, especially during boom periods.

Minimal coalitions with two members also displayed significant differences in the upper limits of β (see Table A1). Coalitions of risk-prone and risk-averse owners (PA coalitions), as well as coalitions of risk-prone and normal owners (PN coalitions), have a sizable β_{ul}, while coalitions of risk-averse and normal owners (NA coalitions) have quite small β_{ul} values. Using the same argument as in the case of one-member minimal controlling coalitions and taking into account the large difference in the absolute size of the derivative of the ENW function (12) before and after the maximum value (attained at αp/(1-p)), we could once again conclude that, owing to the mixing of such different effects, the average effect of two-member minimal coalitions could be unclear in the empirical analysis if data on the types of owners were not available.

[16] It is assumed that the sizes of the share packages of owners do not differ.

[17] For example $\Phi(n^2\gamma(\pi_p,\pi_a,\pi_n)) = 1\text{-}\exp(\text{-}n^2\gamma(\pi_p,\pi_a,\pi_n))$.

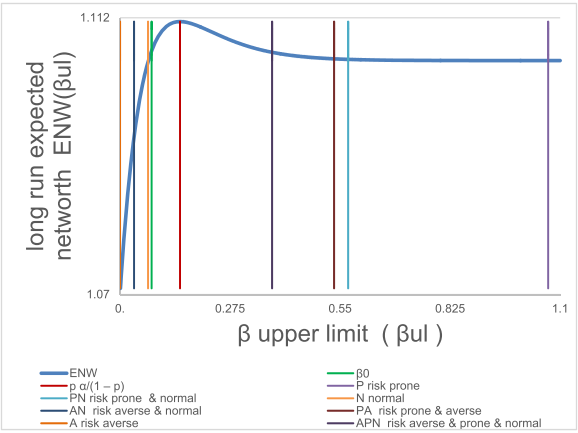

Fig. A1. Theoretical ENW. *Notes:* The theoretically ENW function calibrated to Slovenian data for the period 2000–2005; values of the function and β_{ul} multiplied by 1000; A – one-member coalition of risk-averse owners (β_{ul} =0); AN – two-member coalition of risk-averse and normal owners (β_{ul} = 35); N – one-member coalition of normal owners (β_{ul} = 70); APN – three-member coalition of risk-prone and risk-averse and normal owners (β_{ul} = 380); PA – two-member coalition of risk-prone and risk-averse owners (β_{ul} = 535); PN = two-member coalition of risk-prone and normal owners (β_{ul} = 570); and P one-member coalition of risk-prone owners (β_{ul} = 1070). Source: Own calculation

In the case of minimal controlling coalitions with two (or more) members, there is a very important distinction compared with one-member coalitions. Namely, a set of controlling two- (or more) member coalitions could comprise several different minimal controlling coalitions, whereas a one-member minimal controlling coalition can be only one. If β_{ul}, and consequently, the strategies of those minimal controlling coalitions (of the same firm) differ significantly, the portfolio of potential strategies of such a firm could cover very different business situations and, therefore, increase the potential portfolio of strategy choices in all phases of the boom-bust cycle, which also raises the potential performance efficiency of such a firm. A set of minimal controlling coalitions (of the same firm) that do not have any owners in common is denoted as a competitive minimal controlling coalition structure (or competitive coalition).[18] Such coalitions (of the same firm) could, for example, mitigate the large costs of a potential sudden large increase in β values in the bust phase by implementing the strategy of the coalition with owners tolerating smaller risks as well as avoiding the opportunity costs of slow growth entering the boom phase and a decrease in β values by implementing the strategy of the coalition of owners tolerating larger risks. Consequently, the blurring effect was avoided.

