Strategic change and corporate governance: Evidence from the stock exchange industry

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Abstract

The literature suggests that demutualization improves financial performance, but most of these studies do not consider the corporate governance (CG) dimension to better understand this positive impact of demutualization. For a representative sample of global stock exchanges over a 21-year period, we examine the short and long term effects of demutualization on their financial performance. Unlike previous researchers, we also study whether the CG strategy of exchanges following demutualization affects their financial performance. Our major results indicate benefits from demutualization in the long term, and we find that improved performance is boosted by major restructuring in CG, when boards evolve to have fewer members but more specialized directors. Our results shed light on how demutualization strategy brings efficiencies by identifying attributes of corporate variables that explain how performance improved. This study provides guidance to exchanges considering demutualization. Results may also apply to firms facing major changes in their business environments.

Keywords: Conversion to for-profit firm strategy; stock exchanges; performance; corporate governance.

JEL classification: G34; G15; L2

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1. Introduction

An increasing number of global exchanges have demutualized by converting their organizations from member-owned, not-for-profit to for-profit companies. Demutualization is a response to the evolution of the financial environment due to the internationalization of financial markets, regulatory reforms and innovative technology and financial products**.** Stock exchanges recognized that they needed flexibility to compete and adapt to the changing environment, but found it difficult to do so while still functioning under a traditional member-owned structure (Domowitz and Steil, 1999; Otchere 2006; Otchere and Abou-Zied, 2008).

Most studies on demutualization over the past two decades are theoretical and focus on the impact of demutualization on financial market competition and regulation (Aggarwal, 2002; Hart and Moore, 1996; Macey and O'Hara, 2005; Pirrong, 1999, 2000; Reiffen and Robe, 2011; Steil, 2002). Only a few researchers focus on the effects of demutualization on market quality, efficiency, and performance (Krishnamurti et al., 2003; Otchere, 2006; Otchere and Abou-Zied, 2008; Serifsoy, 2008). They consider relatively short time periods and often find that demutualization positively affects financial performance. However, demutualization is also accompanied by changes in corporate governance (Aggarwall, 2002; Hart and Moore, 1996) and, while governance can critically affect performance (Lee, 2010), this dimension has been overlooked in the literature.

This paper addresses these two gaps in the literature by first examining the short and long term effects of demutualization on financial performance and, second, by studying the role of

the corporate governance dimension on the financial performance of the demutualized stock exchanges. We use a unique firm-level data set of a representative sample of stock exchanges covering a 21-year period, combining financial data with detailed data on board composition that enables us to conduct a fine-grained analysis of the interaction among corporate governance, demutualization and exchange performance. We explore the potential moderating role of exchanges' corporate governance strategies and how demutualization affects performance.

We focus our study on the boards of directors, examining board attributes such as directors' stakeholder status and expertise because, as the literature suggests, the board is a key factor in the governance structure of large firms (e.g. Fama and Jensen, 1983). We also assess the effect of changes in top management and incentive structures on exchange financial performance. The literature on corporate governance suggests that these factors may contribute to improving firm value (e.g. Mehran 1995; Morgan and Poulsen, 2001).

We find a positive impact of demutualization, especially over the long term, and we report that some changes in stock exchanges' corporate governance improve financial performance of the demutualized exchanges. These findings suggest the need to incorporate the corporate governance dimension for a better understanding of demutualization and its impact on exchange performance.

This article contributes to the literature in several ways. First, regarding financial institutions, it contributes to the literature on the impact of demutualization on the performance of exchanges by analyzing various performance indicators. Second, we extend previous research over a longer time period and a more comprehensive list of exchanges. Third, and most important, it is the first study on demutualization to consider the corporate governance

dimension in a fine-grained manner. We explore the potential moderating role of corporate governance restructuring measures on financial performance after demutualization.

We believe that these three contributions provide a more complete overview and a better understanding of demutualization and how it affects performance. Consequently, our research has important implications for the governance strategy of exchanges considering demutualization.

The remainder of the paper is structured as follows. Section 2 briefly reviews the literature on demutualization. Section 3 develops the tested hypotheses. Section 4 describes the sample, the data and the methodology while Section 5 presents and discusses the empirical results. Section 6 concludes.

2. The demutualization of stock exchanges

According to the World Federation of Exchanges, in 2017 more than two-thirds of their stock exchange members were for-profit companies. Domowitz and Steil (1999, p.21), among the first authors to explore this development, find that demutualization is a process of "*detaching ownership from membership*" that "*could have a significant impact on the exchange's behavior*". As member-owned mutual associations, exchanges were typically run as clubs where only members had access to trading. To trade on the market, nonmembers were obliged to go through the brokers-owners and pay fees of intermediation. This allowed broker-owners a monopoly in intermediation, and they became resistant to changes in exchange operations that could alter their competitive position and reduce a major source of revenue (Lee, 1998). The decisions taken on the board of the exchanges were substantially influenced by the interests of members (Steil, 2002).

This monopolistic market view of exchanges became outdated during the last 20 years as technology changed the landscape. Automated trading considerably affected the exchange

industry and reduced the need for brokers to be physically present on the trading floor. Listing and trading became less constrained by location and access to exchange platforms. Automated exchanges allow non-members to trade without member intermediation, which increased competition and forced the exchanges to adapt in order to keep their market share. The governance model of exchanges based on membership proved to have many limitations, including poor adaptability to a changing financial environment (Steil, 2002).

Hart and Moore (1996) use a theoretical model to show that a for-profit organization is more efficient than a members' cooperative exchange in an increasingly competitive environment. Aggarwal (2002) finds that changes in the organizational structure of exchanges reflect the huge transformation affecting the industry, pushing them to undertake strategic measures, especially demutualization, to respond to the new environment.

By distinguishing ownership from membership, the main objective of demutualization is "*to reduce the control of intermediaries over the strategic positioning of the exchange*" (Steil, 2002, p.6). Demutualization encourages exchanges and their boards to react as for-profit companies and to put the interests of the exchange over interest groups (Cybo-Ottone et al., 2000). The conversion to a for-profit structure is usually accompanied by changes in governance structure, especially changes in boards of directors to better represent outside shareholders (Aggarwall, 2002). For example, following demutualization, many exchanges change their boards by appointing more qualified and specialized directors (Akhtar, 2002). Therefore, demutualization may have a profound effect on corporate governance, including board composition. However, as Steil (2002) notes, demutualized exchanges are not all the same regarding governance practices. For example, while some demutualized exchanges retain governance practices not much different from those of mutual exchanges, for others, practices greatly differ. Therefore, we need to investigate these differences in corporate governance practices following demutualization to have a better understanding of how

demutualization affects exchange performance. We expect that these differences may influence the efficiency of demutualization processes to a great degree.

3. Hypotheses development

3.1 Demutualization, listing and financial performance

With the rapid emergence of demutualization over the last 20 years, researchers began to examine the impact of demutualization on exchange performance empirically. Krishnamurti et al. (2003) show that demutualized exchanges have better market quality than mutualized exchange. Serifsoy (2008) finds that demutualized exchanges have better technical efficiency, in general, than mutual exchanges. However, in contrast to Hart and Moore (1996), he finds that some mutual exchanges were able to adapt to innovative trading technologies as well as the demutualized exchanges. Otchere and Abou-Zied (2008) find that demutualization contributes to improve financial performance.

