

The ‘CorE’ Dynamics of Corporate Soft-Regulation: Theory and Evidence

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Abstract

Using elements from the rational and institutional theories we formulate a simple model that describes, at the firm level, the evolution of compliance of corporate governance practices regulated by comply or explain standards. We show that, under the assumptions of our model, the level of compliance of a practice evolves as a diffusion process that converges to the practice efficacy level. Speed of convergence depends on the pre-regulation compliance level, efficacy level and expected loss prevented by the practice. This speed reduces monotonically with time. We find that Chilean data fits the model with high significance. We find evidence that levels of efficacy and expected losses are different when we gather practices in 1) functioning and composition of the board; 2) relations of the firm with shareholders and others or; 3) risk management and control. In addition, we show that for the Chilean case, efficacy and loss are correlated with the practice’s pre-regulation compliance level. We suggest ways to improve levels of compliance and discuss policy implications.

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Key words: Comply or Explain, soft-regulation, corporate governance practice, dynamics of compliance, diffusion process, rational theory, institutional theory, Chile

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1. INTRODUCTION

It has been more than 40 years since the first Code of Best Corporate Governance Practices was created (1978 in USA) and almost 30 years since the influential Cadbury Code made its appearance (1992 in UK).² By now, more than 91 countries have enacted corporate codes or equivalent bodies of soft-regulation in corporate governance.³ Since the early 90s a prolific research agenda has studied goals, contents and scope of these codes. It has also studied effectivity, diffusion and convergence across countries as well as firms' levels of compliance with the codes and their effects over financial performance.⁴ This literature has made unquestionable contributions uncovering key concepts and empirical regularities behind the adoption and impact of best corporate practices at the international, national and firm level. However, despite all this progress, we are still missing a formal yet tractable model that based on the already understood concepts can better explain the reasons, dynamics and convergence behind compliance at the firm level.⁵ A model that both fits the existing data and can be used to make concrete suggestions on how to increase compliance levels.⁶

Built upon the rational and institutional theories, in this paper we introduce a mathematical model that describes firms' decisions to comply with suggested corporate governance practices. We show that, after the code is introduced, the dynamics of compliance follows a diffusion process in which the level of compliance among firms converges to an

² In their documentation of the diffusion of Codes across countries, Aguilera and Cuervo-Cazurra (2004) state that the 1978 code was followed by a code enacted in Hong Kong in 1989, another in Ireland in 1991 and then the Cadbury Code in 1992.

³ Unlike hard law, Corporate Codes are soft law, that is, a set of rules that are nonbinding, voluntary and flexible in their application (Haxhi and Aguilera, 2014). Cuomo *et al* (2016) report 91 country level codes by 2014.

⁴ See Aguilera and Cuervo-Cazurra (2009), Plugiese *et al* (2009), Cuomo *et al* (2016), among others.

⁵ As stated in the literature review by Cuomo *et al* (2016) "Our results show that the large majority of articles are empirical, while conceptual papers are much less common. In addition, ... the majority of articles on codes are not built on an explicit theory or that the theoretical grounding can be found only inductively."

⁶ Leuz and Wysocki (2008), Cuomo *et al* (2016), among other authors have suggested the desirability of more research on the dynamics of regulation.

efficacy level that is specific for each practice. We assume that after a pre-regulation stage in which the level of compliance is determined by rational considerations on how to improve the administration of the firm, increment in compliance is mainly driven by institutional/legitimacy benefits. These benefits take the form of a market-premium and the avoidance of a value destroying event (scandal, illegal wrongdoing, social questioning) which sizes are proportional to the percentage of compliers. Indeed, there is evidence that the value of a firm reacts more positively to a compliance the more firms have already accepted the practice and the harshness of regulators/society with a non-complier is stronger the greater is the level of compliance among the rest of the firms.⁷

We find that the compliance level is equal to the previous compliance level plus a fraction of new compliers determined by the pressure to invest in the reduction of the probability that a value-destroying event takes place. Central to the dynamics of the model, we assume that each practice is able to reduce the probability of an event only up to a certain boundary (efficacy). Indeed if you compare the recommendation that firms should have a web page with the one that firms should have a whistle blowing mechanism, very likely the latter will reduce the probability of a fraud or other illegal activities more than the former. In that line, it is reasonable to expect heterogeneity in the levels of efficacy and prevented losses when we distinguish by practice.

The model predicts that both, the level and the speed of convergence of compliance are determined by the initial level of compliance, the effectiveness of the practice at avoiding

⁷ While Kumar and Ganguly (2020) measure effects of bandwagons over financial performance, Staw and Epstein (2000), Dick (2005), Majumdar and Chang (2010) measure effects of bandwagons over firm performance. More and Pierce (2016) document harsher punishments to non-compliers when the number of compliers is large. In addition, Bode et al (2015) together with Paek and Nelson (2009) respectively document how firms might lose employees and consumers when they do not follow good corporate governance practices.

a value destroying event and the loss associated with this same event. More specifically, compliance will be greater if, *ceteris paribus*, any of these three variables increase. Intuitively, the greater the fraction of pre-regulation compliers the larger the momentum to add new compliers in the future. In addition, the greater the efficacy of the practice or the larger the expected loss associated with an event the stronger the incentives to adopt a practice to avoid the event. However, and somehow counterintuitively, the speed of convergence to the efficacy level will be reduced with time, since regulation was implemented, or with the initial value of compliance. In addition, speed of convergence can be increased or decreased when either efficacy or the expected loss increase.

The properties of the speed of convergence are mainly driven by the fact that this expression is proportional to the distance between the practice's efficacy level and the practice's current compliance level. Because with time compliance becomes closer to the efficacy level, with time that distance becomes smaller and ergo the proportional increment in the level of compliance becomes smaller as well.

A final noteworthy theoretical finding is that our model defines a diffusion process in which backrolling is possible, unlike the classic diffusion processes in which backrolling is not possible (once the state variable reaches its equilibrium level, it stays there for good).⁸ The reason for this difference is that, in our model, convergence is not necessarily to compliance by all the firms but only to a fraction of them. That implies that in some scenarios, when the expected loss is large enough, compliance will surpass the efficacy level and from there go back (ergo some compliers will stop complying with the practice). Compliance could

⁸ See Rogers (2010).

then become smaller than the efficacy level to start increasing again. The oscillatory process will eventually end with compliance being equal to the efficacy level.

To test the predictions of our model, we utilize Chilean data associated with the second corporate governance self-regulatory attempt introduced to the country in 2015. Not surprisingly, because until 2012 Chile did not have a Code or equivalent soft-regulatory body, the Chilean case has not been documented in the international literature.⁹ The second comply or explain Chilean code (NCG 385), introduced by the Chilean Regulator of Financial Markets (SVS at the time, now CMF) in 2015, asked all public companies registered with the CMF (who are enabled to issue publicly traded securities – but whose shares are not necessarily traded in stock markets) to reveal or explain inquiries regarding 99 corporate governance practices separated in four categories. These categories are: 1) Functioning and composition of the board (51 practices), from now on we call it FCB. 2) Relations of the firm with its shareholders and other stakeholders (22 practices), from now on we call it RSS. 3) Risk management and control (22 practices), from now on we call it RMC and 4) Compliance evaluation (4 practices), from now on we call it CE.

We test the capacity of our model to explain the evolution of the average compliance per practice for the three first categories.¹⁰ In all categories and with high significance, we find that the evolution in compliance follows a diffusion process without backrolling. In addition, we find evidence that compliance converges to a level that is significantly smaller than 100% in the FCB category however, compliance converges to a level of 100% in the RMC category. In other words, on average, efficacy level for the latter practices is weakly

⁹ As we will mention later, Chilean literature has discussed rather descriptively results associated with the implementation of the first (2012) and the second (2015) soft-regulation codes.

