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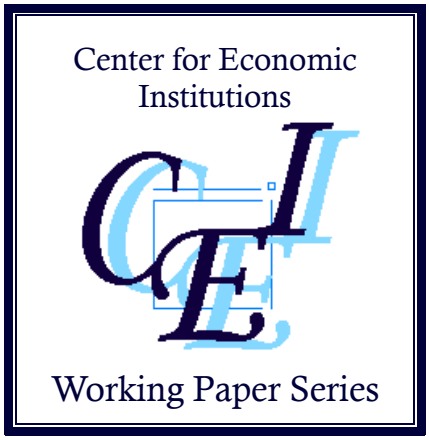

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The Evolution of Corporate Governance in the Global Financial Crisis*

The Case of Russian Industrial Firms

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Abstract: In this paper, using a unique dataset of industrial firms obtained from enterprise surveys conducted across the Russian Federation in 2005 and 2009, we trace back structural changes in the corporate governance system before and after the global financial crisis. We also empirically examine the impacts of the crisis on the organization of boards of directors and audit systems. Our survey results reveal that, in the Russian industrial sector, the quality of corporate governance has been improved through the crisis. Furthermore, we found that, corresponding to the alignment hypothesis, in firms that decisively reformed their management and supervisory bodies in response to the 2008 financial shock, the total number of worker representative directors significantly declined, as did their proportion to all board members. On the other hand, we also found that, in firms that substantially reorganized their audit system to cope with the crisis, the independence of the audit system was undermined remarkably, corresponding to the expropriation hypothesis. Findings that management behaviors predicted by the two conflicting hypotheses are simultaneously detected—and that their targets are significantly different—deserve special mention.

JEL classification numbers: D22; G01; G34; M42; P34

Keywords: global financial crisis, the evolution of corporate governance, alignment versus expropriation, Russia

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1. Introduction

It is widely believed that exogenous shock is a strong driver promoting the selection and evolution of firm organizations (Milgrom and Roberts, 1992; Langlois, 2007). In the context of corporate governance system, the agency theory predicts that firms with governance structures that effectively motivate managers to maximize firm value perform better; therefore, their survivability in competitive markets is higher. In other words, drastic changes in the business environment that greatly expand market pressures accelerate the weeding out of firms with poorly functioning governance systems. In addition, differently from biological evolution, firms are able to adjust their own organs in response to environmental changes. Thus, self-organization toward an optimal governance system may occur within a firm to cope with management challenges associated with the given exogenous shock.

Studies that have empirically examined the above theoretical predictions, however, are quite limited despite Kole and Lehn's (1997) earnest call made two decades ago. One reason for this deficiency is the fact that exogenous shocks that cause large-scale firm selection and force surviving firms to drastically change their internal organization are historically scarce events. The economic shock caused by the global financial crisis of 2008 was more severe in post-socialist emerging markets than in the US and Western Europe.[1] In particular, the crisis caused extremely profound economic damages in Russia.[2] In addition, the Russian corporate governance system in the pre-crisis period had considerable room for further improvement as compared to that of developed economies. Therefore, the empirical study of Russian firms has the advantage of capturing the impacts of the crisis more effectively *ceteris paribus*. In this sense, the Russian experience during the 2008 financial shock provides an invaluable opportunity to investigate the relationship between an exogenous shock and the selection and evolution of corporate governance systems.

Using this chance, Iwasaki (2014a) measured the exit rate of Russian industrial firms before and after the global financial crisis or, more specifically, during the period of 2005–2009 and conducted a survival analysis to identify factors that influenced the market exit. This paper found that the vast majority of exiting firms were forced to discontinue operation during the two years of 2008 and 2009. It also verified that the quality of the corporate governance system observed in

[1] In fact, according to the UNCTAD, the real GDP growth rates of the US and of the 15 European Union (EU) member countries were -2.8% and -4.5%, respectively, in the year 2009. Meanwhile, in the same year, Central and Eastern European countries and Russia recorded sizable negative growth rates of -6.1% and -7.8%, respectively (http://unctad.org).

[2] The damage of the global financial crisis to the Russian economy is examined in a series of articles including: Tabata (2009), Gaddy and Ickes (2010), Nefedova et al. (2010), Yakovlev et al. (2010), Kuznetsov et al. (2011), Osipian (2012), and Klapper et al. (2013).

2005 had a statistically robust and positive correlation with the company's subsequent survival probability. In this paper, we aim to tackle issues that present another side of the same coin dealt with in Iwasaki (2014a). By examining the kinds of changes that occurred in the corporate governance bodies in surviving Russian firms and how the global financial crisis was related to these changes, we will provide evidence concerning the direction and extent of the impacts of the 2008 crisis on the self-organizational process of the corporate governance system.

By achieving these research goals, this paper makes three contributions to the extant literature. First, it provides new evidence regarding the extent and speed of the evolution of corporate governance systems, taking Russian firms as a laboratory case. To the best of our knowledge, recent studies that report time-series structural changes in corporate governance bodies using a firm-level data have been limited to Cornett et al. (2010), Ezzine and Olivero (2013), Black et al. (2014), and Chen (2014). Thus, current research does not allow us to discuss in detail how corporate governance systems evolve. The accumulation of empirical evidence is an urgent task in this research field. Using a unique dataset of Russian industrial firms obtained from enterprise panel surveys conducted across Russia in 2005 and 2009, we will extensively describe time-series changes in the Russian corporate governance system.

Second, this study is the first to strictly discriminate the impact of the global financial crisis from historical trends on the evolution of corporate governance by distinguishing Russian firms that actually reacted to this financial shock.

The aforementioned studies—Cornett et al. (2010), Ezzine and Olivero (2013), and Chen (2014)—traced the changes in corporate governance systems before, during, and after the global financial crisis. For instance, Chen (2014) compared the corporate governance systems of listed Taiwanese companies during the three years (2005–2007) before the global financial crisis with those during the three years ex post (2009–2011). Based on findings of ex-post improvement, Chen concluded that the 2008 crisis had a disciplinary effect on Taiwanese corporate governance. However, the problem is that Chen's empirical approach makes it impossible to separate companies that reformed their corporate governance systems in response to the 2008 financial shock from other companies that did not. Therefore, she falls short of rigorously proving the corporate governance disciplinary effect of the crisis. Cornett et al. (2010) and Ezzine and Olivero (2013) also have the same problem.

In contrast, our 2009 follow-up survey included questionnaires designed to identify whether firms drastically reformed their management and supervisory bodies and/or audit systems in response to the global financial crisis. Therefore, the survey results enable us to identify among companies that actually took countermeasures against the crisis and to assess the genuine impact of the crisis on Russian corporate governance. Utilizing this information, we will overcome the methodological issue of the previous studies.

Third, we will propose two conflicting hypotheses regarding the impact of the global financial crisis on the independence from management of boards of directors and audit systems and will empirically compare the applicability of these hypotheses to the Russian economy. As we will discuss later, the alignment hypothesis and the expropriation hypothesis develop opposing arguments about the evolution of corporate governance in a financial crisis. In line with the aforementioned view of agency theorists, the alignment hypothesis predicts that a financial crisis tends to promote the organizational independence of corporate governance bodies to better align interests between managers and shareholders to cope with challenges associated with the crisis. In contrast, based on the bitter lessons from the 1997 Asian currency crisis, the expropriation hypothesis suggests that a financial crisis may undermine the independence of corporate governance systems as a consequence of opportunistic and rent-seeking behaviors of a controlling shareholder and/or corporate officers in expropriating minority shareholders. It is valuable to empirically examine these contradictory predictions in order to resolve this crucial argument among financial economists.

Our survey results revealed that throughout the period of 2005–2009, the surviving firms enhanced their corporate governance system's independence from management, mainly by increasing the number of outside directors/auditors as an entire sample group. In this sense, the global financial crisis has improved the quality of corporate governance in the Russian industrial sector. However, the observed changes are sluggish, implying that the 2008 crisis did not drastically accelerate the evolution of corporate governance systems. Furthermore, we found that, in keeping with the alignment hypothesis, in firms that decisively reformed their management and supervisory bodies in response to the 2008 financial shock, the total number of worker representative directors significantly declined, as did their proportion to all board members. On the other hand, we also found that, in firms that substantially reorganized their audit systems to cope with the crisis, the total number of outside auditors and their proportion to all auditors declined, while the proportion of worker representative auditors increased. As a consequence, the overall independence of the audit system was undermined remarkably, corresponding with the expropriation hypothesis. Findings that management behaviors predicted by the two conflicting hypotheses are simultaneously detected within one country—and that their targets are significantly different—deserve special mention.

The remainder of this paper is organized as follows: Section 2 discusses possible impacts of an exogenous shock on the evolution of corporate governance systems and presents our testable hypothesis. Section 3 conducts an empirical analysis based on the results from our enterprise surveys. Section 4 examines the statistical robustness of the estimation results. Section 5 summarizes the major findings and concludes the paper.

2. Hypothesis Development: Alignment versus Expropriation

This section theoretically considers the possible impact of a strong exogenous shock, represented by the global financial crisis of 2008, on the evolutionary path of corporate governance systems and presents our testable hypothesis in the context of the Russian economy.

Kole and Lehn (1997, 1999) published the first studies that thoroughly examined the impacts of drastic changes in the business environment on corporate governance systems. They argued that an exogenous shock that injects uncertainty and instability into the business environment would cause the governance structure of an affected firm to evolve in the direction of strengthening its monitoring and supervisory functions over top management. This is because such an exogenous shock enhances the importance of managerial decisions while, at the same time, increasing the costs of observing and evaluating the performance of management executives. Consequently, relevant firms are forced to adjust their governance systems to mitigate new potential agency problems. Therefore, it is anticipated that, for instance, in the board of directors, the proportion of outside directors and/or independent directors to all board members will increase after an exogenous shock, given their important role in monitoring and supervising management. In fact, Lehn (2003) reported that such interorganizational changes were actually observed among US telecommunications companies, which faced drastic deregulation implemented by the Telecommunications Reform Act of 1996.

Perry and Shivdasani (2005) provide additional grounds for predicting that a company experiencing a management crisis will enhance the independence of its management and supervisory bodies. They documented that when business performance rapidly worsens, companies with a majority of outside directors on the corporate board are more likely to initiate asset restructuring and employment adjustments than are firms with a minority of outside directors, and that their subsequent improvement in operating performance is significantly higher than that of the latter. This suggests that firms with highly independent governance structures may excel in coping with management crises. In this regard, Perry and Shivdasani (2005) maintain that it is difficult to find a close relation between firm performance and board composition during tranquil times, since the board of directors' principal role is to monitor and supervise managers and not to run the company itself on a daily basis. In times of crisis, however, the board directors will substantially influence corporate management in order to keep the organization alive and help it emerge from its worsening business performance. In this sense, the corporate board is a "contingent" governance system (Aoki, 2000). According to the bargaining model developed by Hermalin and Weisbach (1998), the board of directors becomes increasingly independent as poor firm performance reduces CEOs' negotiating power (Francis et al., 2012). We conjecture that this possibility further increases during a management crisis triggered by an exogenous shock.