The literature infers that demutualization provides the exchanges with the flexibility and the financing required to be competitive in fast-changing global markets (Aggarwal, 2002; Lee 2002; Steil, 2002). After demutualization, exchanges behave like other for-profit firms, seeking to minimize costs, maximize profits and increase market share (Lee, 1998). Changes in strategy include new products and technologies and internationalization, all of which benefit market performance, market quality and attractiveness (e.g. Hasan et al. 2003; Hendershott and Moulton, 2011; Lo, 2013). In addition, demutualization pushes exchanges to change their shareholders, boards and management (Cybo-Ottone, 2000). Contrary to member-owned entities, demutualized exchanges should theoretically consider exchange utility rather than individual member interests (Di Noia, 1998). Accordingly, we argue that the effect of demutualization on exchange financial performance should be positive:

H1 a: Demutualization has a positive impact on the financial performance of stock exchanges.

After demutualizing, an increasing number of exchanges go public by listing their shares on their own exchanges (self-list). Aggarwal (2002) states that self-listing is an optional step following demutualization. In 2017, around 70 percent of the demutualized exchanges worldwide were publicly listed companies. Few studies have documented the effect of self-listing on exchange profitability and performance. In analyzing eight listed exchanges, Mendiola and O'Hara (2003) find mixed results that are not conclusive on the impact of self-listing on financial performance. While some exchanges clearly improved their performance (measured by ROA, ROE and net income margin) after self-listing, others experienced a decrease. Otchere (2006) considers a sample of listed and not listed exchanges and finds mixed results, with a decrease in some financial variables (ROA and ROE) in the post-listing years and a slight increase in other variables. However, his results show that listed exchanges performed better than non-listed exchanges during the post-listing period. Otchere and Abou-Zied (2008) focus on the case of the Australian Stock Exchange (ASX), one of the first exchanges to self-list, in October 1998. Contrary to previous studies, they find that ASX's profitability improved after self-listing.

Therefore, the empirical studies are not conclusive on the effects of listing on exchange profitability. There can be advantages of self-listing, such as improved efficiency, because listed exchanges better respond to the evolution of the exchange environment (Otchere, 2006). In addition, self-listing allows exchanges to raise capital and to introduce market incentives and discipline (Otcher, 2006). It also gives incentives to exchange managers to perform better. However, the self-listing decision can be costly for exchanges. One potential disadvantage is that listed exchanges, motivated by profits, may charge higher fees for their services, which could reduce the volume of their activity[1] and eventually result in a negative impact on profitability.

[1] - For more details on advantages and disadvantages of the listing process, see Otchere's study (2006).

The literature on initial public offerings can help to explain the potential negative effect of exchange listing on performance, based on three explanations: first, the transition from private to public ownership leads to the reduction of management ownership, which may result in an increase of conflicts of interest between managers and shareholders, as described by Jensen and Meckling (1976) in their theory of the agency problem (Jain and Kini, 1994). Second, managers can manipulate accounting numbers by overstating performance prior to listing (Teoh et al., 1998). Third, the decision to go public is made when the firm reaches the top of its productivity cycle and it may be difficult to maintain in the future (Chemmanur et al., 2010). Consequently, the effect of self-listing on exchange performance is unclear; it could be positive or negative. We thus pose the following hypotheses:

H1 b 1: Listing has a positive impact on the financial performance of stock exchanges.

H1 b 2: Listing has a negative impact on the financial performance of stock exchanges.

3.2 Structural changes in the governing bodies and in the incentive programs

Demutualization should help to improve exchange governance and efficiencies but, as Akhtar (2002) argues, this is only possible if accompanied by better decision-making, incentive programs and effective supervision of governing bodies. These improvements involve changes in the boards of directors and top management and changes in management incentive programs.

An extensive literature examines the interactions among firm performance and boards of directors and management turnover in different contexts, especially during periods of major changes in the business environment in developing markets (e.g. Firth et al., 2006), after takeovers (e.g. Martin and McConnell, 1991) or after privatization (Omran, 2009). Results indicate that operating performance increases following management changes, for a variety of reasons. Long-tenured managers may not have current knowledge and their skills may

become obsolete (Claessens and Djankov, 1999). In addition, the linkage of management remuneration to corporate performance objectives aligns managers with firm profit objective (Jensen and Meckling, 1976).

According to the management turnover literature, value created by demutualization can come from changes in the top management team. The replacement of existing management by new management better aligned with a new business environment may be beneficial for the exchanges, since existing management may be resistant to changes.

In addition, management must have the right incentives to adapt and reinforce the new commercial culture of the exchanges following demutualization. Consequently, we believe that the increased use of incentive pay schemes that better align managers' interests with shareholder value maximization in a new for-profit organization (Holmström, 1979) will be associated with a larger positive impact of demutualization on the performance of the stock exchanges.

The literature also shows that changes in the boards of directors contribute to increased firm performance as well, especially when these changes in the boards are accompanied by a new management style (Omran, 2009). The management literature on strategic change has brought board characteristics to the forefront (e.g. Haynes and Hillman, 2010; Oehmichen et al., 2017; Westphal and Fredrickson, 2001). The studies examine different dimensions of board characteristics and suggest that these characteristics including size, demography, human and social capital, experience and diversity affect corporate strategic change and, in turn, corporate performance, since strategic change is a major source of competitive advantage and firm survival (Mintzberg, 1978). For example, some previous studies, such as Haynes and Hillman (2010), find a positive relationship between board diversity and strategic change. We believe that board diversity is valuable for exchanges when they change strategies after demutualization. Based on this literature, we expect that diversifying the board of directors

through the introduction of new board members will be associated with a larger positive impact of demutualization. Consequently:

H2: Structural changes in the governing bodies of exchanges involving changes in top management, increased use of incentive payment schemes for top management and the introduction of new board members (especially investors in the exchange), positively moderate the impact of demutualization on performance.

3.3 Presence of exchange members on the board

One of the most important tasks of boards is their role (Tricker, 2012) in actively evaluating and voting on strategic alternatives recommended by top management (e.g. Andrews, 1980; Johnson et al. 1996), including decisions on restructuring measures that help firms adapt to changes in the competitive environment.

The literature on corporate governance emphasizes the possible agency conflicts that can push managers not to act systematically in the interests of their shareholders. To reduce these problems, the board of directors supervises top management to a certain extent. By performing its supervisory function well, the board may contribute to corporate performance (Jackling and Johl, 2009). But the board then needs to decrease the number of dependent directors (Baysinger and Butler, 1985; Lefort and Urzúa, 2008) who have relationships with the company either directly or indirectly as partners or members (Duchin et al., 2010).