¹⁰ We do not test the model in the fourth category because of the small number of observations.

higher than for the others. We also find some evidence that the loss (normalized by the cost of adopting the practice) associated with the average practice in the RMC category is smaller than the same magnitude in the FCB and RSS categories. Finally, when we gather practices by their pre-regulation levels of compliance, estimations reveal that the levels of compliance are positively correlated with efficacy of the practice, but they are negatively correlated with the expected loss prevented by the practice.

Several implications follow from our theoretical and empirical results. First, a diffusion process implies that a firm copies what other firms do but also reacts to the threat posed by losses associated with value-destroying events. When a regulation is just enacted, firms' decisions are mainly driven by the threat of the value-destroying event, but with time, the decisions tend to be driven by the mimicking effect, which close to the steady state is equal to the practice's effectiveness. Second, regulators should not expect (or demand) that all firms comply with all practices as some practices might have low levels of efficacy. Third, regulators can encourage compliance with a given practice if they are able to increase the efficacy of the practice. Alternatively, regulators can also increase the levels of compliance if they convey information that clarifies the losses that practices can prevent.¹¹ Fourth, firms should consider that corporate governance practices might present important differences in their efficacy and the losses that they prevent when we distinguish by the category of the practice (i.e., FCB, RSS or RMC). In particular, our results associated with the pre-regulation levels of compliance suggest a trade-off in which, without regulation, firms tend to adopt practices that are efficient at preventing events, but those events are not necessarily the most

¹¹ Our model opens a new window of opportunity to explain the diffusion of apparently inefficient innovations (for example studied by Abrahamson and Rosenkopf, 1993). In our model, even practices with low levels of efficacy will be diffused but they will achieve low levels of compliance. The speed of compliance might be higher than other practices, with greater levels of efficacy, if the prevented loss is large enough.

harmful ones for firms. For example, it is certainly beneficial for a firm to assure that it has enough employees who speak different languages so it can improve the quality in the provision of services to investors. However, very likely the losses associated with value-destroying events that idiom proficiency prevent are much smaller than the losses that adequate risk management procedures do.

It is important to keep in mind, as the literature commonly does (i.e., Bianchi *et al*, 2011) that declaring compliance does not mean that firms indeed implement the practices with all the desired conviction. In addition, in our study we only utilize “hard responses” (Yes or No) and we do not use the explanations that firms provide to justify their decisions. That said, we test the robustness of our results and develop extensions in several directions. We incorporate to our estimations data from the first comply or explain Chilean code (NCG 341) and verify that the main results hold. We end by presenting an alternative way of deriving the model based on the decisions made by a “representative firm”.

The rest of the paper is organized as follows. In Section 2 we review the relevant literature. In Section 3 we explain key concepts of the model and show how it connects to the literature. In Section 4 we introduce the model, derive our main theoretical results and state testable hypothesis. In Section 5 we explain Chilean institutionality, describe the data and derive our main empirical results. In Section 6 we present extensions and discuss results. In Section 7 we conclude.

2. LITERATURE REVIEW

Our article connects with three strands of the literature. The first one studies the conceptual reasons behind firms’ adoption of best corporate governance practices, mainly divided into rational (agency or efficiency) and institutional (legitimacy) theories. The

second one documents the evidence and regularities associated with the adoption of best practices at the firm level. The third and final strand of the literature develops and studies diffusion processes. Next we briefly review each of these strands and link them to our article.

2.1 MAIN THEORIES BEHIND COMPLIANCE

Hard and soft corporate governance regulations compel and suggest firms to follow best management practices (Board of Directors and Chief executives); protect shareholder and stakeholder rights; and implement adequate compensation as well as risk management policies. While in the context of hard/mandatory regulation, firms do not have much decision leeway, soft regulation (Code) provides firms with the flexibility to adjust compliance to their particular realities (mainly through the comply-or-explain principle). But what exactly determines that some firms voluntarily comply with given practices and other firms do not?

Although many theories have been applied or developed to answer the last question, according to Zattoni and Cuomo (2008) and Cuomo *et al* (2016) the two most commonly utilized have been the agency/efficiency theories and the institutional theory.¹²

While the lens of agency theory (Fama and Jensen, 1983 or Jensen and Meckling, 1976) fosters the adoption of corporate practices that minimize conflicts between principals and agents, the lens of efficiency theory fosters the adoption of practices whose benefits outdo costs at the marginal level. In other words, under these two theories best corporate governance practices aim to maximize the long-term value of a corporation through improved administration (cash flows) and/or reduced risks (cost of capital).

For example, the extensive literature (i.e., La Porta *et al* 1998, 2013, Djankov *et al*, 2003) that finds correlation between the quality of corporate regulation with its legal origins

¹² Other theories are stakeholder theory, political theory, stewardship theory, contingency theory, conflict and signaling theories, and financial system theory, see Cuomo *et al* (2016).

and by extension its impact over the efficiency of markets supports the explanatory power of the agency theory within corporate governance regulation. Moreover, the literature (i.e., Sasseen and Weber, 2006; Engel *et al*, 2007; Leuz *et al*, 2008) that studies and many times questions the convenience of mandatory regulation in the context of the enactment of the Sarbanes-Oxley Act supports the explanatory power of the efficiency theory. For parsimony, in the rest of the paper, we call the agency/efficiency theories the rational theory.

Institutional theory considers that the decisions made by administrators (and ergo the value of a firm) can be substantially impacted by the quality, stability and normative context of the institutions (economical, political and social) within which firms operate (North, 1991; Meyer and Rowan, 1977; DiMaggio and Powell, 1983; May, 2004, 2005). Among the many variations of the institutional theory, legitimacy theory (Winter and May, 2001; Lieberman and Asaba, 2006; Karlsson-Vinkhuyzen and Vihma, 2009) considers that the pressures established by both internal (employees, suppliers, distributors) and external groups (investors, consumers, society, press, judiciary, legislators) fuel firms' need to mimic other firms' behaviors. Such mimicking includes economic (i.e., to discourage anticompetitive behaviors and foster quality of economic associates), political (i.e., to encourage environmental protection) and social (i.e., to encourage social programs and diversity at the place of work) dimensions.¹³

Many papers have taken advantage of the conceptual amplitude of the institutional theory to study diverse corporate governance phenomena. Edelman (1990) uses that theory

¹³ DiMaggio and Powell (1983) outline a theory of external pressures to explain why organizations tend to adopt certain structures. They describe three forces that lead organizations to look similar—coercive, mimetic, and normative. Mimetic forces arise because organizations need to manage uncertainty, so they sometimes imitate successful firms without a clear understanding of how the structure they are imitating works. The more organizations adopt a particular structure (like a governance committee), the more likely it becomes that others will adopt simply so that they will conform to what has become a widely accepted norm.

to explain organizational responses to new legal demands. Largely motivated by the ENRON and Arthur Andersen crisis, Jones *et al* (2015) study the adoption of governance committees among firms trading at NYSE as responses to external pressures of markets to do so. Jackson (2010) emphasizes that, in the context of international corporate social responsibility, soft-law is a source of reputation for compliers. Zattoni and Cuomo (2008) state that companies tend to comply with code recommendations mainly to increase their legitimacy among investors and improve the effectiveness of their governance practices. Hooghiemstra and van Ees (2011) find that Dutch firms largely comply with a Code of corporate governance out of fear to damage their reputation. And Werder *et al* (2005) report a high degree of uniformity in firm responses to the German Corporate Code, which suggests that firms observe the declaration of practices from other firms and adopt their argumentative patterns.¹⁴

It is worth noting that a number of authors (Aguilera and Cuervo-Cazurra, 2004; Zattoni and Cuomo, 2008 among others) have tested whether the rational theory or the institutional theory better explain the dynamics in the adoption of codes across countries and have found that both theories have explanatory power.¹⁵ Even more Aguilera and Cuervo-Cazurra (2004) suggest that these two theories complement each other.¹⁶ To our knowledge, this idea of complementarity has not been explored in the adoption of practices at the firm

¹⁴ For example, the CGGC recommends agreeing a suitable deductible if the company takes out a D&O (directors' and officers' liability insurance) policy for the management board and the supervisory. This norm has the least acceptance of all the 62 recommendations and the firms' justifications are standard.