The presented characteristics of the ENW function shape are even more transparent if the parameters of this function are quantified for a specific country, such as Slovenia. This is shown in Fig. A1, wherein the ENW function is illustrated for the stylized Slovenian economy. It is assumed that the distribution of owner types is uniform (see the corresponding values of β_{ul} in the second column of Table A1) and that the macroeconomic parameters (α, p, β_0) are equal to those for Slovenia in the period before the GFC.[19]

Appendix 2

See Tables A2 and A3

As documented in Table A2[20], the analyzed firm collation types can be divided into three groups based on the distribution of firm efficiency. In the first group, segments of firms from coalition types n2, n2_com, F, B, and O stand completely for their own regarding the distribution of efficiency. They are significantly different from the efficiency distributions of all other analyzed segments of firms. A firm of coalition type n1 is the sole member of the second group. Its efficiency significantly differs from all other analyzed firm coalition types except for no123, that is, firms with a minimal controlling coalition larger than 3.[21] The distributions of other analyzed firm segments (n3, no123, H, and P) do not significantly differ between any pair; they can be classified in the third group.

[18] A set of minimal controlling coalitions comprising three coalitions (first of risk-prone owner and risk averter, second of risk-prone and normal owner, and third of risk averter and normal owner) is an example of such a two-member competitive coalition structure (see Table A1).

[19] In the period 2000–2005, the corresponding parameters were ε = 0.07, α = 0.15, β = 0.079 and p = 0.5. See, Eurostat.

[20] Testing of differences in the entire distribution of the efficiency for pairwise comparison of analyzed segments of firms is performed for the whole analyzed period (2007-2018) and only for the sample of observations (firms) which are effectively used in the models' estimation (that is, for which data for all model and instrumental variables are available). To avoid the strong assumption of normal distribution of efficiencies, the nonparametric KruskalWallis test is used.

[21] Because the analyzed firm's segments with single institutional owner (F,P,O,H,B) are subsamples of n1, in testing efficiency distribution differences between them and n1, the efficiency distribution of the single institutional owner X is, in fact, tested against the distribution of its complement in n1 (n1-X).Similarly, firm segment n2_com is a sub-sample from n2, so the efficiency distribution of firm segment n2_com is tested against its complement in n2 (n2-n2_com). See notes of Table A2.

Table A2
Comparison of firms' efficiency distribution.
Source: Own calculations

		n2	n3	no123	n2_com	F	P	H	B	O
n1	Chi-sq.	60.298	8.060	0.416	3.748	961.770	59.173	4.628	24.543	984.198
	prob.	0.0001	0.0045	0.5186	0.0529	0.0001	0.0001	0.0315	0.0001	0.0001
n2	Chi-sq.		37.738	14.022	7.095	722.912	126.461	24.884	20.422	41.173
	prob.		0.0001	0.0002	0.0077	0.0001	0.0001	0.0001	0.0001	0.0001
n3	Chi-sq.			2.227	12.879	65.338	0.243	0.191	26.350	23.800
	prob.			0.1356	0.0003	0.0001	0.6220	0.6622	0.0001	0.0001
no123	Chi-sq.				3.833	93.575	2.241	1.096	21.964	18.053
	prob.				0.0503	0.0001	0.1344	0.2952	0.0001	0.0010
n2_com	Chi-sq.					233.849	23.983	8.896	22.544	18.224
	prob.					0.0001	0.0001	0.0029	0.0001	0.0001
F	Chi-sq.						294.761	66.381	39.377	1224.496
	prob.						0.0001	0.0001	0.0001	0.0001
P	Chi-sq.							0.016	26.904	369.211
	prob.							0.8999	0.0001	0.0001
H	Chi-sq.								25.440	58.528
	prob.								0.0001	0.0001
B	Chi-sq.									17.948
	prob.									0.0001

Notes: Pairwise testing of the equality of efficiency distributions for analyzed segments of firms; nonparametric Kruskal-Wallis test is used; if X and Y are tested firm segments and Y is a subset of X firm segments, then the test is calculated for X-Y and Y; for every pair of firm segments, the value of testing statistic χ^2 (with one degree of freedom) and corresponding probability p are calculated, because the testing statistics matrix is symmetric, only its upper triangular part is shown; insignificant statistics (at $p = 0.05$) are shown in gray; minimal controlling coalition: n1 – of one-member, n2 – of two members, n3 –of three members, no123 –with more than three members, n2_com – competitive minimal controlling coalition of two members; one-member minimal controlling coalition of: H – holding; F – foreigner; B – bank; P – non-financial firm; O – family/individuals.