The increase in exchange industry competition is forcing its managers to search for new value-enhancing business opportunities and to make changes and introduce innovations to adapt to these new circumstances (Otchere and Abou-Zied, 2008). But as Domowitz and Steil (1999) argue, members may resist innovations if they reduce the demand for members' intermediation services. When exchanges were run as mutual associations, as Akhtar (2002, p.12) puts it, exchange members "resisted changes if these entailed additional costs, loss of

revenue or competitive threat". Several instances where reforms and diverse changes in exchanges have been hindered by members of the exchange have been documented (e.g. Cybo-Ottone et al., 2000; Hart and Moore, 1996). For example, Cybo-Ottone et al. (2000) note that member-owned exchanges not fully electronic have resisted the possibility of electronic trading. They also note that member-owned exchanges have also resisted remote membership, which increases competition in domestic markets and is useful to attract cross-border business by giving more access to foreign intermediaries. Some European countries and the US have often restricted membership in a national exchange by foreign entities (Cybo-Ottone et al., 2000). Cybo-Ottone et al. (2000) also find that member-owned exchanges have resisted different types of integration, consolidation processes and privatization in the EU. For example, members of Swedish and Italian exchanges blocked informal takeover attempts (Cybo-Ottone et al., 2000).

Akhtar (2002) and others argue that when exchanges separate ownership and membership by demutualizing, it is not appropriate that members have exclusive authority over decision-making. It follows that exchanges can decrease the influence of trading members on corporate decisions by decreasing their representation on the board and replacing them by directors more willing to consider competitive strategies to adapt to new market conditions. Consequently:

H3: The proportion of exchange members on the boards of stock exchanges negatively moderates the impact of demutualization on performance.

3.4 Directors' attributes

It is widely accepted that "*board composition is a critical element in the ability of the board to impact firm outcomes*" (Johnson et al. 2013, p.1) and a growing literature highlights the importance of taking into account the human capital dimension beyond board independence.

Human capital characteristics are "*the skills and experiences that directors bring to the decision-making process*" (Johnson et al. 2013, p. 240) that may contribute to increased firm performance (Hillman and Dalziel, 2003).

Demutualization implies an important change in strategy and motive. In a technically complex and highly specialist risk sector such as stock markets, directors, as part of their strategic, advisory and monitoring roles, need sufficient industry-specific knowledge to access the necessary information and ask critical questions of management. Industry-specific knowledge enables directors to understand market functioning and evaluate challenges. Regarding boards' monitoring function, industry-specific knowledge enables directors to understand managerial performance and to recognize misconduct (Oehmichen et al., 2017).

A regulatory background for board members may be especially important in stock markets as exchanges operate in a complex regulatory environment. Researchers have already highlighted the benefits of having directors with regulatory backgrounds in market infrastructure institutions (Lee, 2010). We also believe that directors with business-oriented competences adapted to this new business environment would be better positioned to help exchanges act to maximize their profits. Business administration experience and background, international experience and diverse business experience may be especially valuable for directors.

Diverse business experience relates to the concept of "board capital breadth" (Haynes and Hillman, 2010), which captures, among other facets of board heterogeneity, work experience in different sectors and companies and positively impacts corporate strategic change. Stock exchanges, forced to make strategic changes after demutualization to better adapt to the evolving business environment, may benefit from having board members with wide capital breath.

We classify director competences and background in two categories: (1) traditional competences in financial markets (stock brokerage) and (2) new-environment-related competences (business administration, diverse business experience, regulatory and international) that we believe are better adapted to a more competitive environment. We believe that an increase in the presence of board directors with new-environment-related competences will be beneficial for the demutualization process.

Accordingly:

H4 a*:* The increase in the presence of board directors with new-environment-related competences (business administration, diverse business experience, regulatory and international) will positively moderate the impact of demutualization on performance.

Director age is considered a key element of directors' demographic characteristics (Xu et al., 2017) since it can affect personal values (Rhodes, 1983) and decision-making about risk, prudence and wealth (Talavera et al., 2018). Director age can therefore be considered an important attribute of directors that has attracted relatively little research attention. According to the literature, younger directors tend to be more open to innovation and changes that can improve financial performance (Mishra and Jhunjhunwala, 2013; Muth and Donaldson, 1998).

Studying the impact of age on financial performance is particularly relevant for stock exchanges because these entities have experienced major transformations during the last two decades. Technological innovations have accelerated competition and encouraged the introduction of new financial products. Based on the literature, we expect that younger directors will be associated with a larger positive impact of demutualization on financial performance of stock exchanges. Consequently:

H4 b: Younger boards positively moderate the impact of demutualization on performance.

4. Data and methodology

4.1 Sample selection

We use a unique firm-level (unbalanced) panel of 31 equity stock exchanges, all members of the World Federation of Exchanges (WFE), covering the period from 1995 to 2016. The 31 equity stock exchanges represent 80 percent of the total market capitalization of the stock exchange members of the WFE. The sample comprises 7 exchanges from the Americas, 10 from Europe, one from Africa and 13 from Asia/Pacific. The appendix A provides a sample overview.

Stock exchanges are classified into three categories: not demutualized, demutualized but not listed and demutualized and listed. Exchange financial data were manually collected from annual reports. When data were not available, it was completed with Thomson Reuters database. The main source for macroeconomic data is the World Bank database. We also used the WFE database for exchange general financial data (i.e. their market capitalization).

Corporate governance data were also collected for 16 of the 26 demutualized stock exchanges of our sample, covering the period 1995 to 2016. For the rest of the demutualized stock exchanges, corporate governance data were not available or were incomplete. These 16 demutualized exchanges cover an average of 220 board directors per year. Data were manually collected from exchange annual reports. When the profiles of directors were incomplete, we supplemented our database from Bloomberg and Reuters databases.

4.2 Variables

In order to test our four hypotheses, we use the variables described below. A further explanation of these variables appears in Appendix B.

4.2.1 Dependent variable- stock exchange financial performance

We measure stock exchange performance by using three different financial performance indicators commonly used in the literature on the exchange industry (e.g. see Otchere, 2006): Return on Assets (*ROA*), calculated as net income to total assets; Return on Equity (*ROE*), calculated as net income to shareholder equity; and Operating Margin (*OM*), defined as operating income to operating revenue.

4.2.2 Independent variables

To test whether demutualization has a positive effect on the financial performance of stock exchanges (H1a), we construct five dummy variables for demutualization that allow us to separate short-term and long-term effects. DEM_t equals one if the exchange demutualized during year t and 0 otherwise. DEM_{t-1} equals one if year t-1 is the demutualization year and zero otherwise, DEM_{t-2} equals one if year t-2 is the demutualization year and zero otherwise and DEM_{t-3} equals one if year t-3 is the demutualization year and zero otherwise. These variables capture the short term effects of demutualization. That is, DEM_t captures the impact of demutualization in exchange performance the same year that demutualization takes place, and DEM_{t-1}, DEM_{t-2} and DEM_{t-3} capture the impact of demutualization one, two and three years after demutualization.

To study the long-term effect, we define DEM_{t-n} as equal to one if the demutualization took place more than three years before t and zero otherwise.

To test the effect of listing on exchange financial performance (H1 b), we also construct five dummy variables for self-listing, *LIST*, designed the same way as the dummies for demutualization.

We introduce a third dummy variable *CGChange* as equal to one (*CGChange*= 1) if the exchange introduces new board members (especially investors of the exchange), changes the CEO and increases the use of incentive payment schemes for top management after demutualization, 0 otherwise. This variable allows us to test whether structural changes in the

governing bodies of exchanges positively moderate the impact of demutualization on performance (H2).

We also introduce the variable Members to measure the proportion of exchange members on the boards of stock exchanges to test if it negatively moderates the impact of demutualization on performance (H3).