¹⁵ For example, Aguilera and Cuervo-Cazurra (2004) study whether the main reason behind the proliferation of corporate codes in civil law countries is: (i) the determination to improve the efficiency of the national governance system; or (ii) the will to "legitimize" domestic companies in the global financial market without radically improving the governance practices.

¹⁶ Aguilera and Cuervo-Cazurra (2004) state "Efficiency and legitimation are often posed as mutually exclusive categories where early in the process of diffusion, practices are adopted because of their unequivocal effects on efficiency or effectiveness, while later adoption is seen as a social legitimation process regardless of net benefit. As pointed out by Strang and Macy, this dichotomy is theoretically costly because 'ideas about rationality and effectiveness come to be cast in opposition to ideas about imitation' (2001: 148). We subscribe to Scott's (2001: 157) suggestion that efficiency and legitimation accounts both compete with and complement each other."

level, perhaps because a theoretical framework has been missing. In our paper, we contribute to fill that void by explicitly writing a mathematical model that uses elements from the rational and the institutional theories at the same time.

2.2 EMPIRICAL EVIDENCE ON CORPORATE CODES AT THE FIRM LEVEL

The use of corporate self-regulation has aggressively expanded in the world in the last 15 years.¹⁷ This expansion has been fueled by the steady incorporation of the comply-or-explain principle, under which firms are not obliged to implement given practices but inform whether they do, and in case they do not, explain why that is the case.¹⁸ A large amount of mainly empirical literature has studied the impact that these codes and this principle have had in the compliance of best practices of corporate governance at the firm level. This literature has found at least four main regularities. First, levels of compliance are high among OECD countries but not that high in less developed countries. In both cases, the level of compliance increases over time. Second, some variables such as size; family, institutional or international ownership of firms significantly impact the level of compliance. Third, explanations for not complying tend to be imprecise and non-informative with different theories predicting the quality of the explanations. And fourth, evidence whether compliance has tangible effects on corporate value is mixed.

Salteiro *et al* (2013) report that in 2007, 82% of Canadian firms and 70% of Australian firms, respectively complied with suggested practices. Arcot *et al* (2010) find that the overall compliance level in the UK was 76.7% in 1998 and 91.4% in 2004. These results support

¹⁷ With the exception of the US, since 1992, all OECD countries have incorporated the comply-or-explain principle-based system in their corporate codes (Salterio *et al*, 2013).

¹⁸ The main inspiration of the Comply-or-explain principle was to recognize that the same standards do not fit all firms. Raising standards of corporate governance cannot be achieved by structures and rules alone because companies are different. Hence, it is not appropriate to impose a strict and rigid regulation common to all, companies should choose the structure that best suits them, (Arcot *et al*, 2010).

positive trends found by Conyon (1994), O'Shea (2005) and MacNeil and Li (2006) in the UK and Ireland.¹⁹ Other studies finding that compliance is not comprehensive but improves over time in Germany are Werder *et al.* (2005) and Werder and Talaulicar (2006).

Studies focusing on the levels of compliance in non-OECD countries, also find improvements over time but percentages are not as high as in OECD countries. Chen and Nowland (2011) study the timing and persistence of firm compliance with code recommendations over the period 1999 to 2009 in four East Asian countries.²⁰ They find significant improvements in governance practices, but not all can be attributed to the Code. Krambia-Kapardis and Psaros (2006) document suboptimal levels of compliance in Cyprus. Overall, Cuomo *et al* (2016) state that compliance is higher in developed countries but lower in less developed countries that lack a tradition of sound corporate governance.

Results connecting compliance levels with determined variables tend to emphasize the role played by both the rational and institutional theories. For example, comparative analyses reveal that company size is positively associated with the extent of Code compliance since, comparatively speaking; larger firms face lower compliance costs (Dedman, 2000). This size effect has been documented for Australia and Great Britain in Clifford and Evans (1996), Samuels *et al.* (1996), Coyon and Martin (1997), Mallin and Ow-Yong (1998); for Eastern European countries in Berglöf and Pajuste (2005); for Germany in Werder *et al* (2005) and for Dutch corporations in Akkermans *et al* (2007).²¹ Even more, Andres and

¹⁹ Conyon (1994) documents significant increments in the level of compliance with best practices from 1988 to 1993 associated with the introduction of the Cadbury Code (i.e. from 57% to 77% at separating the role of chief executive officer and chairman; from 54% to 94% at operating remuneration committees).

²⁰ Malaysia, Taiwan, Singapore and Hong Kong.

²¹ For example, Werder *et al* (2005) document that, in Germany, deviations from the recommendations on the structure of the supervisory board occur predominantly in smaller companies. The differences between the company categories allow the presumption that smaller supervisory boards (smaller companies) simply do not need committees for improving their efficiency.

Theissen (2008) document a non-monotonic link between ownership concentration and the probability of compliance. Dispersed ownership implies that managers do not feel pressed to reveal information and concentrated ownership implies that shareholders already know it.

As for the literature that studies non-compliance, Arcot *et al* (2010) document the common use of boilerplate, non-informative, explanations for non-compliance among British firms.²² In line with these findings, Hooghiemstra and van Ees (2011) identify nine types of motivations for noncompliance among Dutch firms. They find that firms frequently justify a deviation from external standards by revealing their internal practices instead.

Seidl *et al* (2013) study the British and German cases simultaneously and show evidence that the comply-or-explain principle provides a way of legitimating deviations from individual code provisions.²³

Finally, there exists mixed evidence on whether compliance has tangible effects. Andres and Theissen (2008) study the impact that soft-regulation had over German firms' decisions to disclose directors' remunerations. They find that with the comply-or-explain principle, less than 10% of the firms disclosed that information.

Rapp *et al* (2011) also study the German case but this time find some support in favor of the effectiveness of the comply-or-explain principle. While firms with atomized ownership benefit from high compliance, high levels of compliance jeopardize performance in firms

²² In their own words "...strong evidence towards compliance, but also the common use of poor language when explanations are given". Compliance increased in all practices except in the composition of auditee committee.

²³ The authors split justifications for non-compliance in three categories: 1) Deficient justification (firm discloses deviation without providing reasons for the deviation); 2) Context-specific justification (firm justifies deviation with reference to its specific situation such as size, board composition, international context, industry, corporate structure, transition); 3) Principled justification (firm justifies deviation with reference to problems with the specific code provision as such associated with efficiency, conflict with current laws, implementation of the code). They find that the frequency for each of these answers in Germany and UK were (55.7%, 41.3%); (23.8%, 52.2%); (19.7%, 6.5%) respectively.

with concentrated ownership.²⁴ That is, soft regulation can work well. Instead, the authors suggest, hard regulation may harm firm performance in well-governed firms.²⁵

Rose (2016) finds that, for some practices, compliance improves the performance of Danish firms (measured by the ROE or ROA).²⁶ Other papers have looked into compliance with the codes in Spain (Fernández-Rodríguez *et al*, 2004), Germany (Gornachov *et al*, 2008) and Portugal (Alves and Mendes, 2004). They have all found a positive correlation with firms' market value.

Unlike the just mentioned positive results, Bianchi *et al* (2011) provide one of the strongest criticisms to the efficacy of the comply-or-explain principle. They show that, despite the high levels of declared compliance with the Italian Code of corporate governance, Italian firms have poor corporate governance systems.²⁷ By measuring the quality of internal procedures to control for related-party transactions they document that the use of best practices is markedly weaker than what is formally declared in the reports.²⁸

Contributing to the scarce evidence for Latin America, Pierce *et al* (2011) find evidence that compliance with the (comply or explain) Code of best corporate governance practices in Mexico increased between 2000 and 2004 but that did not positively correlate with firm performance or transparency. In addition, Godoy *et al* (2018) study the effects that the first Chilean self-regulation code, NCG-341, introduced in 2012, might have had upon

²⁴ The authors find evidence that managers use code compliance as a substitute for other governance devices.