As mentioned in the Introduction, Chen (2014) is one of the few works that directly addresses the issue of how the corporate governance system evolved during the global financial crisis. On the grounds of previous studies, including those of Kole and Lehn (1997; 1999) and Perry and Shivdasani (2005), she predicted that "[a]fter coping with the rigorous business conditions during a financial crisis, increasing board independence after the financial crisis is a likely result," (p. 6) and empirically verified this hypothesis using data of 797 listed Taiwanese companies. Based on this result, Chen concluded that the global financial crisis inspired Taiwanese firms to adopt new governance structures that better align managerial interests with those of shareholders to cope with the tough business conditions. In the same vein, Ezzine and Olivero (2013) also investigated 120 listed French companies and reported notable improvements in the quality of their corporate governance after the 2008 financial shock.

With regard to Russia, some empirical evidence is consistent with that from the studies mentioned above. In fact, Suvankulov and Ogucu (2012) examined the relationship between corporate governance and firm performance of 177 listed Russian firms in the period of the global financial crisis and detected a statistically significant and negative relationship between the corporate governance quality index in 2007 and a decline in stock prices and Tobin's Q during the 2008 crisis. They concluded that Russian firms that had established a good corporate governance system could effectively prevent their businesses from worsening during the crisis.[3] The empirical findings of Suvankulov and Ogucu (2012) conform highly with the research outcomes of Iwasaki (2014a), which verified that the independence of corporate boards and audit systems is robustly and positively correlated with the survival probability of Russian firms during the period from 2005–2009. In this way, if better corporate governance was effective both for firm survival and preventing a firm's worsening performance during the crisis period, as maintained by Kole and Lehn (1997, 1999) and Chen (2014), it is natural to predict that Russian firms that decided to reform their internal organizations in the wake of the 2008 financial shock are more likely to increase the independence of their corporate governance bodies. That is to say:

> Alignment hypothesis: *Both the board of directors and the audit system become more independent in a company that reforms its corporate governance system as a countermeasure against a global financial crisis.*

The above prediction accords with the alignment hypothesis, which claims that an exogenous shock will promote the evolution of corporate governance in an affected company toward better aligning the interests of managers with those of shareholders. However, there is a conflicting

[3] As Suvankulov and Ogucu (2012) did, from his empirical analysis of listed Polish companies, Kowalewski (2012) also verified the statistically significant and positive association of corporate governance index with Tobin's Q and the dividend payout ratio during the global financial crisis.

theory, called the expropriation hypothesis (Claessens et al., 2000, 2002). Johnson et al. (2000) examined this counter hypothesis in the context of the Asian currency crisis. Their findings indicate that controlling shareholders and/or managers tend to expropriate minority shareholders more intensively during a financial crisis than at ordinary times. This is because the marginal opportunity cost of corporate asset expropriation substantially decreases when, due to the crisis, the return on investment falls considerably. For this reason, in emerging markets where the rights of minority shareholders are not sufficiently secured, firm value was broadly and significantly damaged both at the national and the company level due to asset tunneling during the financial crisis. Russia is no exception. Johnson et al. (2000) pointed out that "[t]he fact that management in most emerging markets is also the controlling shareholder makes these transfers easier to achieve. The downturns in these countries have been associated with significantly more expropriation of cash and tangible assets by managers" (p. 143).

As discussed above, the expropriation hypothesis, which advocates that in the face of a financial crisis large shareholders and/or managers abuse their control rights and expropriate minority shareholders, is strongly opposed to the alignment hypothesis, which predicts that firms will take measures to align interests between managers and shareholders to mitigate agency problems caused by a crisis. Inspired by these arguments, many empirical studies on the Asian currency crisis or the global financial crisis paid a great deal of attention to which hypothesis would be able to explain reality in the world more appropriately. However, as far as we surveyed, the number of studies that empirically support the expropriation hypothesis (Lemmon and Lins, 2003; Baek et al., 2004; Kang et al., 2010; Erkens et al., 2012; Cheng et al., 2015) almost counterbalances the number of studies that endorse the alignment hypothesis (Mitton, 2002; Leung and Horwitz, 2010; Yeh et al., 2011; Liu et al., 2012), just as empirical evidence regarding the effect of corporate governance on firm performance during a crisis period is really mixed.[4] In sum, the debate remains unsettled. Accordingly, in Russia, where minority shareholders are not adequately protected in terms of both the legal system and company management practices (Filatotchev et al., 2001), we consider that the expropriation hypothesis is likely to be validated.

Unfortunately, no studies have examined the impact of a financial crisis on the evolution of corporate governance from the standpoint of the expropriation hypothesis. Nevertheless, if large shareholders and/or managers scheme to tunnel corporate assets behind the backs of minority shareholders, they would reasonably try to undermine the independence of their company's corporate governance bodies, since these bodies would otherwise constitute a serious obstacle to

[4] In addition to Suvankulov and Ogucu (2012) and Kowalewski (2012), see Cornett et al. (2010), Grove et al. (2010), Aebi et al. (2012), Francis et al. (2012), Peni and Vähämaa (2012), Ezzine and Olivero (2013), Gupta et al. (2013), McNulty et al. (2013), van Essen et al. (2013), and Nguyen et al. (2015), as well as O'Sullivan et al. (2015).

their attempts. In fact, according to a study on publicly traded US bank holding companies by Cornett et al. (2010), corporate governance weakened significantly, especially among large firms, just before and during the global financial crisis. This implies that the internal monitoring function could actually be undermined at the very time when effective corporate governance seems most crucial.[5]

Based on the above considerations, it is reasonable to hypothesize that a Russian firm is more likely to have decreased the independence of its corporate governance bodies if the 2008 financial crisis seduced large shareholders and/or managers into expropriation behaviors and if they attempted to reorganize the corporate governance system based on their opportunistic and rent-seeking motivations. That is to say:

> Expropriation hypothesis: *Both the board of directors and the audit system become less independent in a company that reforms its corporate governance system as a countermeasure against a global financial crisis.*

Other factors related to firm organization and/or management activities are also likely to have a certain impact on the evolutionary process of a corporate governance system. For this reason, we will control for these aspects when we empirically examine the above hypotheses. More specifically, we will focus on the following six factors related to firm organization as potential determinants of the corporate governance system of Russian firms: (a) ownership by outside investors, (b) the presence of the management team as a large shareholder, (c) affiliation with a business group through stock ownership, (d) restrictions on ownership shares in the articles of incorporation, (e) the choice of corporate form, and (f) company size. We will also give attention to the following four factors related to management activities: (a) the efficiency of management and production activities, (b) fund procurement from the capital market and financial institutions, (c) business internationalization, and (d) R&D/innovation intensity.

Points in the discussion regarding the impact of firm organization–related factors on the independence of corporate governance bodies include: (a) Shareholding by outside investors tends to enhance governance structures in their investing firm to prevent mismanagement and opportunistic behaviors by management executives; (b) On the other hand, top managers use their voting rights to resist any action that would strengthen the corporate governance system and limit management's discretion; (c) Russian firms that belong to a business group through stock

[5] Cornett et al. (2010) themselves do not associate this finding with the expropriation hypothesis. Nevertheless, it has been confirmed that these major banks not only undermined the corporate governance, but their adoption rate of the CEO's golden parachute rose remarkably. It cannot be ruled out that these movements might have stemmed from managers' opportunistic and rent-seeking behaviors.

ownership tend to have more independent corporate governance bodies than do so-called independent firms; (d) Including a provision in the articles of incorporation that stipulates a certain upper limit on shareholding discourages the appointment of outside directors by restraining the voices of outside shareholders; (e) As compared to closed joint-stock companies and limited liability companies, open joint-stock companies have stronger intentions to construct more open corporate governance systems; (f) The corporate governance system tends to be more independent as company size increases.

In connection with the impact of management activity–related factors, the following arguments can be made: (a) Irrespective of the differences in countries and periods, many empirical studies have found that pressure to supervise management executives is relaxed in well-performing companies; (b) Issuances of shares or bonds in the capital market and fund procurement from financial institutions inspire the relevant company to adopt an open corporate governance system that improves business transparency; (c) For the same reason, the internationalization of business has an effect similar to that of fund procurement; (d) On the other hand, R&D/innovation intensity tends to increase the need to evaluate management performance based on decision-making quality rather than financial performance because this kind of business activity carries technological uncertainty and high risk. Only in-house personnel are able to make this sort of performance evaluation. Accordingly, R&D/innovation intensity is negatively related to corporate governance bodies' independence from management.[6]

Table 1 summarizes our theoretical prediction based on the above discussion.

3. Empirical Analysis

In this section, we will trace the changes in systems of Russian industrial firms' corporate governance before and after the global financial crisis and empirically examine the testable hypotheses presented in the previous section.

3.1 The Enterprise Survey

A joint Japanese-Russian research team consisting of staff members of the Institute of Economic Research, Hitotsubashi University (Tokyo), and the Institute for Industrial and Market Studies, Higher School of Economics (Moscow), administered the 2005 questionnaire survey. During the five months from February to June of that year, the research team dispatched professional interviewers from the Yuri Levada Analytical Center (the former USSR Public Opinion Poll Center of the Ministry of Labor) and its local branches to more than 800 large and medium-sized

[6] See Iwasaki (2008, 2009, 2014b, 2014c) for more detailed arguments about the effects of firm organization– and management activity–related factors on Russian corporate governance systems.

industrial firms located in the 64 federal districts of Russia. Valid responses were received from the senior managers of 751 firms. Using a stratified sampling method, target companies were selected from among joint-stock companies with 100 or more workers. The average number of workers in each surveyed company was 1,516 (median: 457). The total number of workers of the 751 surveyed firms was 1,138,609. According to official statistics (Rosstat, 2005), this accounted for 8.0% of the average total workforce in the industrial sector through 2004. The surveyed firms formed a regionally and sectorally representative sample of large and medium-sized Russian industrial firms.[7]

The follow-up survey was organized and performed by a team of Japanese researchers, again in cooperation with the Levada Center. In this survey, which took place between October and December of 2009, the Japanese research team confirmed whether the 751 firms surveyed in 2005 had survived. Then, among surviving firms, we conducted a second questionnaire survey with almost the same questions as those used in 2005, along with some additional items that inquired about countermeasures taken against the global financial crisis.

The survey results are summarized in **Figure 1**. As shown in this figure, among the 751 firms surveyed in 2005, the survival status of 741 firms was ascertained. Of these 741 firms, 637 firms (86.0%) survived without any drastic change in their company profile. The remaining 104 firms (14.0%) had either completely disappeared, their respective legal registrations having been terminated by the time of the survey, or had come to a virtual standstill, despite their continuing existence as corporations.[8] We asked the 637 surviving firms to join our follow-up survey. Of these, 424 firms (or 66.6% of all surviving firms) accepted our request. The president (or CEO or general manager) or vice president accounted for 91.8% (389 persons) of the respondents. The remaining included 28 managers in charge of corporate governance issues (6.6%) and 7 board chairmen (1.7%). Valid responses were obtained from these 424 corporate executives. In the following two subsections, mainly using a dataset of the surviving firms surveyed in 2009, we will conduct an empirical analysis.