Finally, to test whether director human capital moderates the impact of demutualization on exchange performance (H4 a), we consider five variables that reflect the professional experience of the board. *StockExchangeExp* measures the percentage of directors having past experience in stock markets. *DiverseBusinessExp* measures the percentage of directors having professional experience in at least three different sectors. *BusinessAdministrationExp* is the percentage of directors with experience in business administration; *RegulatoryExp* measures the percentage of directors with experience in regulation and *InternationalExp* measures the percentage of directors with international experience.

To ascertain whether board demography also positively moderates the impact of demutualization on performance (H4 b), we consider the *DtorAge* variable, which is the average age of board directors.

4.2.3 Control variables

We use control variables that the literature suggests can affect the performance of exchanges, including stock exchange characteristics such as financial and governance variables, and macroeconomic indicators. First, we control for exchange efficiency by using the ratio of total revenues to total assets (*AssetTurn*) (Mendiola and O'Hara, 2003). Second, we control for both the size of the exchange and the level of development of its home economy by using the ratio market capitalization divided by GDP (*MCap/Gdp*) (Rajan and Zingales, 2003). Third, the level of exchange (*Leverage)* is measured by the ratio of total liabilities divided by equity (Mendiola and O'Hara, 2003). For corporate governance variables, we use controls from the

literature: board size (*BoardSize*), measured by the number of directors on the board (Jensen, 1993). The empirical results regarding board size are inconclusive: while some studies find a negative correlation between board size and firm performance (e.g. Paniagua at al., 2018), other studies find that large boards improve financial performance (Dalton et al., 1999); director tenure (*DtorsTenure)* is measured by the average tenure of directors in the board (Fich and Shivdasani, 2006; Muth and Donaldson, 1998); the number of other directorships (*OtherDtorSh)* is measured by the average number of directorships other than the stock exchange (Cashman et al. 2012) and board independence (*Independent)* is measured by the proportion of independent directors on the board (Bhagat and Black 2002; Hermalin and Weisbach, 1991). We classify as independent directors those who have no business or employment relationships with the exchange. The empirical results regarding the presence of independent directors in boards are also inconclusive. Based on agency theory (Fama and Jensen, 1983), some studies argue that independent directors, being free from economic and personal links with the firm, can better control managerial decisions and encourage strategic changes, which in return improve firm financial performance (Uribe-Bohorquez et al., 2018). Other studies highlight the lack of firm-specific knowledge of independent directors that can alter the quality of their roles in monitoring and advising managers (e.g. Adams and Ferreira, 2007).

Following Otchere and Abou-Zied (2008), we use GDP growth (*GdpG*) as macroeconomic variables to control for the country economic situation. We also control for merger activities (*Merger*). The literature suggests that the merger of stock exchanges can contribute to increased market value, so it is important to control for this potential effect (Nielsson, 2009).

Table A provides a summary of the variables we use in the empirical analysis to test each hypothesis and the related literature, together with the expected sign for variables.

4.3 Methodology

We proceeded in three steps. First, we conducted a univariate analysis to investigate differences in performance and in director characteristics between pre- and post-demutualization periods. In order to capture the long-term effect of demutualization, pre-demutualization corresponds to the five years preceding demutualization, and post-demutualization corresponds to the seven years following demutualization.

Second, we investigate the impact of demutualization on the financial performance of exchanges by using a two-way fixed-effect model (with a time-invariant stock exchange fixed effect and a year fixed effect) with (unbalanced) panel data . The model specification is (Eq. (A.1):

$$PERFORMANCE_{it} = \alpha + \beta_0 DEM_{it} + \beta_1 DEM_{i\,t-1} + \beta_2 DEM_{i\,t-2} + \beta_3 DEM_{i\,t-3} + \beta_4 DEM_{i\,t-n} + \beta_5 LIST_{i\,t} + \beta_6 LIST_{i\,t-1} + \beta_7 LIST_{i\,t-2} + \beta_8 LIST_{i\,t-3} + \beta_9 LIST_{i\,t-n} + \beta_{10} CHARCONTROLS_{it} + \beta_{11} GdpG_{it} + \beta_{12} Merger_{it} + u_{it}$$

Subscripts *i* and *t* index stock exchange and time. The error component structure is of the form: $u_{it} = d_i + d_t + \varepsilon_{it}$.

Here, d_i is the time-invariant stock exchange fixed-effect, d_t is the year fixed-effect and ε_{it} the i.i.d. component. The stock exchange fixed effect is meant to capture unobservable stock exchange characteristics such as manager abilities. We include year fixed effects to mitigate concerns over any other time trend that could impact exchange financial performance. They allow us to control for global trends of exchange performance world-wide. We run three regressions since, for robustness purposes, we use three different indicators to measure the performance of the exchanges: ROA, ROE, and OM. *CHARCONTROLS* refers to stock exchange characteristics, including *AssetTurn*; *MCap/Gdp* and *Leverage*. We also include a control for exchange macroeconomic environment (GdpG) and for merger activities (*Merger*).

The third step was to investigate the potential moderating role of corporate governance on how demutualization affected exchange performance. The model specification is (Eq. (A.2)):

$$PERFORMANCE_{it} = \alpha + \beta_1 DEM_{it} + \beta_2 LIST_{it} + \beta_3 BoardCHAR_{it}\ x\ DEM_{it}$$
$$+ \beta_4 CHARCONTROLS_{it} + \beta_5 GdpG_{it} + \beta_6 Merger_{it} + u_{it}$$

Where *BoardCHAR* refers to the corporate governance variables allowing us to test hypotheses H2, H3 and H4 (*CGChange, Members, StockExchangeExp, DiverseBusinessExp, BusinessAdministrationExp, RegulatoryExp, InternationalExp* and *DtorAge,)*. In this specification, since our variables of interest are the cross effects of corporate governance with demutualization, the dummy variables for demutualization (DEM_{it}) and listing ($LIST_{it}$), are simpler and not broken down in short and long term effects, taking the value of 1 after demutualization and self-listing and 0 otherwise. Here $CHARCONTROLS_{it}$ include both the financial and the corporate governance control variables explained above (*AssetTurn, MCap/Gdp, Leverage, BoardSize, DtorsTenure, OtherDtorSh, Independent).*

5. Empirical results and discussion

5.1 Descriptive statistics

Table B.1 shows the descriptive statistics of the financial variables used. On average, the exchanges' debt represents 38.26 percent of their equity (*Leverage*) and their market capitalization represents around 90.10 percent of their GDP on average (*MCap/Gdp*). The average return on assets (ROA) is 8.76 percent and the average return on equity (ROE) is 14.80 percent. We observe significant differences between demutualized and non-demutualized stock exchanges for all the financial performance ratios. The demutualized exchanges seem to have better performance and to be more efficient than non-demutualized exchanges.

Considering governance variables (Table B.2), boards in our sample have 13.14 directors on average (*BoardSize*) with an average age of 53.88 years (*DtorsAge*). The directors have been on the board for 3.56 years (*DtorsTenure*) and belong to the boards of 2.71 other companies (*OtherDtorSh*).The proportion of independent directors on the board is 29.37 percent, in line with the average ratio of independent directors observed in many different sectors and countries. In a comprehensive study that includes a sample of 2185 firms from 2006 to 2015 from various industries and countries, Uribe-Bohorquez et al. (2018) find that the proportion of independent directors is 30.8 percent. On average, 37.52 percent of the directors are members of the exchange (*Members*), 28.25 percent have experience in the exchange market (*StockExchangeExp*), 24.36 percent have international experience (*InternationalExp*), 15.35 percent have strong backgrounds and experience in business administration (*BusinessAdministrationExp)*, 11.37 percent have experience in diverse businesses (*DiverseBusinessExp*) and 9.72 percent have experience in regulation (*RegulatoryExp*). About 13 percent of the exchanges implemented structural changes in their boards, top management and management payment schemes following demutualization (*CGChange*).