²⁵ Overall, they argue that soft regulation of governance dominates hard regulation from a welfare perspective.

²⁶ He finds positive effects with the compliance of practices associated with board composition and remuneration policy. He finds no effect with practices associated with risk management and internal controls.

²⁷ The annual report on corporate governance by Italian listed companies generally shows a high degree of compliance with the Italian Code. In particular, the 2008 report concluded that over 95% (it was 94% in 2007) of the Italian listed companies claim to be compliant with the Code. Contrary to this reality, most of the Italian literature (i.e., Dyck and Zingales, 2004 or Zingales, 1994) on corporate governance suggests an ineffective corporate governance system.

²⁸ They find that whereas 85.9% of companies are formally compliant with the Code's recommendations with respect to RPTs, only 32.6% of their sample indeed implemented the recommendations.

the declared adoption of 19 corporate governance practices, many of which were already demanded by the Chilean laws. The paper reveals that 59% of the practices had been present since the enactment of the norm. In addition, in the three years in which this norm operated, the percentage of adopted practices increased by only 6 percentage points. Furthermore, the paper finds that the explanations provided by the firms were mainly standardized and uninformative. The authors conclude that the impact of the norm was minimal.²⁹

2.3 DIFFUSION PROCESSES

As we will see in the next Section, our model predicts that firms' decisions on corporate governance practices follow a diffusion process.

The seminal reference for diffusion processes of innovations in social science is Rogers (1962), updated for last time in Rogers (2010). Although there are many variations, the most common depiction of these processes is the mathematical equation

$$Rate_t = \beta n_t(N - n_t)$$

In which n_t is the number of adopters at time t , N is the size of the relevant population, β is a constant and $Rate_t$ is the speed at which the process converges to N . If the process takes place in discrete time then $Rate_t = n_{t+\Delta t} - n_t$. If the process takes place in continuous time then $Rate_t = \partial n_t / \partial t$.

Among the most important extensions of the work by Rogers (1962, 2010) Abrahamson (1991) and Abrahamson and Rosenkopf (1990, 1993) propose a refinement of

²⁹ This coincides with the conclusions derived by Chilean regulators, which partly motivated the introduction of NCG 385 (See Final Report SVS, 2015). Novoa *et al.* (2022) is a working paper that aims to extend the study of Godoy *et al.* (2018), but this time over NCG 385. Once more, the authors test the hypothesis of negligible effects. Preliminary results show that the 2015 norm produced significant changes in certain practices. While Novoa *et al.* (2022) take a descriptive approach to the effects generated by NCG 385 we mathematically formalize the rationale behind the dynamics in the adoption of these practices.

diffusion processes by incorporating three important properties many times found in reality and not present in the classic literature.³⁰ First, how do diffusion processes start? Indeed if $n_t = 0$, the number of compliers never becomes positive and the diffusion process never begins. Second, quintessentially, innovations are uncertain processes. Third, unlike diffusion processes in which backrolling cannot take place (because of a pro-adoption bias) in reality the level of acceptance of the innovation might eventually start to decline among firms.

In our formulation, there exists an initial stage that assures almost with certainty that the initial number of firms adopting best corporate practices is strictly positive. In addition, when the parameters of our model take given values, backrolling can take place when compliance approaches the steady state of the process. Those properties position our model closer to the Abrahamson models than the traditional diffusion models.

It is true that other articles have studied the adoption of corporate practices as diffusion processes (i.e., Edelman, 1992 study the diffusion of corporate practices triggered by equal employment opportunity/affirmative action laws. Fiss and Zajac, 2004 or Westphal and Zajac, 1994 study the diffusion of long-term incentive plans. Westphal and Zajac, 1997 study the diffusion of Board independence and Davis, 1991 study the diffusion of takeover defenses) however, none of them do it through a formal mathematical modelling of the process as we do here.

3. EXPLAINING THE MODEL

In section 4 we introduce a mathematical model that explains the evolution of firms' decisions to comply with corporate governance practices. In this section, we explain the key concepts behind the model, which are rooted both in the rational and in the institutional

³⁰ While bandwagon, fad and fashion effects refer to the propensity to make a decision because others do in the first one the effect is long term while in the others is short term.

theories. Because the model will include a pre-regulation stage (period in which no Code of Best Corporate Governance practices exist) and a regulation stage (period that starts when a Code is enacted), we explain the elements from both theories present in each stage.

3.1 RATIONAL THEORY

As explained in the previous section, the rational theory assumes that agents choose the actions that maximize their utilities constructed upon their preferences. Whether it is in the context of regulation or not, firms follow the practices that generate them more benefits than costs.³¹ As we explain later, we assume that there is only one source of rational benefits at the pre-regulatory stage and only one source of rational benefits at the regulatory stage. Although it could be argued that both sources of rational benefits are present at both stages, we want to emphasize that firms' decisions are mainly driven by one of them at each stage.

Pre-Regulation Stage

Good corporate governance practices will at the same time increase firms' expected cash flows and reduce their costs of capital, that is, good corporate governance practices will increase the firm's present value. From a contractual perspective (Kraakman and Hansmann, 2004; Kraakman *et al*, 2006; Becht *et al*, 2003) good corporate governance practices reduce transaction costs (i.e. it standardizes procedures). In addition, from a strategic perspective (Porter, 1996; Barney and Hesterley, 2010) these practices allow firms to create more business value (i.e. it attracts more consumers, increases their willingness to pay or makes the cost structure more efficient) and from a financial perspective (Jensen and Meckling, 1976) they reduce agency conflicts (i.e. it attracts more investors and reduce risks). Table 1

³¹ We are assuming that compliance is a dichotomous decision; if instead compliance implies a continuous decision (for example deciding a level of activity as we do in Section 6.3) then the efficient solution is the one that equals marginal benefit to marginal cost.

provides some examples of the administrative benefits generated by known corporate governance practices.

<<Insert Table 1 about here>>

Although the just mentioned benefits will be present regardless of whether corporate regulation is mandatory or self-imposed, the costs in each of these scenarios are different. In the case of mandatory regulation, a firm will not only face the costs of complying with regulation but will also face legal sanctions in case of non-compliance. In the case of self-regulation, the firm will only face the costs of implementing the suggested best practices of corporate governance. Evidently, the costs of complying with different practices will be different. Table 2 provides some examples of corporate governance practices that have low implementation costs and others that have high implementation costs.

<<Insert Table 2 about here>>

Whether we are talking about the practices associated with the relationship between top management and shareholders, firm and stakeholders or control and risk management, the implementation of more detailed or intensive practices will cost more.

Regulation Stage

After a first stage in which firms have decided whether to comply with practices given their administrative benefits and costs, self-regulation is introduced in the form of a Code of Best practices. At this stage, firms internalize the capacity of good corporate governance practices to reduce the likelihood of conflicts with its stakeholders (La Porta *et al*, 1998; La Porta *et al*, 2013). Firms want to avoid these conflicts because they are value-destroying events (scandals, illegal wrongdoings, social, cultural or environmental backlashes). The list of possible events is as long as the list of different stakeholders. Just to mention some: interested groups might boycott a firm with high levels of environmental pollution;

consumers may stop purchasing goods of a company involved in anticompetitive practices; creditors might restrict financing a firm that employs subcontractors operating with suboptimal levels of security. In many ways, best corporate governance practices act as preventers/deterrents of value-destroying events.

3.2 INSTITUTIONAL THEORY

As we also explained in the previous section, institutional theory considers that the behavior of other firms can substantially affect the value of a firm. The greater the number of firms implementing a given corporate governance practice, the greater the pressure to do so as well. A key assumption of our model is that these institutional forces will be relevant only after the Code is enacted.

Pre-Regulation Stage

In the absence of regulation, there are no payoffs associated with legitimacy. Because there is neither formal nor informal regulation, firms will consider that there are no external pressures (either coming from markets, society or other institutions) for them to adopt specific corporate governance practices.