3.2 Univariate Analysis

In the 2009 follow-up survey, we asked the surviving firms whether they had substantially changed their corporate governance systems during the past five years and, if so, whether and how such changes were related to the global financial crisis. As **Figure 2** shows, among the 404 firms that gave valid answers, 183 firms (45.3%) indicated a drastic change in their management and supervisory bodies (the board of directors, in particular), including 20 firms (5.0%) that reported that such changes represented organizational reform as their countermeasure against the

[7] For more details on the 2005 survey, see Dolgopyatova et al. (2009, Appendix).

[8] For more details on these 104 exit firms, see Iwasaki (2014a).

crisis. Furthermore, 139 firms (34.5%) of the 403 firms acknowledged a substantial change in their audit system, including 13 firms (3.2%) reporting that this change was closely related to the crisis. As seen from the above responses, more than a few Russian firms experienced great changes in their corporate governance systems from 2005–2009; it has been revealed that these changes were driven in part by the 2008 financial shock.

Keeping the above findings in mind, we next trace structural changes in the corporate governance systems during the period from 2005–2009. **Table 2** defines the variables used in the empirical analysis for this paper as well as descriptive statistics by data type. As shown in Panel (a) of the table, the structure of the board of directors and its relevant time-series changes are identified using eight variables—from the outsideness of the board chairman (*BOALEA*) to the total number of worker representative directors (*WORDIR*)—plus the first principal component score for these variables (*BODSCO*). Meanwhile, as indicated in Panel (b) of the same table, the structure of the audit system and its diachronic change are identified using eight variables—from the proportion of outside auditors (*AUDCOM*) to the total number of worker representative auditors (*WORAUD*)—plus their first principal component score (*AUDSCO*). **Table 3** shows the results of the principal component analysis. Judging from the eigenvectors of the first component reported in the table, increases in *BODSCO* and *AUDSCO* denote the reinforcement of organizational independence from management of the board of directors and the audit system, respectively.

Figure 3 shows kernel density estimates of the above 18 variables for the years 2005 (dashed green lines) and 2009 (solid red lines). As shown in Panel (a) of the figure, the density distribution of the proportion of outside directors (*BOACOM*) and that of the proportion of independent directors (*BOAIND*) reveal a particularly substantial difference between the two years toward strengthening the independence of the board of directors. With regard to the audit system, as Panel (b) of the same figure illustrates, density distributions of the proportion of outside auditors (*AUDCOM*), the proportion of expert auditors (*AUDEXP*), and the proportion of worker representative auditors (*AUDWOR*), as well as the total number of outside auditors (*OUTAUD*), indicate a tendency similar to that observed in the corporate boards. Consequently, a substantial change between 2005 and 2009 is also confirmed in the distribution of both *BODSCO* and *AUDSCO*. These results suggest notable improvement in the quality of corporate governance from the viewpoint of independence from management.

Next, we examined whether the independence of corporate governance bodies improved in the entire industrial sector. Panel (a) of **Table 4** shows the results. Here, using the means and the differences of the 2005 and 2009 data of the surviving firms surveyed in 2009, we performed a *t* test of the hypothesis that the independence of the corporate board and the audit system improved

during the observation period.[9] The hypothesis is supported for variables related to outside directors and independent directors and those related to outside auditors and expert auditors as well as *AUDSCO*. These results correspond with the findings shown in **Figure 3**.

We conducted the same examination, this time limiting observations to surveyed firms reporting substantial changes in their management and supervisory bodies or audit systems in response to the global financial crisis. The results, shown in Panel (b) of **Table 4**, indicate that firms that drastically reorganized the board of directors as a countermeasure against the crisis not only appointed more independent directors but also decreased the number of inside directors and worker representative directors. These results support the alignment hypothesis. Meanwhile, according to Panel (c) of the same table, in firms that had introduced considerable changes in their audit system to cope with the crisis, the audit firm attribute (*AUDFIR*) rose with a statistical significance that corresponds with the alignment hypothesis. However, at the same time, the proportion of outside auditors (*AUDCOM*), the proportion of expert auditors (*AUDEXP*), the total number of expert auditors (*EXPAUD*), and *AUDSCO* all decreased, while the proportion of worker representative auditors (*AUDWOR*), the total number of inside auditors (*INSAUD*), and the total number of worker representative auditors (*WORAUD*) all increased significantly. In other words, the behaviors observed in firms that had reorganized their audit systems during the crisis can be interpreted mostly with the expropriation hypothesis.

As described above, we found that Russian firms as a whole in the entire industrial sector improved the quality of their corporate governance system during the five years before and after the global financial crisis. This finding coincides with the empirical results for Taiwanese firms by Chen (2014) and those for French companies by Ezzine and Olivero (2013). Moreover, we also revealed that firms that had substantially reformed their management and supervisory bodies or their audit systems to cope with the 2008 financial shock enhanced the independence of their boards of directors and employed audit firms with more desirable attributes. This evidence backs up the alignment hypothesis. However, we obtained empirical results that firms that had drastically reorganized their audit systems to tackle the crisis were more likely to have undermined the independence of their audit committees in line with the expropriation hypothesis. In the next subsection, using multivariate regression analysis, we will examine whether the above results obtained from the univariate analysis can be reproduced even after we simultaneously control for other factors that may affect corporate governance structures.

[9] From this point of view, we tested the hypothesis that the respective total numbers and proportions of worker representative directors, inside directors, worker representative auditors, and inside auditors decreased during the observation period. We also tested the hypothesis that the value of the respective variables increased.

3.3 Multivariate Regression Analysis

Here, we will estimate a difference model, which is designed to analyze structural changes in a corporate governance system at two different times. Let us denote by y_{it} the corporate governance structure of the *i*-th firm in the year of *t*. A static panel model using observations for the years 2005 and 2009 can be expressed in the following equation:

$$y_{it} = \mu + \sum_{j=1}^{n} \beta_j x_{ijt} + \sum_{k=1}^{m} \gamma_k z_{ik} + \varphi_l + \omega_i + \varepsilon_{it}, i = 1 \dots N, t = 2005, 2009, \quad (1)$$

where μ denotes a constant term; β and γ denote parameters; x is a time-varying independent variable, and z is a time-invariant independent variable; φ and ω denote, respectively, the fixed effects of the industry to which the *i*-th firm belongs and the firm-level individual effect; ε is an error term.

From Equation (1), we can obtain the difference model to be estimated as:

$$\Delta y_{it} = \sum_{j=1}^{n} \delta_j \Delta x_{ijt} + \Delta \varepsilon_{it}\,, \quad (2)$$

where δ represents a first-difference parameter to be estimated, while $\Delta y_{it} = y_{i2009} - y_{i2005}$, $\Delta x_{ijt} = x_{ij2009} - x_{ij2005}$, and $\Delta \varepsilon_{it} = \varepsilon_{i2009} - \varepsilon_{i2005}$. As indicated by the equation above, the difference model excludes any time-invariant variables and fixed effects, namely z, φ, and ω, as well as the constant term μ.[10]

In the left-hand side of Equation (2), we introduce a total of 18 types of variables—from the outsideness of the chairman of the board of directors (*BOALEA*) to the first principal component score for the audit system–related variables (*AUDSCO*)—as described in Subsection 3.2. To test the hypotheses, as shown in Panel (c) of **Table 2**, we adopted two global financial crisis–related variables, consisting of a dummy for the firms that made significant changes in management and supervisory bodies in response to the crisis (*CRISIS_BOD*) and a dummy for the firms that made significant changes in their audit systems in response to the crisis (*CRISIS_AUD*) in the right-hand side of the regression equation.

As discussed in Section 2, we simultaneously controlled for other factors with respect to firm organization and management activities that may affect the corporate governance structure. More specifically, we employed six types of firm organization–related variables—from the ownership share of outside shareholders (*OWNOUT*) to the average number of employees (*COMSIZ)*—and another six types of management activity–related variables—from labor productivity (*LABPRO*) to a dummy variable for the development of new products and services (*NEWPRO*)—as defined in Panels (d) and (e) of **Table 2**, respectively.

[10] Needless to say, the difference model also removes unobservable time-invariant factors.

For the empirical examination of the testable hypotheses proposed in Section 2, it is essential to perform regression analysis with consideration of a possible survival bias that might be caused by the exclusive use of samples that were not forced to exit the market during the observation period. To deal with this problem, the Heckman two-step estimation method was used. As a first step, we estimated a probit model of firm survival probability utilizing firm organization–related variables, management activity–related variables, and time-invariant dummy variables for privatized companies (*PRICOM*) and spin-off firms from a state-owned (municipal) company or privatized company (*SPIOFF*)[11] as well as industry fixed effects as independent variables. Then, in the second step, we added the inverse Mills ratio to the right-hand side of Equation (2) to control for the survival bias. If the coefficient of the inverse Mills ratio is statistically different from zero, a survival bias is judged to be present.

Table 5 shows the estimation results. Panel (a) of the table shows estimation results that take board of director–related variables as the dependent variable, while Panel (b) gives estimation results with an audit system–related variable serving as the dependent variable. According to the probit estimation of firm survival probability using all available observations (not reported), the correct rate of discrimination reaches 83.42%. In addition, the Pearson goodness of fit test accepts the null hypothesis that predicted values fit the distribution of observations (χ^2=368.94, p=0.334). Therefore, we concluded that the inverse Mills ratio obtained from the first-step estimation is sufficiently capable of adjusting for possible survival bias.

The estimates of global financial crisis–related variables clearly exhibit asymmetric impacts on the board of directors and audit system, corresponding with the results of the univariate analysis reported in Subsection 3.2. In fact, Panel (a) of **Table 5** shows that *CRISIS_BOD* is estimated with a significant and negative coefficient in models that introduce *BOAWOR* and *WORDIR* into the left-hand side, suggesting that a Russian firm that has reformed its board of directors in the wake of the global financial crisis is highly likely to have reduced worker representative directors by 1.045 people, on average, while reducing their proportion to the board of directors by 13.2%.

On the other hand, Panel (b) of the same table indicates that *CRISIS_AUD* is negatively related to *AUDCOM* and *OUTAUD* and positively related to *AUDWOR*, with statistical significance at the 5% level. In other words, a Russian firm that embraced drastic changes in its audit system in response to the 2008 financial shock reduced outside auditors by 1.625 people, on average; as a result, they decreased their proportion to all auditors by 47.2%, while at the same time, the firm increased the proportion of worker representative auditors by 44.3%. As a result, a significant and

[11] *PRICOM* and *SPIOFF* are used to control the impact of the organizational legacy of former socialist firms on the survivability of Russian firms. The descriptive statistics of these two variables are: *PRICOM*—mean: 0.727, S.D.: 0.446, median: 1; *SPIOFF*—mean: 0.106, S.D.: 0.308, mean: 0.

negative correlation is present between *CRISIS_AUD* and *AUDSCO*. This means that Russian firms that reorganized their audit systems to cope with the crisis significantly undermined the independence of their audit committees.