5.2 Univariate analysis

Table B.3 shows the mean values of financial performance variables and the board of director characteristics for pre- and post-demutualization periods. Considering financial aspects, we find that the mean ROA increases from 6.89 percent before demutualization to 11.42 percent after demutualization and that the difference is significant at the 1 percent level. The mean ROE also increases from 10.64 percent to 18.25 percent following demutualization, and this difference is significant at the 1 percent level. More important is the difference observed for the mean OM, which more than doubled, from 14.04 percent during the period prior to

demutualization to 31.66 percent after demutualization, and this difference is significant at the 1 percent level.

Unlike previous studies that examine the effect of demutualization only five years following this event (Otchere and Abou-Zied, 2008), we examine a longer time period. The results suggest that stock exchanges experience an improvement in their financial performance after demutualization and that this positive effect lasts and was significant even seven years after their conversion to profit firms.

For the corporate governance dimension, we observe that after demutualization, the boards of the exchanges are smaller (going from 14.36 to 12.91 directors), with smaller member representation (from 44.70% to 36.99%) and an increased proportion of directors with international experience (from 18.14% to 26.19%), more directors with experience in diverse businesses (from 6.38% to 15.58%) and business administration (from 11.04% to 16.64%). The proportion of independent directors remains unchanged (about 28%).

5.3 Multivariate analysis

In the first part of this analysis, we study the impact of demutualization on exchange performance without incorporating the corporate governance dimension. In the second part, we add director characteristics in order to assess their contributions to improving financial performance.

5.3.1 The impact of demutualization on exchange performance excluding the corporate governance dimension

We study first the correlations between the variables used in the model to detect potential multicollinearity problems. Table B.4 reports the results. The correlations between the independent variables are not high, meaning that multicollinearity is not a problem in our model.

The results of the regressions of model (Eq.(A.1)) are reported in Table C.1 We find that demutualization has a significant and positive impact on ROA, ROE and OM, especially in the long term. Results indicate that demutualization enhances performance and that the effect takes more than two years to be significant. Therefore, we accept H1 a, a result in line with the study of Otchere and Abou-Zied (2008) that focuses on the Australian Stock Exchange and shows that the exchange's demutualization contributed to improving its performance.

Another remarkable result is the non-significance and some negative coefficients for *List* dummies, partially consistent with H1 b2. These two findings confirm results from previous studies of improved performance at the demutualization stage and no significant improvement in operating performance when exchanges subsequently self-list (e.g. Oldford and Otchere 2011). Our results suggest that the increase in exchange performance should be attributed to demutualization and not to self-listing.

For the rest of the control variables, results show that asset turnover positively affects exchange financial performance, implying that efficiency in the use of assets contributes to improve performance (Mendiola and O'Hara, 2003). We use market capitalization as a percentage of GDP as a proxy for both the size of the stock exchange and the level of development of its home economy, finding that performance increases with these two indicators when measured by ROE and OM. One possible explanation is that large exchanges located in developed countries attract more trades (Economides, 1996) which in turn yields more positive performance. Other studies confirm the positive effect of firm size on financial performance (e.g. Mikkelson et al., 1997). Regarding *Leverage*, we find that exchanges using less debt have better performance. However, these results are not statistically significant for any of the three financial variables used.

For control variables, *GdpG* and *Merger* have a positive and significant coefficient for OM, suggesting that, in line with previous studies (Otchere and Abou-Zied, 2008), the

macroeconomic environment of exchanges and the number of deals with other financial entities contribute to improve their operational performance (Nielsson, 2009).

5.3.2 The impact of demutualization on exchange performance, including corporate governance dimension

Table C.2 reports the results of the regressions for model (Eq. (A.2)). In line with the results for the long-term effects of demutualization in the regressions without corporate governance variables, the positive and highly significant coefficients for *DEM* in all the regressions, including corporate governance variables, suggest that demutualization is highly beneficial for exchange performance and confirm again H1a. The coefficient for listing is negative and significant for ROA and ROE regressions, which confirms the results obtained in Model 1.

The remaining regressions reported in Table C.2 analyze whether some corporate governance variables moderate the effect of demutualization on performance, i.e. whether changes in corporate governance practices following demutualization strengthened the positive effect of demutualization. We find that *CGChange* is positive and significant for ROE, thus partially supporting H2. Structural changes in the governing bodies of the exchanges contribute to improve performance as measured by ROE.

For *Members*, we obtain the negative coefficient expected in H3 in all the regressions, significant for two of the three performance measures (ROE and OM), suggesting that those exchanges with fewer members on the board benefited most from demutualization. This finding is in line with the studies of Domowitz and Steil (1999) and Akhtar (2002), who report that mutual exchanges encounter resistance to change from their members. Consequently, some of them decided to demutualize their activities and decrease the number of members.

Regarding H4 a, results are mixed. For international and diverse business experience, we do not obtain significant evidence of their moderating role in increasing demutualized exchange financial performance. The considerable increase in the proportion of directors with international and diverse business experiences (cf. table B.3) did not contribute to improved financial performance. In addition, we find little evidence of the moderating role for experience in the stock exchange sector. However, one of the most noteworthy results is the positive and highly significant coefficient for all the performance indicators for *BusinessAdministrationExp*, which suggests that business administration experience and background become especially valuable given the new for-profit motive of the exchanges. After demutualization, exchanges are no longer monopolies and must run as efficient business companies. Moreover, directors with business administration experience are likely to have financial expertise as well. Scholars suggest that board-level financial expertise is critically important in achieving performance targets in technically complex sectors (e.g. Adams and Jiang, 2016; Agrawal and Chadha, 2005).

We also find a negative moderating effect of the average age of directors on the impact of demutualization on performance for all the financial performance indicators, thus supporting H4 b. This implies that the nomination of younger directors in the board significantly contributes to strengthening financial performance following demutualization.

For board controls, *DtorsTenure* has a positive and significant coefficient for all the performance indicators, suggesting that director experience is valuable for exchange performance. This result is in line with the literature, which associates tenure with director experience and cognitive capabilities in making good decisions (e.g. Johnson et al., 2013; Muth and Donaldson, 1998). Similarly, our results suggest that the number of other directorships held by directors positively contributes to exchange performance. The experience gained by directors through participation in the boards of other companies facing

different type of challenges may strengthen their ability to provide general managerial advice and counsel as well as oversight of firm management performance.

Our results also show no significant effect of board size on financial performance, in line with previous studies (e.g. Coles et al. 2008).

Finally, we do not find evidence that the presence of independent directors on the boards affects financial performance, in line with several previous studies (e.g. Bhagat and Black, 2002; Hermalin and Weisbach, 1991).

5.4 Robustness check

We conducted several robustness checks. We examined a fourth financial performance variable, the net income margin, measured as net income over total revenues. Findings are in line to those for ROA, ROE and OM.