Table A3
Fit of the first-stage regressions for the model (1).
Source: Own calculations

	Boom (2007-2008)	Bust (2009-2012)	Recovery (2013-2015)	Trend (2016-2018)
n2	0.902	0.618	0.811	0.724
n3	0.809	0.394	0.731	0.754
no123	0.592	0.519	0.672	0.599
n2_com	0.848	0.495	0.752	0.640
F	0.939	0.777	0.915	0.905
P	0.878	0.683	0.873	0.802
H	0.826	0.621	0.797	0.821
B	0.818	0.384		

Notes: The fit of the regression models for the instrumentalized explanatory variables; set of instruments consists of lagged coalition size variables as well as lagged share of the largest owner; in the recovery and trend sub-period, minimal controlling coalition with the bank as the single controlling owner had only three complete observations and regression could not be calculated; minimal controlling coalition: n1 – of one-member, n2 – of two members, n3 –of three members, no123 – with more than three members, n2_com – competitive minimal controlling coalition of two members; one-member minimal controlling coalition of H – holding; F – foreigner; B – bank; P – non-financial firm.

References

Aragon, Y., Daouia, A., Thomas-Agnan, C., 2005. Nonparametric frontier estimation: a conditional quantile-based approach. Econom. Theory 21 (2), 358–389.
Becker, B., Cronquist, H., Fahlenbrach, R., 2011. Estimating the effects of large shareholders using a geographic instrument. J. Financ. Quant. Anal. 46 (4), 907–942.
Bellak, C., 2004. How domestic and foreign firms differ and why does it matter? J. Econ. Surv. 18 (4), 483–514.
Bennedsen, M., Wolfenzon, D., 2000. The balance of power in closely held corporations. J. Financ. Econ. 58, 113–139.
Bennedsen, M., Fan, J.P., Jian, M., Yeh, Y.H., 2015. The family business map: Framework, selective survey, and evidence from Chinese family firm succession. J. Corp. Financ. 33, 212–226.
Bernanke, B.S., Gertler, M., & Gilchrist, S., 1999, Chapter 21: The financial accelerator in a quantitative business cycle framework. Handbook of Macroeconomics 1, 1341–1393.
Berle, A.A. &Means, G.C., 1932, The Modern Corporation and Private Property. New York: Macmillan.
Berrone, P., Cruz, C., Gomez-Mejia, L.R., 2012. Socioemotional wealth in family firms: theoretical dimensions, assessment approaches, and agenda for future research. Fam. Bus. Rev. 25 (3), 258–279.
Beveren, I.V., 2012. Total factor productivity estimation: a practical review. J. Econ. Surv. 26 (1), 98–128.
Biesebroeck, J.V., 2007. Robustness of productivity estimates. J. Ind. Estim. 55 (3), 529–569.
Bloch, F., & Hege, U. (2003). Multiple shareholders and control contests. Unpublished working paper, HEC School of Management.
Bole, V., Prašnikar, J., Trobec, D., 2014. Policy measures in the deleveraging process: a macroprudential evaluation. J. Policy Model. 36 (2), 410–432.
Bole, V., Oblak, A., Prašnikar, J., Trobec, D., 2018. Financial frictions and indebtedness of Balkan firms: A comparison with Mediterranean and Central European countries. J. Policy Model. 40 (4), 790–809.
Burkart, M., Gromb, D., Panunzi, F., 1997. Large shareholders, monitoring, and the value of the firm. Q. J. Econ. 112 (3), 693–728.
Bournakis, I., Mallick, S., 2018. TFP estimation at firm level: The fiscal aspect of productivity convergence in the UK. Econ. Model. 70 (C), 579–590.
Burkart, M., Gromb, D., Panunzi, F., 1998. Why higher takeover premia protect minority shareholders. J. Political Econ. 106 (1), 172–204.
Burkart, M., Panunzi, F., Shleifer, A., 2003. Family Firms. J. Financ. 58, 2167–2202.
Charnes, A., Cooper, W., Rhodes, E., 1978. Measuring the efficiency of decision-making units. Eur. J. Oper. Res. 2, 429–444.
Cleassens, S., & Kose, M.A., 2018, Frontiers of Macrofinancial Linkages. BIS Paper No. 95.
Daraio, C., Simar, L., 2007. Advanced Robust and Nonparametric Methods in Efficiency Analysis. Springer,, pp. 248.
Davies, S.W., Lyons, B.R., 1991. Characterising relative performance: the productivity advantage of foreign firms in UK. Oxf. Econ. Pap. 43, 584–595.
Deprins, D., Simar, L., Tulkens, H., 1984. Measuring labor-efficiency in post offices. In: Marchand, M., Pestieau, P., Tulkens, H. (Eds.), The Performance of Public Enterprises: Concepts and Measurement. North-Holland, Amsterdam, pp. 243–267.
Domadenik, P., Lisal, M., Pahor, M., 2003. The effect of enterprise break-ups on performance. Revueéconomique 63 (5), 849.
Dunning, J.H., 1988. Explaining International Production. Unwin Hyman,, London.
Eden, L., Miller, S.R., 2004. Distance matters: liability of foreignness, institutional distance and ownership strategy. *Adv. Int. Manag.,* 16 187-22.
Edmans, A., 2014. Blockholders and corporate governance. Annu. Rev. Financ. Econ. 6, 23–50.
Edmans, A., Holderness, C., 2017. Blockholders: a survey of theory and evidence. In: Hermalin, B., Weisbach, M. (Eds.), Handbook of the Economics of Corporate Governance. vol. I. North-Holland, Amsterdam, pp. 542–628.