Furthermore, based on estimation results of the control variables, we point out the following seven features: First, the acquisition of additional shares by outside investors enhances the independence of the board of directors and the audit firm attribute, while the rise of a management team as a large shareholder undermines the independence of the corporate governance bodies in their own company. Second, Russian firms newly joining a business group tend to appoint better audit firms as compared to independent firms. Third, the independence of boards of directors is substantially suppressed at firms that introduced upper limits on shareholding into their articles of incorporation. Fourth, transformation from a closed joint-stock company to an open joint-stock company is an influential factor in promoting the expertise of the audit system.[12] Fifth, growth in company size has a positive impact on the assignment of outside directors and the audit firm attribute. Sixth, as compared with bank credits, fund procurement from the capital market more strongly enhances the independence of the audit system. Seventh, the estimation result of R&D expenditure intensity and that of the development of new products and services differ substantially in the sense that the former is positively correlated with the independence of the board of directors while the latter is negatively correlated with the independence of both the corporate board and the audit committee.

Finally, in all 18 models, the estimates of the inverse Mills ratio are not statistically significant. Therefore, it is reasonable to conclude that survival bias has virtually no influence on our estimation results.

4. Robustness Check

As described above, we conducted an empirical analysis that explicitly dealt with a survival bias that might be caused by using only samples that survived the global financial crisis; we confirmed the insignificance of its influence on the estimation results. However, as indicated in **Figure 1**, 33.4% of firms (213 of the 637 surviving firms) declined our request for the 2009 follow-up survey—a significant number. We cannot rule out the possibility that such an omission of samples might cause a certain bias in our estimation results. In particular, if the relation between the "dropouts" from the 2009 follow-up survey and a dependent variable is not independent, it could

[12] Among the surviving firms surveyed in 2009, a very small number transformed their corporate form from a closed joint-stock company to a limited liability company during the observation period. Nevertheless, we have not detected any influence from this organizational change on the independence of corporate governance bodies.

cause a serious bias in the relevant estimation results.

In order to examine the possible influence of this problem, we first compared the surviving unsurveyed firms with the surveyed firms in 2009 based on corresponding values, as of 2005, for the dependent variables used in the empirical analysis. As Panels (a) and (b) of **Table 6** show, in terms of board of director–related variables and audit system–related variables, there are no statistically significant differences between the two sample groups for 14 of 16 variables. The remaining two variables, *INSAUD* and *WORAUD*, show significant differences, in the sense that the mean values of the unsurveyed firms exceed those of the 2009 surveyed firms. Nevertheless, the difference in each variable is below 1.0 and, thus, cannot be said to be substantially remarkable.

We also made the same comparison between firm organization–related variables and management activity–related variables. As Panels (c) and (d) of **Table 6** show, statistically significant differences are found in three variables—*LIMOWN*, *LABPRO*, and *EXPSHA*. The mean values of these three variables imply that, as compared to the 2009 surveyed firms, the unsurveyed firms are less likely to stipulate in their articles of incorporation upper limits on the ownership of shares; their labor productivity and share of exports in total sales also tend to be higher than those of their counterparts. Nevertheless, these differences are not particularly large.

To further examine this problem, we performed complementary regressions by replacing the observations of the exit firms with those of the 2009 unsurveyed firms; this confirmed that the estimation results were not much different from those in **Table 5**, and the inverse Mills ratios are all insignificant. Taking into account results from the univariate comparison in **Table 6** as well as the above complementary regression estimates, we inferred that the omission of samples that resulted from the dropping of 213 surviving firms from the follow-up survey in 2009 does not cause any serious bias in our empirical results.

Furthermore, to check the overall robustness of the empirical results, we conducted a supplemental estimation, in which various sample restrictions were placed on the regression models, and confirmed that these sample restrictions do not substantially change our major findings. More concretely, supplementary regressions were performed with the following four settings: (1) excluding fuel/energy and metallurgy companies, which are subject to unique government regulations regarding firm organization and business activities; (2) limiting the samples to those with company sizes within the mean ±1 standard deviation so that very large enterprises are excluded from the observations; (3) limiting the samples to companies that did not issue securities in 2005; (4) limiting the samples to firms that were non-group-affiliated (i.e., independent firms) in 2005.

The above findings led to the conclusion that the estimation results reported in this paper are fairly robust across the various specifications.

5. Conclusions

In this paper, using a unique dataset of industrial firms obtained from enterprise panel surveys conducted across Russia in 2005 and 2009, we traced structural changes in the corporate governance system before and after the global financial crisis. We also empirically examined impacts of the crisis on the structures of boards of directors and audit systems.

Our survey results reveal that throughout the period of 2005–2009, surviving firms enhanced the independence from management of their corporate governance system, mainly by increasing the number of outside directors/auditors of the entire sampling group. In this sense, in the Russian industrial sector, the quality of corporate governance was improved before and after the 2008 financial shock, as monitored by Chen (2014) in Taiwan and Ezzine and Olivero (2013) in France. The observed changes, however, cannot be considered drastic. Rather, as Kole and Lehn (1997) stated, change in the governance structure "occurs more slowly than many economists might imagine" (p. 424). We conjecture that path-dependency and interorganizational frictions are very influential factors in the evolutionary process of corporate governance systems.

Moreover, based on the results of the 2009 follow-up survey, we identified Russian firms that had drastically reformed their corporate governance systems in the wake of the global financial crisis and then investigated structural changes in the boards of directors and the audit systems of these firms. The empirical results in Section 3 revealed that, corresponding with the alignment hypothesis, in firms that decisively reformed their management and supervisory bodies in response to the unprecedented macroeconomic shock, the total number of worker representative directors, whose presence is regarded as harmful to efficient corporate management, significantly declined, as did their proportion to all board members. On the other hand, we also found that, in firms that substantially reorganized their audit systems to cope with the crisis, the total number of outside auditors and their proportion to all auditors declined, while the proportion of worker representative auditors increased. As a consequence, the overall independence of the audit system was undermined remarkably, corresponding with the expropriation hypothesis.

The findings that management behaviors predicted by the two conflicting hypotheses are simultaneously detected within one country—and that their targets are significantly different—are noteworthy. We infer that this evidence is closely related to the fact that the board of directors mainly functions as a mechanism to coordinate conflicts of interest between managers and shareholders, while the audit system more purely serves to monitor and control firm assets. Moreover, the empirical results in this paper also revealed that the number and organizational behavior of Russian firms that have actually reacted to the global financial crisis are relatively limited, contrary to our expectations. This fact implies the possibility that, since the election and termination of board directors and auditors are the responsibility of the general shareholders, who

should meet in the first half of the year in accordance with the federal law regarding joint-stock companies, most Russian firms could not take any concrete action in response to the 2008 crisis until the 2009 general meeting of shareholders, and the scope of realized organizational reforms was also quite constrained. In this sense, this paper provides valuable insight to understanding the above-mentioned statement by Kole and Lehn (1997) concerning the sluggish evolution of the corporate governance system.

The ongoing conflict with the international community over Ukraine and the plunge in crude oil prices are again causing economic hardship in Russia. It is likely that Russian firms will be affected as severely as they were during the global financial crisis of 2008. From the perspective of the empirical questions remaining in this paper, the future actions of Russian firms merit further attention.

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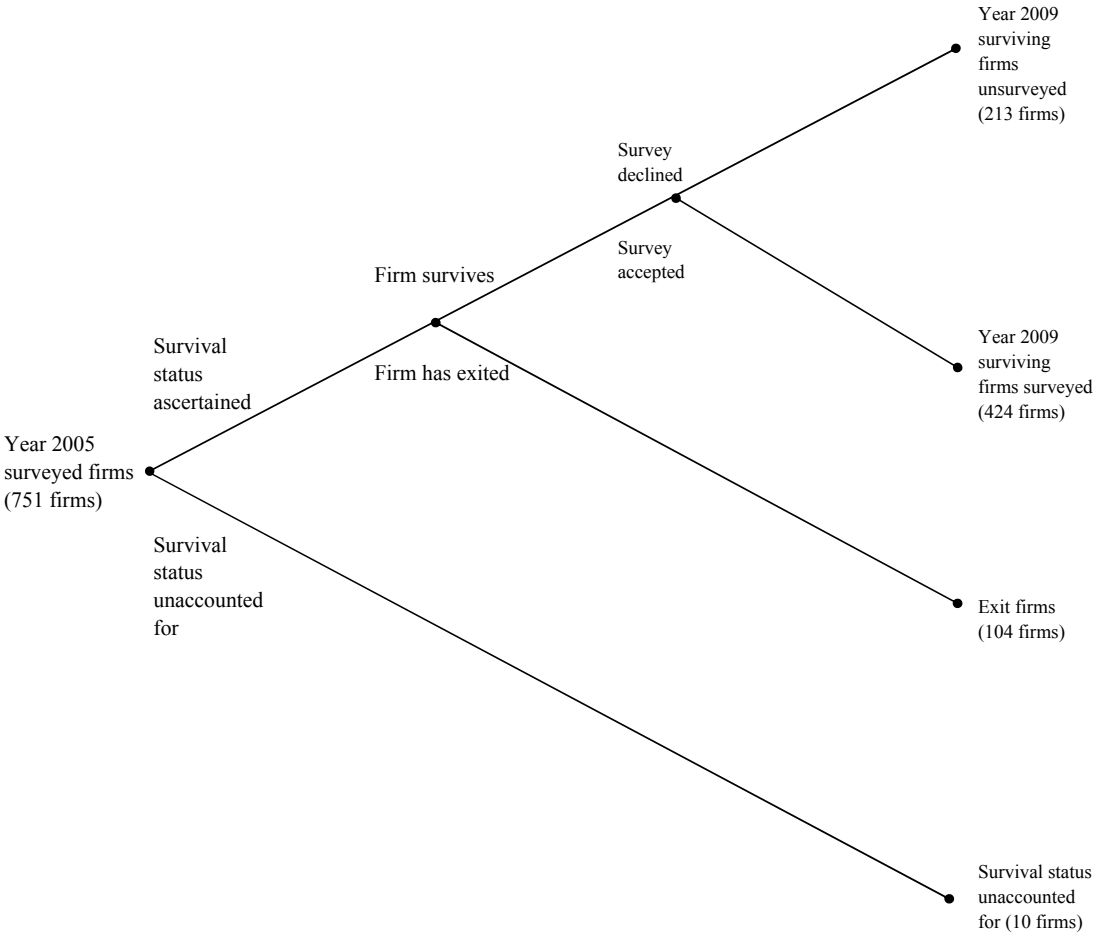
Table 1. Theoretical prediction of determinants of the independence of board of directors and audit system from management

	Board of directors	Audit system
Reaction to the global financial crisis	?	?
Ownership by outside investors	+	+
Presence of management team as a large shareholder	-	-
Affiliation with a business group through stock ownership	+	+
Restrictions on ownership of shares by the articles of incorporation	-	
Choice of an open joint-stock company as the corporate form	+	+
Company size	+	+
Efficiency of management and production activities	-	-
Fund procurement from the capital market and financial institutions	+	+
Business internationalization	+	+
R&D/innovation intensity	-	-

Note: This table summarizes theoretical predictions of the impact of potential factors on the independence of the board of directors and the audit system from management on the basis of the discussion in Section 2 of the paper. The sign '+' denotes a positive correlation between a given factor and the independece of the corporate governance system; '-' indicates a negative correlation, '?' means that impact is unpredictable.