Why the effects of corporate governance restructuring following demutualization are so long-lasting? One possible explanation is the argument given by many researchers that board variables need some time to affect the performance of firms (Liu et al., 2015). Another related explanation is that changes in board composition may take a relatively long time to be implemented (Akhtar, 2002; Steil, 2002).To test for this explanation, we examine the timing of corporate governance changes by performing an unreported analysis where we compare the mean values for the different corporate governance variables before demutualization with the mean values for different time periods after demutualization. In particular, we compare the mean values for the five years preceding demutualization (Period 1) with the mean values for 3 different periods following demutualization: the first window captures board composition during the three years following demutualization (Period 2), the second (Period 3), includes the five years following demutualization, and the third (Period 4) refers to the seven years after demutualization. Results indicate that some changes are significant only when

considering Period 4. In particular, this is the case for *Members, StockExchangeExp, BusinessAdministrationExp, InternationalExp, DiverseBusinessExp and RegulatoryExp*. These results suggest that corporate governance restructuring took a relatively long time following demutualization (all unreported results are available from the authors upon request). In addition, we face the challenge of endogeneity like most of the research examining the relationship between board composition and firm performance (e.g. Liu et al. 2015). The performance of exchanges could affect board composition. To account for the possibility of endogeneity in our regressions, we estimate three regressions presented in Table C.3 instrumenting the corporate governance variables related to directors of the board by its one-period lagged values as in the standard fashion, given the obvious difficulties of finding other valid instruments in a study involving companies from different areas in the world as ours. However, this specification allows us to test for the above mentioned argument by many researchers that board variables need some time to affect the performance of firms. Although with this specification we lose some significant coefficients because of losing several observations due to lagged variables, the fit of these regressions is satisfactory and our main results regarding corporate governance variables are unchanged. In fact, this specification can be considered more appropriate since, as already argued, changes in corporate governance may need time to affect the performance of firms (Liu et al., 2015), especially those affecting the governing bodies of the exchanges (boards of directors and top management). Some impacts of corporate governance variables now become evident and are more significant when measured with their lagged values. This is the case for *CGChange*, which now has a positive and significant coefficient for the three performance indicators, supporting H2: demutualization brings more efficiencies if accompanied by structural changes in the governing bodies of the exchanges. The new for-profit motive and the more competitive environment require restructuring the exchanges at both the board and top management level.

According to our results, the exchanges that combined both types of restructuring, and also revised top management payment incentives, benefited the most from demutualization.

6. Conclusion

The internationalization of financial markets and the development of sophisticated electronic communication networks has positioned exchanges in direct competition with each other and altered their major sources of revenue (Lee 2002; Otchere 2006; Otchere and Abou-Zied, 2008). Exchanges must search for multiple sources of revenue and strategies to be competitive, and the member-owned structure does not provide managers with the flexibility to exploit profitable business opportunities to adapt to these new circumstances (Otchere and Abou-Zied, 2008). Many exchanges have converted from member-owned not-for-profit to for-profit companies by demutualizing to respond to a more dynamic environment.

But for demutualization to ensure effective governance and generate the maximum efficiencies, it must be accompanied by appropriate governance strategies to improve decision-making and incentive schemes (Akhtar, 2002). We examine the role of corporate governance strategies in explaining the general improvement in performance following demutualization. This is in contrast with the existing literature that has not considered in detail the corporate governance dimension when examining the impact of demutualization on performance. The use of detailed data on board composition for a number of demutualized exchanges with different characteristics allows us to do a fine-grained analysis and provide guidance to other exchanges considering demutualization.

Our findings provide evidence that a demutualization strategy is beneficial for exchange performance, although that improvement occurs over a long-term period. Our results also suggest that some corporate governance strategies play a role in understanding the channels through which demutualization can bring efficiencies. The exchanges that benefited most

from demutualization diversified their boards, had fewer exchange members and more directors with specific competences, experiences and backgrounds. The exchanges that re-focused their boards, top management teams and incentive structures to create value also improved their performance following demutualization. Directors with for-profit business experience are especially valuable. We believe that how directors are distributed across board committees is also key to understanding how board composition affects demutualization strategy and, in turn, performance. Indeed, the conversion to for-profit might persuade exchanges to diversify their activities and to pursue new business initiatives, although these activities could entail more risks and generate conflicts of interests in the board (e.g. Worthington and Higgs, 2006). One solution is to nominate special committees to address these risks, as the Singapore Stock Exchange did in setting up a conflicts committee. A growing body of literature addresses the relation between monitoring committees and firm performance (e.g. Upadhyay and Bhargava, 2014) although none of these studies focuses on stock exchanges. Future research could explore the role of board committee composition in the context of demutualization strategy.

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Table A. Hypotheses and variables used in the empirical analysis

Hypothesis	Variables used in the empirical study	Literature	Expected sign
H1 a*: Demutualization has a positive impact on exchange's financial performance*	DEM_t; DEM_{t-1}; DEM_{t-2}; DEM_{t-3}; DEM_{t-n}	Krishnamurti et al. (2003) ; Serifsoy (2008); Hart and Moore (1996); Otchere and Abou-Zied (2008)	+
H1 b 1: *Listing has a positive impact on the financial performance of stock exchanges*	$LIST_t$; $LIST_{t-1;}$ $LIST_{t-2;}$ $LIST_{t-3}$; $LIST_{t-n}$	Literature on stock exchanges: Mendiola and O'Hara (2003); Otchere (2006); Otchere and Abou-Zied (2008) Literature on IPO: Jain and Kini (1994); Teoh et al. (1998); Chemmanur et al. (2010), etc.	+
H1 b 2: *Listing has a negative impact on the financial performance of stock exchanges*			-
H2: *Structural changes in the governing bodies of the exchanges positively moderate the impact of demutualization on performance.*	*CGChange*	Firth et al. (2006), Martin and McConnell (1991), Omran (2009), Claessens and Djankov (1999), Jensen and Meckling (1976); Haynes and Hillman (2010); Westphal and Fredrickson (2001); Oehmichen et al. (2017)	+
H3: The proportion of exchange members on the boards negatively moderates the impact of demutualization on performance.	*Members*	Baysinger and Butler (1985); Lefort and Urzúa (2008); Duchin et al. (2010); Cybo-Ottone et al. (2000); Hart and Moore (1996)	-
H4 a: The increase in the presence of board directors with new-environment-related competences will positively moderate the impact of demutualization on performance.	*InternationalExp; DiverseBusinessExp; BusinessAdministrationExp; RegulatoryExp; StockExchangeExp*	Johnson et al. (2013); Hillman and Dalziel (2003)	+
H4b: *Younger boards positively moderate the impact of demutualization on performance*.	*DtorsAge*	Mishra and Jhunjhunwala (2013);Muth and Donaldson (1998)	-

Table B.1 Descriptive statistics of financial variables

	All sample			Demutualized exchanges		Non demutualized exchanges		T-test (p-values)
Variables	N	Mean	S.D.	Mean	S.D.	Mean	S.D.	
ROA	567	8.76	9.37	9.37	9.65	5.68	7.07	0.000
ROE	557	14.80	13.86	15.77	14.13	9.97	11.32	0.000
OM	557	27.54	25.54	29.71	24.71	16.71	26.96	0.000
AssetTurn	563	36.16	27.17	36.99	27.20	31.90	26.83	0.050
MCap/Gdp	633	90.10	143.96	94.78	159.30	72.50	53.78	0.056
Leverage	555	38.26	30.32	38.36	31.39	37.76	24.39	0.431

This table presents descriptive statistics for a sample of 31 stock exchanges covering the period 1995-2016. The sample includes 26 stock exchanges that demutualized and 5 stock exchanges that did not demutualize. The variables are described in Appendix. The last column provides p-values of t-statistics test where the mean of non-demutualized stock exchanges is equal to the mean of demutualized stock exchanges.