Regulation Stage

There exist two sources of institutional pressures that can be linked to additional benefits associated with the compliance of best corporate practices. First, investors might consider the number (or proportion) of firms adopting a given practice as a signal of its effectiveness at increasing the value of the firm due to an improved administration (Rumelt, 1974; Abrahamson and Rosenkopf, 1990). Regardless of their true effectiveness, investors might require, due to ethical or responsibility reasons, that a firm follows the best ESG practices in order to invest in it (Friede *et al*, 2015; Hart and Zingales, 2017). Second, authorities (legislators and judiciary) and even markets might consider the number (or

proportion) of firms implementing a given practice as a determinant of the intensity of the legal (fine, injunction or compensation) or social (reduced consumption, economic activity or productivity) sanctions suffered by a non-complying firm affected by a value destroying event.³² Firms might be fined more severely because they contaminate more than comparable firms in the industry (i.e. British judiciary is fining water polluters more harshly than before). Alternatively, the sales of firms might be boycotted by consumers that don't see the same level of concern with suppliers as their competitors (i.e. Forever 21); and firms can lose key employees because their employment practices are substandard when compared to their competitors (i.e. long carries versus low cost providers in the airlines industry). Those are only some of many examples in which the expected loss suffered by non-complying firms, in the case of a value-destroying event, will be greater because more firms are complying with the relevant practice.³³

<<Insert Table 3 about here>>

To be even clearer, table 3 summarizes the sources (rational and/or institutional theories) of the model at the pre-regulatory and at the regulatory stages. While in the pre-regulatory stage there are only elements from the rational theory (improved administration), in the regulatory stage, there are elements from the rational (avoid value-destroying events) and the institutional theories (number of firms complying with the practice).

4. THEORETICAL RESULTS

4.1 THE MODEL

³² Note that this is not only valid in a cross-sectional sense (industries with more or less compliers) but it is also valid over time. That is, the lack of certain corporate practices might have been acceptable in the past but they are not acceptable in the present (consider salary inequalities based on gender, waste recycling or compliance with ESG standards).

³³ Note that we are not talking about the effectivity of the practice at avoiding the event.

Pre-Regulation Stage

At $t = 0$, a period of time in which a self-regulatory Code does not exist yet, a continuum of firms has to decide whether to comply with $P \in \mathbb{N}$ corporate governance practices. If firm i decides to comply with practice $p \in \{1, \dots, P\}$ then it pays cost c_i^p uniformly distributed in $[0,1]$ and in exchange obtains benefit $u^p \in [0,1]$. While this benefit captures the increment in net present value of the firm associated with several sources: the firm attracts more customers; increment their disposition to pay or improves its efficiency (improved administration), at this point we keep the formulation as simple as possible and consider a constant u^p . Remember that at this stage there is no legitimacy utility.

It follows that only firms with $c_i^p < u^p$ comply with the practice and define a pre-regulation level of compliance equal to

$$a_0^p = u^p$$

Regulation Stage

A self-regulatory Code is enacted and implemented at period $t = 1$. The Code suggests that firms must comply with the best $P \in \mathbb{N}$ ESG corporate governance practices that for simplicity we assume are the same faced by the firms at $t = 0$.³⁴ At every period $t \geq 1$ all the firms know that a fraction $a_{t-1}^p \in [0,1]$ of them complied with practice p in the previous period. If firm i decides to comply with the practice then it pays cost c_i^p uniformly distributed in $[0,1]$ and in exchange obtains two benefits exclusively determined by legitimacy considerations.³⁵ First, because the fraction of compliers with a given practice signals the level in which the practice improves the administration of the firm, investors are

³⁴ Firms do not anticipate that a Code will be enacted. If a practice is new then evidently $a_0 = 0$.

³⁵ There is not much gain of considering that this cost is not the same paid by the firms in the first stage.

willing to pay a premium $1 * a_{t-1}^p$ associated with compliance. Second, the adoption of the practice reduces the expected loss associated with the occurrence of a value destroying corporate event.

On one side, $L^P a_{t-1}^p$ captures the size of the loss suffered by the firm if a value destroying event takes place, in which $L^P > 0$ is the maximum loss. Institutional considerations imply that the loss suffered by the firm increases with the number of firms that adopts the practice.³⁶ On the other side, if the firm adopts the practice then the probability that the value destroying event happens is $1 - a_*^p$ in which $a_*^p \in [0,1]$ captures the efficacy of practice p at avoiding the event. However, if the firm does not adopt the practice then the probability of the event is $1 - a_{t-1}^p$. Consistent with legitimacy and institutional ideas, the proliferation of a practice among firms have positive externalities over non-complying firms.³⁷ For regularity of the solution we impose that $a_0^p \leq a_*^p$.

Before moving to the derivation of our main results, we write down three important considerations about the Model.

REMARK 1. At the pre-regulation stage, firms might know that best corporate practices can reduce the likelihood of value-destroying events. In that case a_0 should be correlated with L^P and a_*^p . Because that consideration does not affect our analysis and estimations for the regulation stage, we delay that discussion to Section 6.2.

³⁶ The more firms have adopted the practice the harsher will society, markets, regulators and/or the judiciary punish a firm that does not comply.

³⁷ For example, in an environment in which whistle blowing mechanisms are beginning to proliferate, employees from firms without a formal mechanism might find other ways to denounce what they see, motivated by the practices observed in the industry. Alternatively, in an environment in which directors training, regarding risk management, ESG or legal issues, is beginning to proliferate, directors from companies without formal training will also benefit from access to seminars, discussions or interaction with other directors in the industry.

REMARK 2. We are aware that adding up administrative gains to the regulatory stage only means that firms obtain an additional benefit equal to u^p when they comply. We omit that constant for two reasons. The first one is simplicity in the conceptual discussion and the second one is an improved fit of the model. As we will see later, the model better fits the data when that constant is 0 at the regulation stage.

REMARK 3. Strictly speaking, variable L^p is normalized by the maximum cost of adopting practice p . To see that, consider a more general formulation in which the cost of practice p is uniformly distributed in $[0, \bar{c}^p]$, the maximum premium from adopting the practice is π^p and L^p is maximum loss as before. We retrieve our formulation if we impose that $\bar{c}^p = \pi^p = 1$. If we do not do that then the analysis has to be carried out in terms of π^p/\bar{c}^p and L^p/\bar{c}^p .

4.2 MAIN THEORETICAL RESULTS

Firm i complies with practice p if and only if the expected benefits of doing so are greater than the expected costs of not doing it

$$a_{t-1}^p - L^p a_{t-1}^p (1 - a_*^p) - c_i > -L^p a_{t-1}^p (1 - a_{t-1}^p)$$

which is equivalent to

$$c_i < a_{t-1}^p + L^p a_{t-1}^p (a_*^p - a_{t-1}^p)$$

That implies that the fraction of firms that complies with practice p at period t is given by

$$a_t^p = a_{t-1}^p + L^p a_{t-1}^p (a_*^p - a_{t-1}^p) \quad (1)$$

Equation (1) defines a classic diffusion process (Rogers, 1962) in which the proportion of compliers (adopters) in every period is equal to the proportion of compliers in the previous period plus, the addition of new compliers, in our case, attracted by legitimacy benefits. Several implications follow from (1).

First, as it is usual in diffusion processes, $a_t^p = 0$ is an absorbing state. If from the beginning, there are no compliers then that never changes. In our model that situation only happens in the exceptional case in which $u^p = 0$, no firm perceives utility in the specific practice before the regulation kicks in.

Second, assuming that $a_0^p > 0$, the fraction of compliers converges to a_*^p , the efficacy level of the practice. Indeed when we impose that $a_t^p = a_{t-1}^p = a_\infty^p$ then (1) holds when $a_\infty^p = 0$ or when $a_\infty^p = a_*^p$. Equation (1) tells us that the only level of compliance that eliminates the pressure to attract new compliers is the one that minimizes the probability that the value-destroying event takes place.