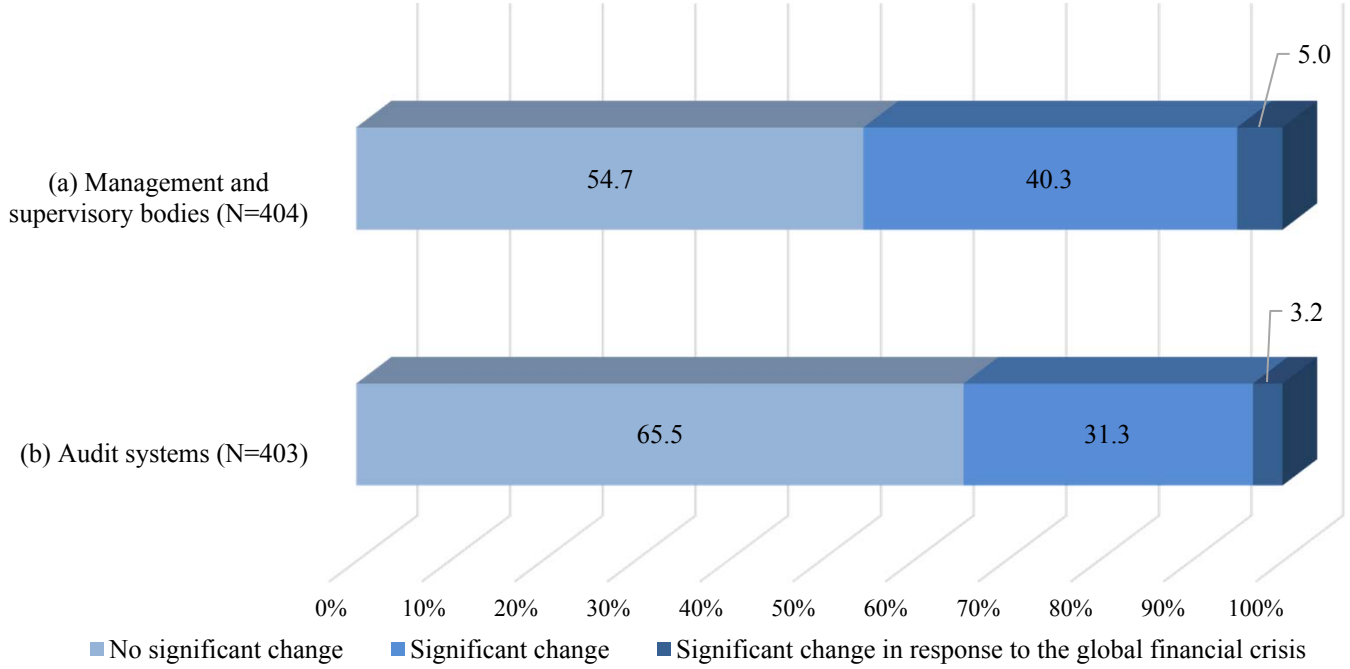
Source: Compiled by the author

Figure 1. Survival status of 751 industrial firms and 2009 survey results



Source: Author's illustration

Figure 2. Changes in corporate governance system during the period of 2005–2009



Source: Author's illustration. The total number of surveyed firms is 424. In this figure, we report only valid answers.

Table 2. Definitions and descriptive statistics of the variables used in the empirical analysis

Definitions of variables (variable names)	Descriptive statistics									
	Panel data [a]					Difference data [b]				
	Mean	S.D.	Median	Max.	Min.	Mean	S.D.	Median	Max.	Min.
(a) Board of director–related variables										
Outsideness of the chairman of the board of directors (*BOALEA*) [c]	0.784	0.870	0	2	0	-0.047	1.044	0	2	-2
Proportion of outside directors (*BOACOM*) [d]	0.487	0.352	0.545	1.000	0.000	0.034	0.389	0.000	1.000	-1.000
Proportion of independent directors (*BOAIND*) [d]	0.075	0.189	0.000	1.000	0.000	0.037	0.261	0.000	1.000	-1.000
Proportion of worker representative directors (*BOAWOR*) [d]	0.054	0.137	0.000	1.000	0.000	0.009	0.182	0.000	0.714	-1.000
Total number of outside directors (*OUTDIR*)	3.316	3.262	3	45	0	0.306	3.629	0	41	-8
Total number of independent directors (*INDDIR*)	0.467	1.172	0	10	0	0.248	1.607	0	10	-6
Total number of inside directors (*INSDIR*)	3.386	3.563	3	55	0	0.115	5.138	0	54	-10
Total number of worker representative directors (*WORDIR*)	0.463	1.992	0	40	0	0.264	2.770	0	40	-7
First principal component score for board of director–related variables (*BODSCO*) [e]	0.000	1.792	0.078	5.177	-12.289	0.062	2.145	0.069	5.893	-13.986
(b) Audit system–related variables										
Proportion of outside auditors (*AUDCOM*) [f]	0.433	0.403	0.333	1.000	0.000	0.042	0.493	0.000	1.000	-1.000
Proportion of expert auditors *(AUDEXP*) [f]	0.173	0.312	0.000	1.000	0.000	0.051	0.399	0.000	1.000	-1.000
Proportion of worker representative auditors (*AUDWOR*) [f]	0.508	0.413	0.500	1.000	0.000	-0.024	0.505	0.000	1.000	-1.000
Audit firm attribute (*AUDFIR*) [g]	0.347	0.576	0	2	0	0.009	0.662	0	2	-2
Total number of outside auditors (*OUTAUD*)	1.609	2.265	1	40	0	0.498	3.128	0	37	-9
Total number of expert auditors (*EXPAUD*)	0.631	1.212	0	10	0	0.315	1.546	0	9	-5
Total number of inside auditors (*INSAUD*)	2.011	2.002	2	30	0	0.044	2.763	0	28	-6
Total number of worker representative auditors (*WORAUD*)	1.800	2.037	2	30	0	0.159	2.797	0	28	-6
First principal component score for the audit system–related variables (*AUDSCO*) [h]	0.000	2.164	-0.249	5.314	-9.641	0.327	2.581	0.000	7.074	-7.000
(c) Global financial crisis–related variables										
Dummy for the firms that made significant changes in their management and supervisory bodies in response to the crisis (*CRISIS_BOD*)	0.021	0.145	0	1	0	0.050	0.217	0	1	0
Dummy for the firms that made significant changes in their audit systems in response to the crisis (*CRISIS_AUD*)	0.014	0.117	0	1	0	0.032	0.177	0	1	0

Definitions of variables (variable names)	Descriptive statistics									
	Panel data [a]					Difference data [b]				
	Mean	S.D.	Median	Max.	Min.	Mean	S.D.	Median	Max.	Min.
(d) Firm organization–related variables										
Ownership share of outside shareholders (*OWNOUT*) [i]	1.931	2.108	1	5	0	0.187	2.208	0	5	-5
Large management shareholder dummy (*MANSHA*)	0.469	0.499	0	1	0	-0.065	0.564	0	1	-1
Business group member dummy (*GROFIR*)	0.359	0.480	0	1	0	0.024	0.533	0	1	-1
Dummy for firms with upper limits on ownership shares (*LIMOWN*)	0.167	0.373	0	1	0	-0.038	0.434	0	1	-1
Open joint-stock company dummy (*OPECOM*)	0.668	0.471	1	1	0	0.005	0.606	0	1	-1
Average number of employees (*COMSIZ*) [j]	6.295	1.237	6.109	10.891	2.708	-0.212	0.722	-0.161	3.143	-3.466
(e) Management activity–related variables										
Labor productivity (*LABPRO*) [k]	12.535	2.016	12.900	18.696	3.906	-0.192	2.498	0.443	7.672	-8.306
Dummy for firms that issued shares or bonds in overseas or domestic stock exchanges (*MARFIN*)	0.108	0.311	0	1	0	0.040	0.335	0	1	-1
Firms that used bank credit and their average lending period (*BANCRE*) [l]	2.604	1.526	3	5	0	0.186	1.769	0	5	-5
Share of exports in total sales (*EXPSHA*) [m]	0.874	1.187	0	5	0	-0.081	1.082	0	5	-4
R&D expenditure intensity (*R&DEXP*) [n]	0.847	0.842	1	2	0	-0.216	0.949	0	2	-2
Dummy for the development of new products and services (*NEWPRO*) [o]	0.581	0.494	1	1	0	-0.017	0.614	0	1	-1

Notes:

[a] The data comprises the 2009 surviving surveyed firms and the exit firms confirmed as indicated in Figure 1.

[b] The data comprises the 2009 surviving surveyed firms as indicated in Figure 1.

[c] An ordinal variable that assigns a value of 0 to a firm where the chairman of the board of directors has been appointed from the inside, a value of 1 to a firm where the chairman is a quasi-outsider appointed from those working in an affiliated business group or a business partner, and a value of 2 to a firm where the chairman has been appointed from the outside

[d] Proportion of the concerned directors to the total number of board of director members, with a range $0.00 \leq x \leq 1.00$ as a continuous variable

[e] Estimated using the nine board of director–related variables above. See Panel (a) in Table 3 for the major estimation results.

[f] Proportion of the concerned auditors to the total number of audit committee members, with a range $0.00 \leq x \leq 1.00$ as a continuous variable

[g] An ordinal variable that assigns a value of 0 to a firm that employs an indigenous Russian audit firm as its accounting auditor, a value of 1 to a firm that employs a non-indigenous Russian audit firm, and a value of 2 to a firm that employs an international audit firm

[h] Estimated using the above nine audit system–related variables. See Panel (b) in Table 3 for the major estimation results.

[i] Ownership share of outside institutional shareholders rated on the following 6-point scale: 0—0%; 1—10.0% or less; 2—10.1 to 25.0%; 3—25.1 to 50.0%; 4—50.1 to 75.0%; 5—75.1 to 100.0%

[j] The natural logarithm of average number of total employees each year

[k] The natural logarithm of the real sales per worker based on the 2005 price

[l] "Firms that used bank credits and their average lending period" fall under one of the following 6 categories: 0—Did not use any bank credits during the period from 2001–2004; 1—Used bank credits, and their average lending period was less than 3 months; 2—Used bank credits, and their average lending period ranged from 3 months to less than 6 months; 3—Used bank credits, and their average lending period ranged from 6 months to less than one year; 4—Used bank credits, and their average lending period ranged from one year to less than 3 years; 5—Used bank credits, and their average lending period was more than 3 years.

[m] "Share of exports in total sales" falls under one of the following 6 categories: 0—0%; 1—10% or less; 2—10.1 to 25.0%; 3—25.1 to 50.0%; 4—50.1 to 75.0%; 5—More than 75%.

[n] Evaluation of the R&D expenditures during the last 4 years falls under one of the following three categories: 0—No record; 1—R&D expenditures remained flat or on the decline, and 2—R&D expenditures on the increase.