Table B.2 Descriptive statistics of corporate governance variables

Variable	Mean	S.D.
BoardSize	13.14	5.46
DtorsAge	53.88	5.10
DtorsTenure	3.56	1.98
OtherDtorSh	2.71	1.60
Members	37.52%	23.28%
Independent	29.37%	21.83%
InternationalExp	24.36%	16.87%
DiverseBusinessExp	11.37%	13.78%
BusinessAdministrationExp	15.35%	12.30%
RegulatoryExp	9.72%	12.73%
StockExchangeExp	28.25%	21.33%
	Frequency	
CGChange	13%	

This table presents descriptive statistics for a sample of 16 stock exchanges that demutualized during the period 1995-2016. The sample includes 5 stock exchanges that demutualized but are not self-listed and 11 stock exchanges that demutualized and are also self-listed.

Table B.3 Differences in performance and in board of directors characteristics of demutualized stock exchanges

	Pre-Demutualization	Post-Demutualization	Difference	T-test p-value
Financial performance variables				
ROA	6.89	11.42	4.53	0.000
ROE	10.64	18.25	7.60	0.000
OM	14.04	31.66	17.62	0.000
Board of directors characteristics				
BoardSize	14.36	12.91	-1.45	0.099
DtorsAge	50.46	54.36	3.90	0.000
DtorsTenure	2.61	3.68	1.07	0.000
OtherDtorSh	2.04	2.75	0.71	0.030
Members	44.70	36.99	-7.71	0.042
Independent	27.61	27.96	0.34	0.920
InternationalExp	18.14	26.19	8.05	0.004
DiverseBusinessExp	6.38	15.58	9.19	0.000
BusinessAdministrationExp	11.04	16.64	5.60	0.004
RegulatoryExp	9.42	12.22	2.79	0.205
StockExchangeExp	30.56	28.45	-2.10	0.537

This table provides pre- and post- demutualization means of the demutualized stock exchanges of our sample. Pre-demutualization corresponds to the 5 years preceding the year of demutualization. Post-demutualization corresponds to the 7 years following the year of demutualization. The last column provides p-values of t-statistics test where the mean during pre-demutualization is equal to the mean following the demutualization.

Table B.4 Bivariate correlations

Variables	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1.ROA	1.00							
2.ROE	0.72***	1.00						
3.OM	0.44***	0.57***	1.00					
4.AssetTurn	0.54***	0.24***	-0.03	1.00				
5.MCap/Gdp	-0.06	0.31***	0.29***	-0.16***	1.00			
6.GdpG	0.09**	0.09**	0.13***	-0.02	0.00	1.00		
7.Leverage	-0.34***	0.05	0.08*	0.37***	0.36***	-0.06	1.00	
8.DEM	0.21***	0.26***	0.30***	-0.07*	0.11***	-0.05	0.11***	1.00
9.List	0.09	0.21***	0.41***	-0.17***	0.25***	-0.07	0.19***	0.53***

Pearson correlations. * Significant at 10% ** Significant at 5% *** Significant at 1%

Table C.1 Empirical results excluding corporate governance variables

Variables	*ROA*	*ROE*	*OM*
DEM_t	-1.293	-1.172	-1.360
	(-0.79)	(-0.41)	(-0.28)
DEM_{t-1}	2.978*	4.505	12.298**
	(1.74)	(1.49)	(2.45)
DEM_{t-2}	4.032**	8.552***	11.417**
	(2.28)	(2.75)	(2.21)
DEM_{t-3}	3.521*	4.930	4.874
	(1.96)	(1.56)	(0.93)
DEM_{t-n}	3.813**	6.797**	7.794*
	(2.46)	(2.49)	(1.72)
$List_t$	-1.861	-3.520	4.129
	(-0.98)	(-1.05)	(-0.74)
$List_{t-1}$	-4.294**	-6.598*	-7.825
	(-2.19)	(-1.91)	(-1.36)
$List_{t-2}$	-4.804**	-6.845*	-6.440
	(-2.43)	(-1.96)	(-1.11)
$List_{t-3}$	-2.844	-2.924	5.270
	(-1.41)	(-0.82)	(0.89)
$List_{t-n}$	-1.676	0.844	5.225
	(-1.18)	(0.34)	(1.26)
AssetTurn	0.266***	0.223***	0.121***
	(16.99)	(8.09)	(2.65)
MCap/Gdp	-0.569	2.027***	3.876***
	(-1.54)	(3.10)	(3.57)
Leverage	-0.011	-0.047	-0.045
	(-0.64)	(-1.55)	(-0.88)
Merger	0.429	2.845	11.928**
	(0.26)	(0.97)	(2.45)
GdpG	-0.029	0.087	1.037***
	(-0.25)	(0.42)	(3.01)
Intercept	-5.860**	-1.708	0.166
	(-2.26)	(-0.37)	(0.02)
N	541	541	541
Year Fixed-Effects	Yes	Yes	Yes
Adj. R^2	0.45	0.31	0.31
F test for no Fixed Effects	6.55	5.27	7.66
Pr > F	0.000	0.000	0.000

Table C.2 Empirical results including corporate governance variables

Variables	*ROA*	*ROE*	*OM*
DEM	21.173***	44.195***	80.707***
	(2.81)	(2.88)	(3.63)
CGChange DEM*	1.545	6.445**	7.483
	(0.92)	(1.97)	(1.50)
Members DEM*	-3.536	-12.923**	-22.302**
	(-1.11)	(-2.00)	(-2.38)
InternationalExp DEM*	-2.787	-9.254	8.648
	(-0.82)	(-1.33)	(0.86)
*DiverseBusinessExp*DEM*	3.310	9.312	-11.217
	(0.86)	(1.19)	(0.99)
*BusinessAdministrationExp*DEM*	13.540***	19.667**	40.686***
	(2.88)	(2.06)	(2.96)
RegulatoryExp DEM*	-7.227	4.709	-42.228***
	(-1.46)	(0.47)	(-2.89)
*StockExchangeExp*DEM*	3.602	1.473	14.622*
	(1.18)	(0.24)	(1.65)
DtorsAge DEM*	-0.350**	-0.657**	-1.360***
	(-2.51)	(-2.32)	(-3.31)
List	-3.414***	-8.101***	-5.573
	(-2.83)	(-3.29)	(-1.56)
AssetTurn	0.258***	0.151***	0.067
	(14.24)	(4.10)	(1.26)
MCap/Gdp	-0.498	1.055	0.811
	(-1.29)	(1.34)	(-0.71)
Leverage	0.017	-.097***	-0.009
	(0.93)	(-2.68)	(-0.17)
GdpG	0.859***	1.379**	1.995***
	(4.39)	(3.46)	(3.45)
BoardSize	0.170	-0.033	-0.043
	(1.58)	(-0.15)	(-0.14)
DtorsTenure	0.544**	1.068**	1.268*
	(2.34)	(2.26)	(1.85)
OtherDtorSh	0.749*	2.531***	3.187**
	(1.75)	(2.90)	(2.52)
Independent	-1.545	-3.999	1.855
	(-0.54)	(-0.69)	(0.22)
Merger	-0.315	-0.004	-2.567
	(-0.13)	(-0.00)	(-0.37)
Intercept	- 13.733***	-6.809	-6.463
	(-4.06)	(-0.99)	(-0.65)
N	263	263	263
Adj. R^2	0.62	0.35	0.48
Year Fixed-Effects	Yes	Yes	Yes
F test for no Fixed Effects	5.52	4.07	5.46
Pr > F	0.0000	0.0000	0.0000