Third, contrary to the standard diffusion process in which there are no backrollers in our model that depends on the value of L^p . If $L^p \leq 1/a_*^p$ then it is always the case that $a_t^p \geq a_{t-1}^p$ and the process cleanly converges to a_*^p . But if $L^p > 1/a_*^p$ then, although initially the level of compliance monotonically increases in value, at one point in time it starts oscillating around a_*^p (go above and below) before stabilizing at that same value. The reason of this difference with the classic diffusion process is that in those processes convergence is to 1 (all firms comply) but in our model convergence is to a fraction of compliers that might be strictly smaller than 1.³⁸

Fourth, if we focus in the process in which there is no backrolling ($L^p \leq 1/a_*^p$) then, for any period, the level of compliance is greater when either a_0^p, L^p or a_*^p are larger. The result is intuitive because more firms will comply if the starting level, the steady state level or the loss associated to the value-destroying event are greater. While we show the formal

³⁸ The intuition of the different types of convergences associated to the size of L^p is associated with the size of the step of convergence. When the step is small enough then there is certainty that compliance never surpasses the steady state level.

proofs in Appendix, all of them follow the same steps in which after we prove that the result holds for a_1^p and we assume it is true for a_t^p we prove it true for a_{t+1}^p as well. Indeed

$$\frac{\partial a_t^p}{\partial x} = \underbrace{\frac{\partial a_{t-1}^p}{\partial x} (1 + L(a_*^p - 2a_{t-1}^p))}_{\text{Indirect Effect}} + \underbrace{\text{Term}}_{\text{Direct Effect}}$$

In which $x \in \{a_0^p, L^p, a_*^p\}$. Because $L^p \leq 1/a_*^p$ then $1 + L^p(a_*^p - 2a_{t-1}^p)$ is positive.

In words, there is a direct and an indirect effect associated to an increment in x . While the indirect effect refers to the impact that the increment in x had over the level of compliance in the previous period the direct effect refers to the additional incentives faced by firms to comply in the current period because the expected loss is greater, the practice has greater efficacy or the pre-regulatory benefits were larger. As an increment in x had a positive effect in the past ($\frac{\partial a_{t-1}^p}{\partial x}$ is positive), pressure to comply will be stronger in the current period. In the Appendix we show that *Term* is always non-negative.

Fifth, the speed (or rate) of convergence to a_*^p is defined by

$$\frac{a_t^p - a_{t-1}^p}{a_{t-1}^p} = L^p(a_*^p - a_{t-1}^p) \quad (2)$$

That expression implies that the speed monotonically decreases with time and with a_0^p (as long as $L^p \leq 1/a_*^p$). However, the effect is unclear when there are increments in the values of a_*^p or L^p . Results follow directly from the previous discussion. A greater a_0^p implies a greater a_{t-1}^p which reduces the speed of convergence because we are close to the goal. On the other side, a greater a_*^p or L^p also imply a greater a_{t-1}^p which reduces speed. But this time that effect has to be compared with the direct effect of an increment in a_*^p or L^p which increases the speed.

Figures 1a&1b provide more intuition associated with the implicit dynamics. The figures depict the evolution of a_t^p and of $a_t^p - a_{t-1}^p$ as functions of a_{t-1}^p always in the case in which $L^p \leq 1/a_*^p$.³⁹ In both cases we are in the presence of strictly concave functions.

<<Insert Figure 1 about here>>

The next Proposition summarizes our main findings.

Proposition 1: If a_0^p is the pre-regulation level of compliance then the level of compliance among firms at period t is given by

$$a_t^p = a_0^p \prod_{i=1}^t (1 + L^p (a_*^p - a_0^p) H_i), \forall t \geq 1$$

where H_i is a function of L^p , a_*^p and a_0^p that decreases with i and converges to 0. In addition,

- i. If $a_0^p = 0$ the level of compliance never leaves that value, $a_t^p = 0$ for all t .
- ii. The level of compliance converges to a_*^p .
- iii. If $L^p \leq 1/a_*^p$ the level of compliance increases with time, $a_t^p \geq a_{t-1}^p$ for all t .
- iv. If $L^p \leq 1/a_*^p$ the level of compliance increases with a_0^p , L^p and a_*^p .
- v. The speed of convergence to a_*^p reduces with t and a_0^p .

Proof: See the Appendix.

4.3 TESTABLE PREDICTIONS

The results uncovered by Proposition 1 allow us to write the following main hypotheses associated with the regulation stage that we test in the next section

³⁹ If our process was taking place in continuous time (or we had the option to measure firms' decision with maximum frequency) then (1) would define the following dynamics

$$a_t^p = \frac{a_*^p}{1 + (a_*^p/a_0^p - 1)e^{-L^p t}}$$

Then a_t^p increases with a_*^p , a_0^p and L^p and converges to a_*^p .

Hypothesis 1 (Regulation Stage): Not all the practices converge to the same level of compliance (a_*^p is not necessarily the same for all values of p).

Hypothesis 2 (Regulation Stage): If the normalized loss is not too big ($L^p \leq 1/a_*^p$) then

- i. For a given practice, the level of compliance always increases ($a_t^p \geq a_{t-1}^p$).
- ii. Compliance is greater for practices with, *ceteris paribus*, a greater level of pre-regulation compliance, greater efficacy and larger expected loss avoided by the practice (a_t^p increases with a_0^p , L^p and a_*^p).
- iii. For all practices, the speed of convergence reduces with time and the initial level of compliance ($\frac{a_t^p - a_{t-1}^p}{a_{t-1}^p}$ decreases with t and a_0^p).

5. EMPIRICAL RESULTS

5.1 INSTITUTIONAL BACKGROUND

In Chile, there are more than 300 public companies and/or security issuers.⁴⁰ During the last 10 years, the aggregate market capitalization of publicly traded firms has fluctuated between 200 and 350 billion USD (between 66% and 160% of the GDP). Frequently through pyramidal schemes, economic groups control almost all the largest companies.⁴¹ Despite the significant development of capital markets and the economy during the last 35 years, property structure and ownership concentration has not significantly changed.⁴² Within this property structure, pension funds usually play the role of the most important minority shareholder.

As a country that belongs to the civil-law legal tradition, hard-regulation shapes the Chilean legal framework and doctrine. Two major laws regulate the Chilean corporate life:

⁴⁰ See Comisión para el Mercado Financiero (CMF), https://www.cmfchile.cl/institucional/estadisticas/merc_valores/sa_indicadores_ifrs/sa_indicadoresfinancieros_cartera.php?lang=es&rg_rf=RVEMI

⁴¹ Dual-class shares are not common.

⁴² For example, see Lefort and Walker (2000) and Larraín and Urzúa (2016).

The corporations' law (Ley de Sociedades Anónimas, N°18.046) and the capital markets law (Ley del Mercado de Valores, N°18.045), both enacted in 1981. These two laws establish a number of standard corporate governance requirements.⁴³ Like in other occidental countries of the civil-law legal tradition Chilean firms are also regulated by specific legal bodies in topics such as antitrust (D.F.L. 211), bankruptcy (Law 20.720), environment (Law 19.300) and labor (Labor Code). Many of them have evolved in response to crises or scandals, or to accommodate reforms, such as the large pension reform of 1981, which allowed pension funds to invest in local public equity during the mid-80s for the first time. Pension funds have been the largest minority shareholder in the market.⁴⁴ Perhaps the need to protect them against potential conflicts with the controlling shareholders is one of the reasons that made Chile a country with relatively good corporate governance standards early on.⁴⁵

Following international trends but also looking to ripe the benefits of flexibility and information dissemination (among investors, shareholders, analysts and the same managers), in 2012 Chilean regulators introduced the first soft-regulation body or Code based on the comply-or-explain principle (see Final Report SVS, 2015). NCG 341 formulated 19 questions to be answered yes or no, with their corresponding explanations, by all firms that can issue publicly traded securities in Chile. The 19 questions/practices were organized into four categories: 1) Functioning of the Board (7 practices); 2) Relations between the firm, its

⁴³ For example: boards are elected at shareholders' meetings, with a typical one-share-one vote rule. Each board member represents all shareholders and must act diligently and prudently. The board is in charge and responsible of the company's management. Annual reports must include all payments to board members. Boards supervise managers but unlike other countries, managers cannot be board members in the same firm. Firms with certain property dispersion levels and whose net worth is above USD 60 million must have a Directors' Committee, where at least one of its members must be an independent director. These committees are in charge of examining all external auditor's reports, salary structure for management, proposing the names of the external auditors, among other duties. In addition, related party transactions are heavily regulated, having to be timely reported, transparent and at market prices. The use of private information is penalized.