[o] Results in last 4 years

Source: Results from the 2005 and 2009 enterprise surveys

Table 3. Principal component analysis of the composition of boards of directors and audit systems

(a) Board of director–related variables (*BODSCO*)

Eigenvalues of the correlation matrix				Eigenvectors of the first component	
Component No.	Eigenvalue	Accounted for variance (%)	Cumulative percentage of total variance	Variables	Eigenvector
1	3.210	0.40	0.40	Outsideness of the chairman of the board of directors (*BOALEA*)	0.212
2	1.742	0.22	0.62	Proportion of outside directors (*BOACOM*)	0.475
3	1.314	0.16	0.78	Proportion of independent directors (*BOAIND*)	0.292
4	0.832	0.10	0.89	Proportion of worker representative directors (*BOAWOR*)	-0.318
5	0.554	0.07	0.96	Total number of outside directors (*OUTDIR*)	0.404
6	0.205	0.03	0.98	Total number of independent directors (*INDDIR*)	0.297
7	0.083	0.01	0.99	Total number of inside directors (*INSDIR*)	-0.441
8	0.059	0.01	1.00	Total number of worker representative directors (*WORDIR*)	-0.312

(b) Audit system–related variables (*AUDSCO*)

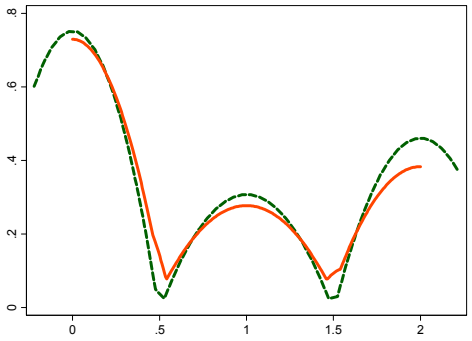
Eigenvalues of the correlation matrix				Eigenvectors of the first component	
Component No.	Eigenvalue	Accounted for variance (%)	Cumulative percentage of total variance	Variables	Eigenvector
1	4.681	0.59	0.59	Proportion of outside auditors (*AUDCOM*)	0.430
2	1.250	0.16	0.74	Proportion of expert auditors *(AUDEXP*)	0.331
3	0.979	0.12	0.86	Proportion of worker representative auditors (*AUDWOR*)	-0.415
4	0.645	0.08	0.94	Audit firm attribute (*AUDFIR*)	0.072
5	0.241	0.03	0.97	Total number of outside auditors (*OUTAUD*)	0.368
6	0.155	0.02	0.99	Total number of expert auditors (*EXPAUD*)	0.319
7	0.045	0.01	1.00	Total number of inside auditors (*INSAUD*)	-0.386
8	0.005	0.00	1.00	Total number of worker representative auditors (*WORAUD*)	-0.377

Note: Author's estimation. See Table 2 for definitions and descriptive statistics of the variables used in estimation.

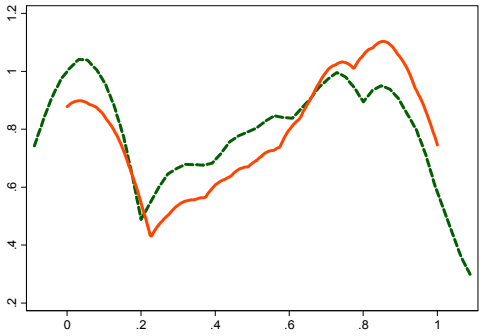
Figure 3. Structural change in corporate governance system: kernel density estimation [a]

(a) Board of director–related variables [b]

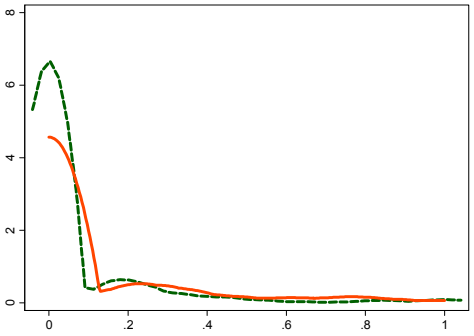
Outsideness of the chairman of the board of directors (*BOALEA*)



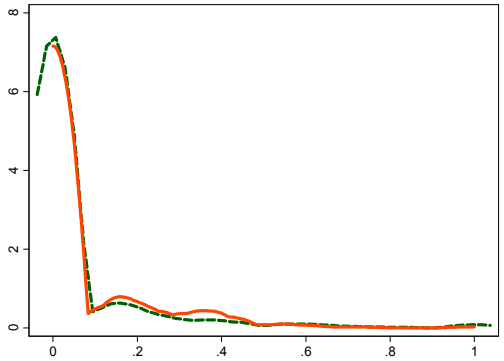
Proportion of outside directors (*BOACOM*)



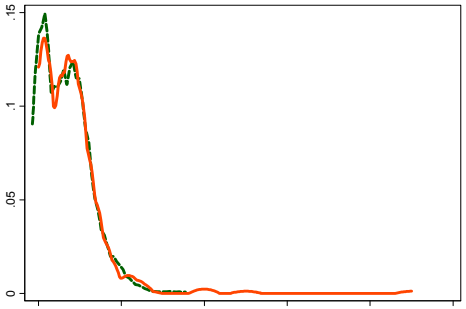
Proportion of independent directors (*BOAIND*)



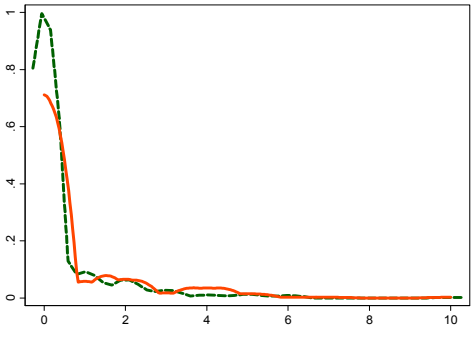
Proportion of worker representative directors (*BOAWOR*)



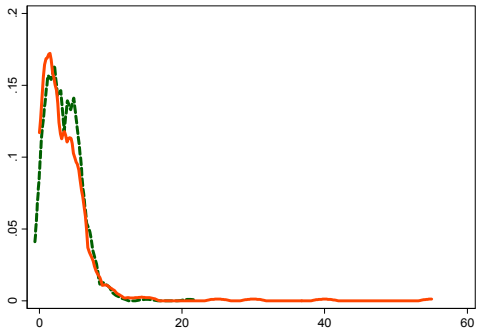
Total number of outside directors (*OUTDIR*)



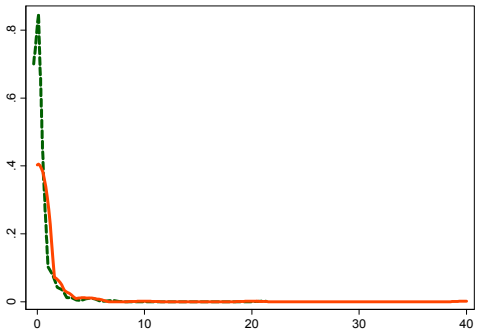
Total number of independent directors (*INDDIR*)



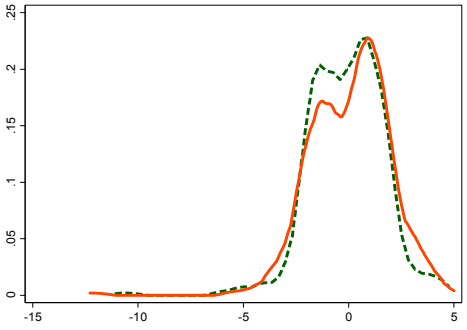
Total number of inside directors (*INSDIR*)



Total number of worker representative directors (*WORDIR*)

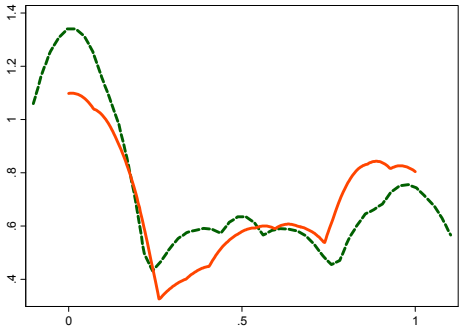


First principal component score for board of director–related variables (*BODSCO*)

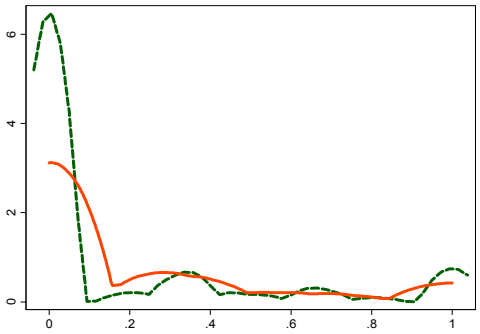


(b) Audit system–related variables [b]

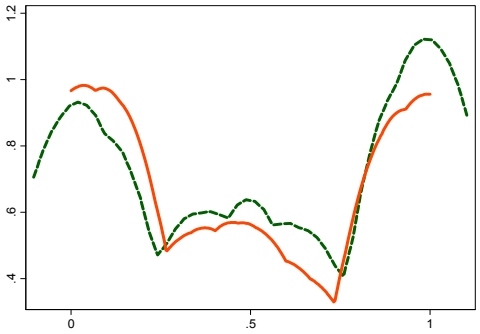
Proportion of outside auditors (*AUDCOM*)



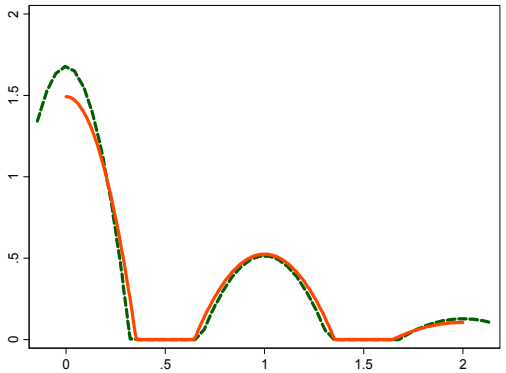
Proportion of expert auditors (*AUDEXP*)



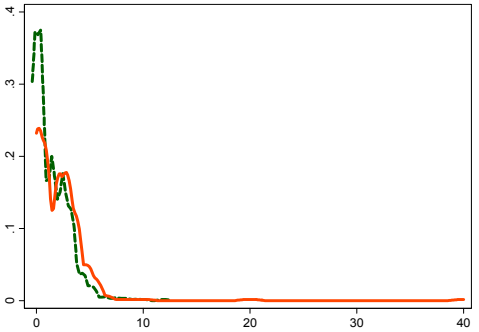
Proportion of worker representative auditors (*AUDWOR*)



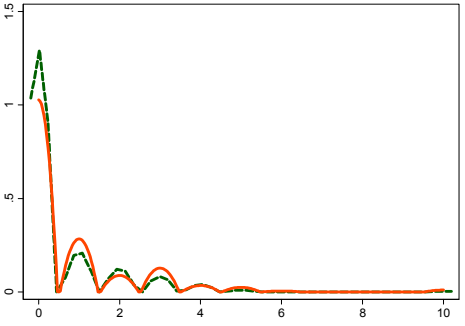
Audit firm attribute (*AUDFIR*)