Table C.3 Empirical results for robustness check study

Variables	*ROA*	*ROE*	*OM*
DEM	32.444***	55.340***	114.737***
	(4.64)	(3.56)	(5.02)
CGChange DEM*	3.005*	7.557**	15.762***
	(1.89)	(2.14)	(3.03)
Members DEM*	-10.388***	-14.415**	-34.725***
	(-3.46)	(-2.16)	(-3.53)
InternationalExp DEM*	-7.105**	-10.189	-1.299
	(-2.11)	(-1.36)	(-0.12)
*DiverseBusinessExp*DEM*	3.209	2.065	-25.516**
	(0.91)	(0.26)	(-2.21)
*BusinessAdministrationExp*DEM*	17.759***	25.111**	22.462
	(4.03)	(2.57)	(1.56)
RegulatoryExp DEM*	-7.762*	18.375*	-18.005
	(-1.78)	(1.90)	(-1.26)
*StockExchangeExp*DEM*	4.478	1.774	14.024
	(1.59)	(0.28)	(1.53)
DtorsAge DEM*	-0.516***	-0.876***	-1.889***
	(-3.92)	(-3.00)	(-4.39)
List	-2.281**	-7.012***	-3.597
	(-2.07)	(-2.86)	(-1.00)
AssetTurn	0.273***	0.184***	0.081
	(15.62)	(4.75)	(1.42)
MCap/Gdp	-0.794**	0.423	0.367
	(-2.21)	(0.53)	(0.31)
Leverage	0.019	-0.090**	-0.005
	(1.14)	(-2.45)	(-0.10)
GdpG	0.873***	1.499***	2.176***
	(4.58)	(3.54)	(3.49)
BoardSize	0.091	0.161	-0.108
	(0.93)	(0.75)	(-0.34)
DtorsTenure	0.266	0.388	-0.088
	(1.22)	(0.80)	(-0.12)
OtherDtorSh	1.395***	3.621***	3.297**
	(3.46)	(4.05)	(2.50)
Independent	-1.758	-6.477	-14.447*
	(-0.66)	(-1.10)	(-1.67)
Merger	-0.649	-0.072	3.670
	(-0.33)	(-0.02)	(0.58)
Intercept	- 13.051***	-12.267*	2.814
	(-4.14)	(-1.75)	(0.27)
N	253	253	253
Adj. R^2	0.63	0.37	0.48
Year Fixed-Effects	Yes	Yes	Yes
F test for no Fixed Effects	7.36	5.91	5.99
Pr > F	0.0000	0.0000	0.0000

Appendix A. Sample overview

Stock exchange	Year of demutualization	Year of IPO
America region		
Bolsa de Comercio de Buenos Aires	2013	
Bolsa de Comercio de Santiago		
Bolsa de Valores de Colombia*	2001	2007
Bolsa de Valores de Lima*	2003	2003
Bolsa Mexicana de Valores*	2001	2008
NASDAQ	2000	2005
NYSE*	2006	2006
Europe region		
Athens Exchange	1999	2000
Budapest Stock Exchange	2002	
Cyprus Stock Exchange		
Deutsche Börse*	2000	2001
London Stock Exchange*	2000	2001
Malta Stock Exchange*	2007	
Oslo Børs*	2001	
SIX Swiss Exchange*	2002	
Warsaw Stock Exchange*	2010	2010
Wiener Borse	1999	
Asia/pacific region		
Australian Stock Exchange*	1998	1998
Bombay Stock Exchange	2005	2005
Bursa Malaysia*	2004	2005
Hong Kong Exchanges and Clearing*	2000	2000
Indonesia Stock Exchange		
Korea Exchange*	2005	
National Stock Exchange of India	1993	
New Zealand Stock Exchange	2002	2003
Philippines SE*	2001	2003
Stock Exchange of Thailand		
Taiwan Stock Exchange Corporation	1961	
Tel Aviv Stock Exchange		
Tokyo Stock Exchange*	2001	
Africa region		
Johannesburg Stock Exchange	2005	2005

*- it refers to stock exchanges for those we collected corporate governance data in addition to financial data. The dates of demutualization and IPO are obtained mainly from stock exchanges websites and from their annual reports. When the information is not available, we collect it from Sustainable Stock Exchanges Initiative Website.

Appendix B. Variables description

Performance Variables	
ROA	Return on assets measured as net income*100 / total assets
ROE	Return on equity measured as net income*100 / shareholder's equity
OM	Operating margin measured as operating income*100/ operating revenue
Financial Variables	
AssetTurn	Asset turnover measured as total revenues*100/total assets
MCap/Gdp	Ratio of market capitalization to GDP in percentage
Leverage	Financial leverage measured as total liabilities *100/ total equity
Demutualization and Listing Dummies	
DEM_{t-j}	Dummy variable = 1 if year t-j is the demutualization year, 0 otherwise
DEM_{t-n}	Dummy variable = 1 if the demutualization took place more than 3 years before t, 0 otherwise
DEM_t	Dummy variable = 1 the years after demutualization, 0 otherwise
$LIST_{t-j}$	Dummy variable = 1 if year t-j is the listing year, 0 otherwise
$LIST_{t-n}$	Dummy variable = 1 if listing took place more than 3 years before t, 0 otherwise
$LIST_t$	Dummy variable = 1 the years after listing, 0 otherwise
Corporate Governance Variables	
$CGChange_{it}$	Dummy variable = 1 if the exchange i introduces new board members (in particular, investors of the exchange), changes top management (including the CEO) and increases the use of incentive payment schemes for top management, 0 otherwise
Members	Percentage of exchange member directors on the board
InternationalExp	Percentage of directors with international experience on the board
DiverseBusinessExp	Percentage of directors with experience in diverse business on the board
BusinessAdministrationExp	Percentage of directors with business administration experience on the board
RegulatoryExp	Percentage of directors with regulatory experience on the board
StockExchangeExp	Percentage of directors with experience in stock markets on the board
DtorsAge	Average age of the directors on the board
BoardSize	Number of directors on the board
DtorsTenure	Average tenure of the directors on the board
OtherDtorSh	Average number of other directorships of the directors on the board
Independent	Percentage of independent directors on the board
Other Variables	
$GdpG_t$	$(GDP_t - GDP_{t-1})/ GDP_{t-1}$
Merger	Dummy variable = 1 if the exchange i merged with another exchange