⁴⁴ See Lefort and Walker (*op cit.*).

⁴⁵ See La Porta, Lopez-de-Silanes, Shleifer & Vishny (1997)

shareholders and others (6 practices); 3) Executives replacement and compensations (2 practices); 4) Internal control and risk management (4 practices). In section 6.1 we come back to this norm and provide more details about the questions it contained.

As we mentioned in the literature review, local studies as well as regulators were unsatisfied with the results of the norm. It did not introduce a change in the behavior of the firms and their responses to the questions were at the same time formal, standardized and uninformative. Understandably, after 3 years, regulators decided to replace NCG 341 with NCG 385; the second Chilean corporate governance self-regulation Code.

Still with the big objectives of catching up with the international standards as well as generating more awareness of the relevance of good corporate governance practices and incentivizing firms to reveal potentially relevant information to interested agents, in 2015 Chilean regulators introduced NCG 385, the norm currently in place. Like in NCG 341, the new norm asked all potential security issuers to answer and explain a set of questions that could be gathered in four categories. Unlike NCG 341, this time the inquiries added up to 99 questions, revealing an upgrade in the ambitions of the regulators. In the next subsection, where we explain the data used in our estimations, we provide more details about the questions in the norm and the firms' responses.

5.2 DATA

We use responses to the questions included in NCG 385 provided by 93 to 95 firms between 2015 and 2019.⁴⁶ Although NCG 385 was meant to be answered by all firms which are potentially public security issuers, in our sample we only include firms that were in the general stock index of the largest local stock exchange (IGPA index of the Santiago Stock

⁴⁶ Data collected by Novoa *et al* (2022).

Exchange). At this point, we do not use data from NCG 341 for several reasons. First, the questions formulated in both norms were not the same. Second, NCG 341 lasted only 3 years. Third, outcomes and studies suggest that the norm had a negligible impact. It follows that it seems reasonable to consider that in Chile the regulatory stage started in 2015 and not in 2012. Fourth, many of the questions asked in the previous norm were later transformed into several related but different questions, so a follow-up is not possible. That said, in section 6.1 we replicate our estimations after eliminating practices that were considered, directly or indirectly, for the first time in 2012.

NCG 385 consists of 99 yes/no questions associated with good corporate governance practices. The norm has four sections or categories: 1) “Functioning and composition of the board of directors” (51 practices), we denote it FCB. 2) “Relations between the firm, its shareholders and the general public” (22 practices), we denote it RSS. 3) “Risk management and control” (22 practices), we denote it RMC and 4) “Evaluations by a third party of NCG 385 compliance” (4 practices), we denote it EC. The different questions within each section inquire about a wide variety of issues. Table 4 presents percentages of adoption for the 99 practices during the analyzed period. Table 5 presents the evolution of the average adoption rate for each of the 4 sections.

<<Insert Table 4 about here>>

<<Insert Table 5 about here>>

Many of the results shown in Table 4 are generally consistent with the prior expectations presented in Tables 2 and 3. For example, having a risk management unit is likely to be expensive, so it might have had relatively low average initial adoption rates, but as firms become aware that a significant fraction of their peers has implemented such a unit, they are more likely to feel compelled to adopt the standard. Such is the case of practice 3.a.ii

(see Table 4), which refers precisely to this. It starts with an adoption rate of 41% in 2015, ending in 2019 with 61%. This is coherent with both the Rational and Institutional theories, since not having that unit while others do is likely to increase the cost of non-compliance, but generalized adoption may also signal the economic value of developing the unit.

On the other hand, an example of a low-cost practice is having a company website (practice 2.g.i), where the adoption rates remain near 93% during the entire period.

Regarding essential legal training of the board and their familiarity with the accounting principles used in the reporting process (practices 1.a.iv and 1.a.vii, respectively), both are likely to have low implementation costs and high non-compliance costs (if reported adoption levels are low), because of the board's fiduciary duty. In both cases, we observe adoption rates starting above 90% and ending near 100%.

A curious final example is the adoption of remote voting and participation in shareholder meetings. Remote voting (2.b.i) is always 0% during the period 2015-2019 and remote participation (2.b.ii) starts at 5%, ending at 12%. This probably seemed like a low-cost, low-benefit decision, since Chile is a very centralized country (all major business events happen in its capital, Santiago). However, these practices became nearly a norm because of the pandemic in 2020-2021. This was a large unforeseen exogenous shock, which our model does not consider.

To get a general view of the distribution of the average adoption level by practice, Figure 2 shows box-plots over time.

<<Insert Figure 2 about here>>

The plots reveal significant dispersion in the average adoption rates for the different practices within each section. Trends for the entire distribution of average adoptions, including the mean and the median, are upwards. We also observe a reduction in the

dispersion of the average practice adoption in sections 1, 3 and 4. However, some of this persistent dispersion may be expected since the economic value of certain practices included in the questionnaire (Table 4) are questionable. Some of those practices include having the current board of directors suggesting how the future board of directors should look like (2.a.i and 2.a.ii) or approving board minutes 5 days after the corresponding meeting (1.k.vi).

5.3 EMPIRICAL ESTIMATIONS

Table 6 presents our empirical results. We exclude the results from EC (section 4) since we have too few observations to extract meaningful conclusions.

<<Insert Table 6 about here>>

We estimate the average fit of the answers for each section to equation:

$$a_t^p - a_{t-1}^p = b_1 a_{t-1}^p + b_2 (a_{t-1}^p)^2 \quad (1')$$

Equation (1') is equation (1) in which $-b_2 = L$ and $-\frac{b_1}{b_2} = a_*^p$. In order to compensate for the relatively low number of years in the time series we run pooled regressions for each section. We first estimate regression (1') with a constant. This may be necessary due to the heterogeneity in the answers within each category. That is, we estimate:

$$a_t^p - a_{t-1}^p = b_0 + b_1 a_{t-1}^p + b_2 (a_{t-1}^p)^2 + \varepsilon_t \quad (1.A)$$

However, if we are not able to reject the hypothesis that the constant is zero, we can rewrite equation (1) as in equation (2). That is:

$$g_t^p = b_1 + b_2 a_{t-1}^p + \varepsilon_t \quad (1.B)$$

Where $g_t^p = \frac{a_t^p - a_{t-1}^p}{a_{t-1}^p}$ is the growth in the adoption rate (speed of the convergence in the level of compliance to level a_*^p). Note that $E(g_t^p) = 0$ when $E(a_{t-1}^p) = -\frac{b_1}{b_2} = a_*^p$.

Because it is reasonable to expect error heteroskedasticity and serial correlation we use a correction to adjust the standard errors, this correction takes into account possible period and cross-section clusters.⁴⁷ We also consider potential problems associated with dynamic panels (see Arellano and Bond, 1991) and with the fact that adoption rates are truncated from below (zero) and above (one). We conclude that they are not reasons of concern for our estimations.⁴⁸ Unfortunately, the heteroscedasticity/autocorrelation correction is not enough to avoid potential biases in our estimated parameters if the errors are autocorrelated. The bias is originated by including lagged dependent variables as explanatory variables with autocorrelated errors. To deal with these potential biases we use lagged values as instruments in our estimations, at the cost of losing degrees of freedom.⁴⁹

Table 6 presents the estimates of L^p and a_*^p with both specifications distinguishing by section: FCB, RSS and RMC when we use instrumental variables.⁵⁰ While we find evidence that hypothesis 1, stated in section 4.3, is true we also find strong evidence that hypothesis 2, stated in section 4.3, holds.