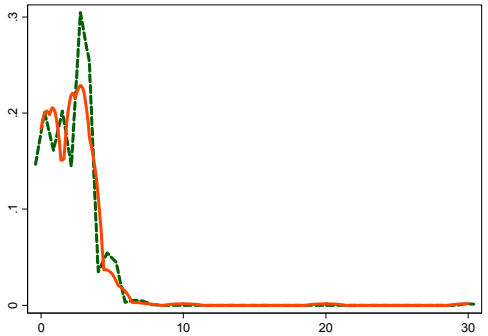
Total number of outside auditors (*OUTAUD*)



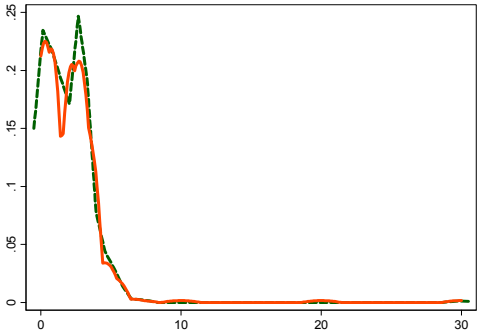
Total number of expert auditors (*EXPAUD*)



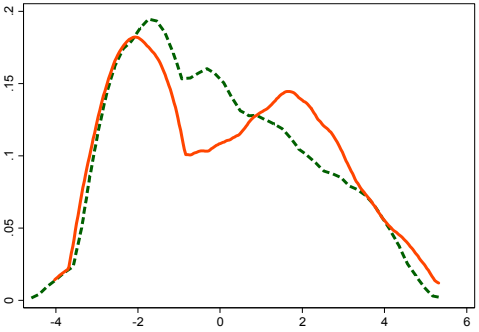
Total number of inside auditors (*INSAUD*)



Total number of worker representative auditors (*WORAUD*)



First principal component score for the audit system–related variables (*AUDSCO*)



Notes:

[a] Vertical axis is estimated density. Holizontal axis is variable value.

[b] Dashed green line and solid red line show 2005 and 2009 data, respectively.

Source: Author's illustration. See Table 2 for definitions and descriptive statistics of the variables used in estimation.

Table 4. Structural change in corporate governance systems during the period of 2005–2009: univariate comparison

(a) 2009 surviving firms surveyed

	(i) Mean of 2005 data	(ii) Mean of 2009 data	(iii) Mean of difference between 2005 and 2009 data (ii–i)	Univariate comparison (*t* test) [a]	
				Test I [b] (i/ii)	Test II [c] (iii)
Board of director–related variables					
Outsideness of the chairman of the board of directors (*BOALEA*)	0.792	0.751	-0.047	-0.634	-0.807
Proportion of outside directors (*BOACOM*)	0.463	0.508	0.034	1.737 **	1.597 *
Proportion of independent directors (*BOAIND*)	0.061	0.091	0.037	2.186 **	2.543 ***
Proportion of worker representative directors (*BOAWOR*)	0.050	0.057	0.009	0.706	0.851
Total number of outside directors (*OUTDIR*)	3.126	3.525	0.306	1.631 *	1.532 *
Total number of independent directors (*INDDIR*)	0.369	0.569	0.248	2.375 ***	2.809 ***
Total number of inside directors (*INSDIR*)	3.423	3.428	0.115	0.019	0.407
Total number of worker representative directors (*WORDIR*)	0.361	0.575	0.264	1.440	1.729
First principal component score for board of director–related variables (*BODSCO*)	-0.087	0.075	0.062	1.177	0.486
Audit system–related variables					
Proportion of outside auditors (*AUDCOM*)	0.427	0.459	0.042	1.068	1.447 *
Proportion of expert auditors *(AUDEXP*)	0.167	0.189	0.051	0.941	2.156 **
Proportion of worker representative auditors (*AUDWOR*)	0.512	0.491	-0.024	-0.671	-0.805
Audit firm attribute (*AUDFIR*)	0.340	0.346	0.009	0.146	0.242
Total number of outside auditors (*OUTAUD*)	1.370	1.887	0.498	3.006 ***	2.737 ***
Total number of expert auditors (*EXPAUD*)	0.511	0.768	0.315	2.814 ***	3.463 ***
Total number of inside auditors (*INSAUD*)	1.929	2.021	0.044	0.634	0.274
Total number of worker representative auditors (*WORAUD*)	1.698	1.859	0.159	1.077	0.968
First principal component score for audit system–related variables (*AUDSCO*)	-0.068	0.161	0.327	1.380 *	2.070 **

(b) Firms that made significant changes in their management and supervisory bodies in response to the globl financial crisis

	(i) Mean of 2005 data	(ii) Mean of 2009 data	(iii) Mean of difference between 2005 and 2009 data (ii–i)	Univariate comparison (*t* test) [a]	
				Test I [b] (i/ii)	Test II [c] (iii)
Board of director–related variables					
Outsideness of the chairman of the board of directors (*BOALEA*)	0.889	0.625	-0.286	-0.936	-1.075
Proportion of outside directors (*BOACOM*)	0.466	0.589	0.030	0.923	0.323
Proportion of independent directors (*BOAIND*)	0.071	0.156	0.091	0.949	1.301
Proportion of worker representative directors (*BOAWOR*)	0.107	0.029	-0.096	-1.111	-1.183
Total number of outside directors (*OUTDIR*)	2.842	3.000	0.375	0.195	0.576
Total number of independent directors (*INDDIR*)	0.368	0.882	0.563	1.057	1.542 *
Total number of inside directors (*INSDIR*)	3.211	2.059	-0.625	-1.401 *	-1.084
Total number of worker representative directors (*WORDIR*)	0.684	0.059	-0.750	-1.472 *	-1.567 *
First principal component score for board of director–related variables (*BODSCO*)	-0.292	0.689	0.254	1.287	0.584

(c) Firms that made significant changes in their audit systems in response to the global financial crisis

	(i) Mean of 2005 data	(ii) Mean of 2009 data	(iii) Mean of difference between 2005 and 2009 data (ii–i)	Univariate comparison (*t* test) [a]	
				Test I [b] (i/ii)	Test II [c] (iii)
Audit system–related variables					
Proportion of outside auditors (*AUDCOM*)	0.508	0.163	-0.330	-2.221	-1.992
Proportion of expert auditors *(AUDEXP*)	0.239	0.033	-0.170	-1.558	-1.252
Proportion of worker representative auditors (*AUDWOR*)	0.422	0.737	0.348	1.953	2.120
Audit firm attribute (*AUDFIR*)	0.154	0.545	0.364	1.770 **	1.789 *
Total number of outside auditors (*OUTAUD*)	1.583	0.800	-0.778	-1.318	-1.139
Total number of expert auditors (*EXPAUD*)	0.750	0.100	-0.556	-1.639	-1.348
Total number of inside auditors (*INSAUD*)	1.667	2.800	0.816	1.865	1.225
Total number of worker representative auditors (*WORAUD*)	1.417	2.500	1.111	1.802	1.440
First principal component score for audit system–related variables (*AUDSCO*)	0.368	-1.450	-1.410	-2.070	-1.261

Notes:

[a] One-sided test. ***, **, and * denote statistical siginifinance at the 1%, 5%, and 10% levels, respectively.

[b] Null hypothesis: The values in 2009 ≧ the values in 2005 for variables *BOAWOR*, *INSDIR*, *WORDIR*, *AUDWOR*, *INSAUD*, and *WORAU*D. Otherwise, the values in 2009 ≦ the values in 2005.

[c] Null hypothesis: The differences between 2005 and 2009 ≧ 0 for variables *BOAWOR*, *INSDIR*, *WORDIR*, *AUDWOR*, *INSAUD*, and *WORAU*D. Otherwise, the differences between 2005 and 2009 ≦ 0.

Source: Author's estimation. See Table 2 for definitions and descriptive statistics of the variables used in estimation.

Table 5. Determinants of the evolution of corporate governance: Heckman two-step estimation of difference model

(a) Board of directors

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Dependent variable	Outsideness of the chairman of the board of directors (*BOALEA*)	Proportion of outside directors (*BOACOM*)	Proportion of independent directors (*BOAIND*)	Proportion of worker representative directors (*BOAWOR*)	Total number of outside directors (*OUTDIR*)	Total number of independent directors (*INDDIR*)	Total number of inside directors (*INSDIR*)	Total number of worker representative directors (*WORDIR*)	First principal component score for board of director–related variables (*BODSCO*)
Global financial crisis–related variable									
Dummy for firms that made significant changes in their management and supervisory bodies in response to the crisis (*CRISIS_BOD*)	-0.104 (0.36)	0.111 (0.11)	0.049 (0.08)	-0.132 ** (0.06)	-0.006 (0.72)	0.238 (0.49)	-1.085 (0.79)	-1.045 *** (0.34)	0.177 (0.64)
Firm organization–related variables									
Ownership share of outside shareholders (*OWNOUT*)	0.036 (0.03)	0.035 *** (0.01)	0.011 (0.01)	-0.009 (0.01)	0.223 *** (0.07)	0.055 (0.05)	-0.286 *** (0.08)	-0.087 ** (0.03)	0.156 *** (0.06)
Large management shareholder dummy (*MANSHA*)	-0.264 * (0.14)	-0.223 *** (0.05)	-0.042 (0.04)	0.006 (0.02)	-1.412 *** (0.31)	-0.195 (0.21)	1.879 *** (0.34)	0.128 (0.15)	-1.028 *** (0.25)
Dummy for business group members (*GROFIR*)	-0.108 (0.15)	-0.021 (0.05)	0.010 (0.04)	-0.009 (0.03)	-0.222 (0.32)	0.050 (0.22)	0.075 (0.36)	0.066 (0.15)	-0.063 (0.27)
Dummy for firms with upper limits on ownership shares (*LIMOWN*)	-0.103 (0.19)	-0.157 ** (0.06)	-0.049 (0.05)	0.063 * (0.03)	-1.147 *** (0.41)	-0.279 (0.28)	0.811 * (0.46)	0.399 ** (0.20)	-1.136 *** (0.34)
Dummy for open joint-stock companies (*OPECOM*)	0.159 (0.13)	0.011 (0.04)	-0.013 (0.03)	0.014 (0.02)	0.010 (0.27)	-0.031 (0.19)	-0.076 (0.30)	0.077 (0.13)	-0.040 (0.23)
Average number of employees (*COMSIZ*)	0.118 (0.11)	0.037 (0.04)	-0.022 (0.03)	0.003 (0.02)	0.442 * (0.24)	-0.090 (0.16)	-0.096 (0.26)	-0.028 (0.11)	0.125 (0.19)
Management activity–related variables									
Labor productivity (*LABPRO*)	0.046 (0.03)	0.010 (0.01)	-0.014 (0.01)	-0.005 (0.01)	0.028 (0.08)	-0.088 * (0.05)	-0.055 (0.08)	-0.011 (0.04)	-0.013 (0.06)
Dummy for firms that issued shares or bonds in the overseas or domestic stock exchange (*MARFIN*)	-0.005 (0.24)	-0.045 (0.08)	-0.010 (0.06)	0.015 (0.04)	-0.328 (0.53)	0.131 (0.37)	-0.173 (0.59)	0.148 (0.25)	-0.010 (0.44)
Firms that used bank credit and their average lending period (*BANCRE*)	-0.046 (0.05)	0.0037 (0.02)	0.015 (0.01)	0.005 (0.01)	0.055 (0.10)	0.057 (0.07)	0.018 (0.11)	0.028 (0.05)	0.049 (0.09)
Share of exports in total sales (*EXPSHA*)	0.080 (0.09)	0.032 (0.03)	-0.018 (0.02)	0.000 (0.01)	0.193 (0.17)	-0.119 (0.12)	-0.139 (0.19)	0.013 (0.08)	0.135 (0.15)
R&D expenditure intensity (*R&DEXP*)	-0.104 (0.08)	0.041 (0.03)	0.046 ** (0.02)	-0.015 (0.01)	0.274 (0.18)	0.332 *** (0.12)	-0.316 (0.20)	-0.146 * (0.09)	0.360 ** (0.14)
Dummy for the development of new products and services (*NEWPRO*)	-0.018 (0.13)	0.003 (0.04)	-0.061 * (0.03)	0.006 (0.02)	0.108 (0.27)	-0.335 * (0.19)	-0.191 (0.30)	0.032 (0.13)	-0.310 (0.23)
Inverse Mills ratio	-0.174 (0.19)	0.028 (0.06)	0.064 (0.05)	0.025 (0.03)	-0.094 (0.42)	0.442 (0.29)	-0.285 (0.47)	0.162 (0.20)	0.222 (0.32)
N	271	276	276	276	276	276	276	276	253
N (uncensored observation)	203	208	208	208	208	208	208	208	185
Wald test (χ^2) [a]	13.75	49.21 ***	17.88	18.17	51.58 ***	17.62	57.59 ***	29.56 ***	47.87 ***