Estrin, S., Hanousek, J., Kocenda, J., Svejnar, J., 2009. The effects of privatization and ownership in transition economies. J. Econ. Lit. 47 (3), 1–20.
Estrin, S., Meyer, K.E., Pelletier, A., 2018. Emerging Economy MNEs: How does home country munificence matter? J. World Bus. 53 (*4*), 514–528.
Fama, E., 1980. Agency problems and the theory of the firm. J. Political Econ. 88 (2), 288–307.
Fama, E., Jensen, M., 1985. Organizational forms and investment decisions. J. Financ. Econ. 14, 101–119.
Gammeltoft, P., Barnard, H., Madhok, A., 2010. Emerging multinationals, emerging theory: Macro-and-micro-level perspectives. J. Int. Manag. 16, 95–201.
Gaur, A.S., Sarathy, R., Kumar, V., 2011. Liability of foreignness and internationalization of emerging market firms. In: Devinney, T.M., Pedersen, T., Tihanyi, L. (Eds.), Advances in International Management: The Past, Present and Future of International Business and Management. Volume 24 New York, NY: Emerald.
Gómez-Mejia, L.R., Takacs-Haynes, K., Nuñez-Nickel, M., Jacobson, K.J.L., Moyanto-Fuentes, J., 2007. Socioemotional wealth and business risks in family-controlled firms: Evidence from Spanish olive oil mills. Adm. Sci. Q. 52, 106–137.
Grossman, S., Hart, O., 1980. Takeover bids, the free-rider problem, and the theory of the corporation. Bell J. Econ. 11, 42–64.
Gutiérrez, M., Tribó, J.A., 2004. Private benefits extraction in closely-held corporations: The case for multiple large shareholders. ECGI Working Paper Series in Finance, Working Paper No, 53/2004.
Iwasaki, I., & Mizobata, S. (2018). Ownership Concentration and Firm Performance in European Emerging Economies: A Meta-Analysis. Center for Economic Institutions Working Paper Series 8.
Iwasaki, I., Ma, X., Mizobata, S., 2022. Ownership structure and firm performance in emerging markets: A comparative meta-analysisof East European EU member states, Russia and China. *Econ. Syst.* (Press). https://doi.org/10.1016/.ecosys.2022.100945
Jensen, M., Meckling, W., 1976. Theory of firm: Managerial behavior, agency costs and ownership structure. J. Financ. Econ. 3 (4), 305–360.
Kavadis, N., Castaner, X., 2015. Who Drives Corporate Restructuring: Co-Existing Owners in French Firms. Corp. Gov.: Int. Rev. 25 (3), 417–433.
Kiyotaki, N., Moore, J., 1997. Credit Cycles. J. Political Econ. 105, 211–248.
Koo, R.C. (2008). The Holy Grail of Macroeconomics: Lessons from Japan's Great Recession, Singapore: J. Wiley.
Krishnamurthy, A., 2010. Amplification mechanisms in liquidity crises. Am. Econ. J.: Macroecon. 2, 1–30.
Laeven, L., Levine, R., 2008. Complex ownership structures and corporate valuation. Rev. Financ. Stud. 21, 579–604.
Lehmann, E., Weigand, J., 2000. Does the governed corporation perform better? Governance structures and corporate performance in Germany. Eur. Financ. Rev. 4, 157–195.
Lins, K.V., Volpin, K., Wagner, H.F., 2013. Does Family Control Matter? International Evidence from the 2008–2009 Financial Crisis. Rev. Financ. Stud. 26 (10), 2583–2619.
Mencinger, J., 2006. Privatization in Slovenia. Slov. Law Rev. 3 (1–2), 65–81.
Miller, M., Stiglitz, J., 2010. Leverage and asset bubbles: averting Armageddon with Chapter 11. Econ. J. 120, 500–518.
Minichilli, A., Brogi, M., Calabrò, A., 2015. Weathering the storm: Family ownership, governance, and performance through the financial and economic crisis. Corp. Gov.: Int. Rev. 24 (6), 552–556.
Morck, R., Wolfenzon, D., Yeung, B., 2005. Corporate Governance, Economic Entrenchment, and Growth. J. Econ. Lit. 43 (*3*), 655–720.
Oblak, A., 2021. A first peek at firms′ cash flow dynamics in the pandemic year: a lesson learned? Econ. Bus. Rev. 23 (*4*), 273–285. https://doi.org/10.15458/2335-4216.1292
Pagano, M., Röell, A., 1998. The choice of stock ownership structure: Agency costs, monitoring, and the decision to go public. Q. J. Econ. 113 (1), 186–225.
Pahor, M., Prašnikar, J., Ferligoj, A., 2004. Building a corporate network in a transition economy: the case of Slovenia. Post-Communist Econ. 16 (*3*), 307–331.
Prašnikar, J., Svejnar, J., 1988. Enterprise Behavior in Yugoslavia. Adv. Econ. Anal. Particip. Labor-Manag. Firms 3, 237–311.
Prašnikar, J., Gregorič, A., 2002. The influence of workers' participation on the power of management in transitional countries: the case of Slovenia. Ann. Public Coop. Econ. 73 (2), 269–297.
Prašnikar, J., Domadenik, P., Koman, M., 2016. The puzzle of state ownership in Slovenia. Monte J. Econ. 11 (2), 37–63.
Prašnikar, J., Bole, V., Dominko, M., Lakićević, M., Oblak, A., 2021. Disentangling external flows (external shocks) and policy effects on the credit activities of banks in three emerging countries during the Great Recession. J. Balk. East. Stud. 23 (1), 78–100.
Ramamurti, R., Singh, J.V. (Eds.), 2009. Emerging Multionationals in Emerging Markets. Cambridge Press, New York, pp. 42–63.