(b) Audit system

Model	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]	[18]
Dependent variable	Proportion of outside auditors (*AUDCOM*)	Proportion of expert auditors (*AUDEXP*)	Proportion of worker representative auditors (*AUDWOR*)	Audit firm attribute (*AUDFIR*)	Total number of outside auditors (*OUTAUD*)	Total number of expert auditors (*EXPAUD*)	Total number of inside auditors (*INSAUD*)	Total number of worker representative auditors (*WORAUD*)	First principal component score for audit system–related variables (*AUDSCO*)
Global financial crisis–related variable									
Dummy for firms that made significant changes in their audit systems in response to the crisis (*CRISIS_AUD*)	-0.472 **	-0.127	0.443 **	0.061	-1.625 **	-0.682	1.142	1.129	-2.224 **
	(0.19)	(0.15)	(0.19)	(0.21)	(0.71)	(0.48)	(0.70)	(0.71)	(0.97)
Firm organization–related variables									
Ownership share of outside shareholders (*OWNOUT*)	0.009	0.001	0.007	0.046 ***	0.038	-0.023	-0.028	0.011	0.058
	(0.02)	(0.01)	(0.02)	(0.02)	(0.06)	(0.04)	(0.06)	(0.06)	(0.08)
Large management shareholder dummy (*MANSHA*)	-0.134 **	-0.075	0.072	-0.126 *	-0.287	-0.205	0.137	-0.003	-0.501
	(0.06)	(0.05)	(0.06)	(0.07)	(0.23)	(0.16)	(0.23)	(0.24)	(0.33)
Dummy for business group members (*GROFIR*)	0.053	-0.027	-0.044	0.212 ***	-0.053	-0.117	-0.386	-0.366	0.212
	(0.06)	(0.05)	(0.07)	(0.07)	(0.24)	(0.16)	(0.24)	(0.24)	(0.34)
Dummy for open joint-stock companies (*OPECOM*)	-0.018	0.092 **	0.090	0.190 ***	0.101	0.240	-0.153	0.126	0.115
	(0.06)	(0.05)	(0.06)	(0.06)	(0.22)	(0.15)	(0.21)	(0.22)	(0.31)
Average number of employees (*COMSIZ*)	-0.025	-0.109 ***	0.024	0.202 ***	0.050	-0.165	0.255	0.219	-0.199
	(0.05)	(0.04)	(0.05)	(0.06)	(0.19)	(0.13)	(0.19)	(0.19)	(0.27)
Management activity–related variables									
Labor productivity (*LABPRO*)	-0.005	-0.009	0.004	-0.044 **	-0.053	-0.047	0.027	0.029	-0.038
	(0.02)	(0.01)	(0.02)	(0.02)	(0.06)	(0.04)	(0.06)	(0.06)	(0.09)
Dummy for firms that issued shares or bonds in the overseas or domestic stock exchange (*MARFIN*)	0.057	0.178 *	-0.063	0.116	0.808 **	0.577 **	-0.138	-0.025	0.397
	(0.11)	(0.09)	(0.11)	(0.11)	(0.40)	(0.28)	(0.39)	(0.40)	(0.57)
Firms that used bank credit and their average lending period (*BANCRE*)	-0.013	0.030 *	0.020	-0.014	0.005	0.069	0.078	0.091	-0.035
	(0.02)	(0.02)	(0.02)	(0.02)	(0.08)	(0.05)	(0.08)	(0.08)	(0.11)
Share of exports in total sales (*EXPSHA*)	-0.023	-0.030	0.017	0.103 ***	-0.101	-0.116	0.119	0.074	-0.192
	(0.04)	(0.03)	(0.04)	(0.04)	(0.14)	(0.10)	(0.14)	(0.14)	(0.20)
R&D expenditure intensity (*R&DEXP*)	-0.030	0.004	0.025	0.021	-0.009	0.018	0.106	0.116	-0.136
	(0.04)	(0.03)	(0.04)	(0.04)	(0.14)	(0.09)	(0.14)	(0.14)	(0.20)
Dummy for the development of new products and services (*NEWPRO*)	-0.017	-0.098 **	0.068	-0.120 **	-0.009	-0.272 *	0.058	0.237	-0.088
	(0.06)	(0.04)	(0.06)	(0.06)	(0.21)	(0.14)	(0.21)	(0.21)	(0.30)
Inverse Mills ratio	0.132	0.000	-0.098	0.132	0.634	0.347	-0.349	-0.195	0.642
	(0.09)	(0.07)	(0.09)	(0.10)	(0.52)	(0.22)	(0.32)	(0.32)	(0.43)
N	275	275	275	309	279	275	279	275	261
N (uncensored observation)	207	207	207	241	211	207	211	207	193
Wald test (χ^2) [a]	14.73	25.70 **	13.18	53.50 ***	13.57	23.09 **	13.20	12.18	12.57

Notes:

[a] Null hypothesis: All coefficients are zero.

[b] Standard errors are reported in parentheses beneath the regression coefficients. ***, **, and + denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Source: Author's estimation. See Table 2 for definitions and descriptive statistics of variables used in estimation.

Table 6. Assessment of omission bias in the 2009 enterprise survey

Variables	2009 surviving unsurveyed firms		2009 surviving surveyed firms		Univariate comparison [a]		
	Mean of 2005 data	Median of 2005 data	Mean of 2005 data	Median of 2005 data	t test (*t* value)	Wilcoxon rank sum test (*z* value)	Proportion test (*z* value)
(a) Board of director–related variables							
Outsideness of the chairman of the board of directors (*BOALEA*)	0.843	1	0.792	0	0.660	0.792	-
Proportion of outside directors (*BOACOM*)	0.476	0.571	0.463	0.472	0.428	0.490	-
Proportion of independent directors (*BOAIND*)	0.057	0.000	0.061	0.000	-0.273	0.066	-
Proportion of worker representative directors (*BOAWOR*)	0.055	0.000	0.050	0.000	0.352	-0.367	-
Total number of outside directors (*OUTDIR*)	3.492	3	3.126	3	1.421	0.947	-
Total number of independent directors (*INDDIR*)	0.459	0	0.369	0	0.925	0.232	-
Total number of inside directors (*INSDIR*)	3.249	3	3.423	3	-0.791	-0.361	-
Total number of worker representative directors (*WORDIR*)	0.337	0	0.361	0	-0.210	-0.309	-
(b) Audit system–related variables							
Proportion of outside auditors (*AUDCOM*)	0.374	0.292	0.427	0.333	-1.439	-1.615	-
Proportion of expert auditors *(AUDEXP*)	0.157	0.000	0.167	0.000	-0.330	-0.582	-
Proportion of worker representative auditors (*AUDWOR*)	0.565	0.667	0.512	0.500	1.406	1.507	-
Audit firm attribute (*AUDFIR*)	0.317	0	0.340	0	-0.466	-0.418	-
Total number of outside auditors (*OUTAUD*)	1.350	1	1.370	1	-0.138	-1.287	-
Total number of expert auditors (*EXPAUD*)	0.586	0	0.511	0	0.744	-0.310	-
Total number of inside auditors (*INSAUD*)	2.383	2	1.929	2	2.680 ***	2.031 **	-
Total number of worker representative auditors (*WORAUD*)	2.103	2	1.698	2	2.312 **	1.685 *	-

Variables	2009 surviving unsurveyed firms		2009 surviving surveyed firms		Univariate comparison [a]		
	Mean of 2005 data	Median of 2005 data	Mean of 2005 data	Median of 2005 data	t test (t value)	Wilcoxon rank sum test (z value)	Proportion test (z value)
(c) Firm organization–related variables							
Ownership share of outside shareholders (*OWNOUT*)	1.706	0	1.851	1	-0.763	-0.715	-
Large management shareholder dummy (*MANSHA*)	0.498	0	0.506	1	-0.197	-0.197	-0.198
Dummy for business group members (*GROFIR*)	0.347	0	0.330	0	0.434	0.434	0.434
Dummy for firms with upper limits on ownership shares (*LIMOWN*)	0.065	0	0.189	0	-3.976 ***	-3.924 ***	-3.928 ***
Dummy for open joint-stock companies (*OPECOM*)	0.665	1	0.673	1	-0.199	-0.199	-0.199
Average number of employees (*COMSIZ*)	6.470	6.215	6.420	6.117	0.507	1.137	-
(d) Management activity–related variables							
Labor productivity (*LABPRO*)	13.059	12.900	12.660	12.700	3.893 ***	3.803 ***	-
Dummy for firms that issued shares or bonds in the overseas or domestic stock exchange (*MARFIN*)	0.109	0	0.082	0	1.113	1.112	1.113
Firms that used bank credits and their average lending period (*BANCRE*)	2.534	3	2.520	3	0.115	0.183	-
Share of exports in total sales (*EXPSHA*)	1.118	1	0.938	1	1.716 *	1.349	-
R&D expenditure intensity (*R&DEXP*)	0.967	1	0.969	1	-0.027	-0.068	-
Dummy for the development of new products and services (*NEWPRO*)	0.652	1	0.588	1	1.560	1.558	1.560

Notes:

[a] Two-sided test. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Source: Author's estimation. See Table 2 for definitions and descriptive statistics of the variables used in estimation.