Ramamurti, R., 2012. What is really different about emerging market mutinationals? Glob. Sttrategy J. 2 (1), 41–47.
Rugman, A.M., 2009. Theoretical aspects of MNE from emerging markets. In: Ramamurti, R., Singh, J.V. (Eds.), Emerging Multionationals in Emerging Markets. Cambridge Press, New York, pp. 42–63.
Rugman, A.M., & Verbeke, A. (1990). *Global Corporate Strategy and Trade Policy*. Routledge: London. U.K.
Russino, A., Picone, P., Dagnino, G., 2019. Unveiling the role of multiple blockholders: Evidence from closely held firms. Corp. Gov.: Int. Rev. 27 (6), 477–502.
Shleifer, A., Vishny, R., 1986. Large shareholders and corporate control. J. Political Econ. 94 (3), 461–488.
Stiglitz, J., 2011. Rethinking macroeconomics: what failed, and how to repair it. J. Eur. Econ. Assoc. 9 (4), 591–645.
Stulz, R.M., 1988. Managerial control of voting rights: financing polices and the market for corporate control. J. Financ. Econ. 20, 25–54.
Wan, W., Yiu, D., 2009. From crisis to opportunity: environmental jolt, corporate acquisitions, and firm performance. Strateg. Manag. J. 30, 791–801.