Regarding hypothesis 1, we find that all estimates of the average efficacy level (a_*^p) are significantly different from zero, regardless whether it is specification 1.A or 1.B. In addition all parameters have values smaller than 1. However, only in sections FCB and RSS

⁴⁷ The econometric program used here calls this a “White-Period” correction when using a panel data structure.

⁴⁸ Dynamic panel estimations present biases when the estimated equation includes cross-section fixed-effects, which make the lagged dependent variable correlated with the error. In our case, this is not a problem because neither 1.A nor 1.B include cross-section fixed effects. In specification 1.A the adoption rate is truncated between zero and 1, by definition. Hence we repeat our estimation of 1.A but this time using a Tobit (censoring the dependent variable between 0 and 1) specification of the form: $a_t^p = b_0 + (1 + b_1)a_{t-1}^p + b_2(a_{t-1}^p)^2 + \varepsilon_t$. We find no meaningful changes in the results, so we don't present them.

⁴⁹ OLS estimations are even more favorable to the hypotheses we test. Because we believe that the error correlation structure is an important issue, we consider the estimations with instruments as our basis point.

⁵⁰ Because specification 1.B may be problematic when a_{t-1}^p is close to zero, we restrict the sample to the practices in which $a_{t-1}^p > 5\%$.

we are able to reject the hypothesis that the coefficient is equal to 1, at the 99% in the first case (1.B) and at the 90% in the second case (1.A and 1.B).⁵¹

As for hypothesis 2, in almost all categories (FCB, RSS and RMC) and specifications (1.A and 1.B), we find that average levels of compliance behave as concave functions over time, only in the case of FCB within 1.A the constant is significant. Concavity is particularly significant under specification 1.B, that is $\frac{a_t^p - a_{t-1}^p}{a_{t-1}^p}$ decreases with t as we postulated in iii. of hypothesis 2. Additionally, we verify the presence of a diffusion process without backrolling because $L^p \leq 1/a_*^p$.⁵² That implies that it is always the case that $a_t^p \geq a_{t-1}^p$ as we postulated in i. of hypothesis 2. As for ii. of hypothesis 2 we cannot perfectly isolate the effects of a_0^p, L^p or a_*^p over a_t^p because these parameters change simultaneously in all the sections. That said, table 7 summarizes the values of the key parameters in our model when we ignore confidence intervals.

<<Insert Table 7 about here>>

The table shows that a_{19}^p (the average adoption rate for 2019) is positively correlated with a_{15}^p and the magnitude of $\frac{a_{19}^p - a_{15}^p}{a_{15}^p}$ is almost constant, suggesting that the differences between the parameters per section counterbalance each other. Indeed, a_*^p is negatively correlated with L^p .

Still focusing on table 7, the average initial level of compliance is higher in section RMC than in sections FCB and RSS, which are almost the same. That is, in 2015, on average Chilean firms were complying more with risk management and control practices than with

⁵¹ That said, when we run a joint instrumental-variable regression including simultaneously sections FCB, RSS and RMC, with both specifications, in differences (1.A) and in growth rates (1.B), we cannot reject that the loss rates or that the average adoption rates are equal for the three sections.

⁵² We verify that this inequality holds in all the regressions we perform.

practices associated with the functioning of the Board or with relations with stakeholders. The order of compliance is preserved in 2019, which is consistent with a higher efficacy of the average practice associated with risk management and control, even when the estimated loss associated with the average RMC practice is the smallest. The last line in the table shows that $L^p(a_*^p - a_{15})$, which is a proxy of the speed of convergence for the whole period 2015-19, was similar for sections FCB and RSS but smaller for section RMC.

6. EXTENSIONS, ROBUSTNESS AND DISCUSSION

In this Section we discuss both robustness and implications of our theoretical and empirical results. We start by showing that our main empirical results (verification of hypotheses 1 and 2) hold if we consider that, in Chile, the first soft-regulation appeared in 2012. Later we test additional hypotheses associated with parameter a_0 . Next we show that diffusion equation (1) can be retrieved if we start from a setting in which decisions are made by a representative firm. We end by discussing implications for firms and regulators.

6.1 REGULATION STAGE STARTS IN 2012 (NCG 341)

The first corporate governance soft-regulation was introduced to the country in 2012. However, as we explained before, there are good reasons (awareness and internalization of what soft-regulation means) to believe that it is more accurate to assume that the regulation stage started in 2015. Despite that, there could be concerns that the previous presence of NCG 341 might bias the results derived uniquely with data from NCG 385. To eliminate those concerns we carry out estimations in which we take out responses from questions that were present (directly and indirectly) in both norms. It is important to have in mind that this exercise is imperfect because the questions included in both norms were not the same.

Because 19 of the 99 practices controlled in NCG 385 had been already controlled in NCG 341, we repeat our estimations excluding the questions asked, directly or indirectly, in NCG 341. The questions in NCG 341 were not always posed in exactly the same way as in NCG 385, and sometimes the old questions were divided into several parts as new ones. As we did in table 4, table 8 summarizes the evolution of the 19 practices inquired by NCG 341, in this case between 2012 and 2014.⁵³

<<Insert Table 8 about here>>

The criteria used to exclude questions is to have any reason to believe that firms had pre-existing awareness of practices in NCG 385 due to the questions formulated in the first norm.

We repeat the empirical estimations completed in section 5.3. Table 9 presents the results. In the case of category FCB, we eliminated 17 practices out of 51, while for RSS and RMC we took out 3 and 9 practices respectively.

<<Insert Table 9 about here>>

Although some results become weaker, in general we are able to verify the explanatory power of hypotheses 1 and 2. As we obtained in our main empirical estimations, a_*^p for category FCB proved to be significantly smaller than 1, in this case the value was even smaller than the one found in Table 6, 0.64 vs 0.77 within specification 1.B. Instead, we were not able to reject that a_*^p is significantly different from 1 for categories RSS and RMC as we found in our main empirical estimations.

As for hypothesis 2, we also find that the data fits models 1.A and 1.B with high significance. We cannot reject the strictly concave shape of a_t^p or g_t^p from where it follows

⁵³ Source of the data is Godoy *et al* (2018).

the support for i. to iii. in hypothesis 2. The only exception is 1.A within category FCB. Perhaps because we drop a large number of observations, results are no longer meaningful in category FCB within specification A. Instead of concavity, we obtain insignificant parameters that suggest convexity. However, when we specify our model in terms of growth rates (column B in Table 9), results recover their significance and meaningfulness.

Furthermore, compared with the results in Table 6, we find that in all categories (all the sections of the norm) the loss rate L^p increases and the steady-state average adoption rate a_*^p decreases. That was the same pattern found when we carried out estimations without considering the NC341 responses.⁵⁴

6.2 THE INITIAL LEVEL OF COMPLIANCE

While in section 5 we tested the veracity of two hypotheses associated with the regulation stage, we did not discuss decisions made at the pre-regulation stage, is there a link between a_0 and the other deep parameters of the model? Here we study that issue.

If institutional elements were relevant at the pre-regulatory stage then practices with larger a_*^p and larger L^p , *ceteris paribus*, should be associated with larger values of a_0^p . Alternatively, practices with larger $a_*^p L^p (1 - a_*^p)$, which is a measure of the reduction in the expected loss due to compliance, should also be associated with larger values of a_0^p . In other words, we can state the following hypothesis at the pre-regulation stage:

Hypothesis 3 (Pre-Regulation Stage): If institutional elements are relevant in the decisions made by firms at the pre-regulation stage then:

⁵⁴ Note that L^p and a_*^p are negatively correlated which looks a little bit puzzling. As we will further discuss in the next section, we have to recall that both L^p and a_*^p are exogenously given and a priori it does not need to be that the most effective practices are the ones that prevent the most harmful events from happening.

- i. There is a positive relation between the pre-regulation compliance level and the efficacy level (positive correlation between a_0^p and a_*^p).
- ii. There is a positive relation between the pre-regulation compliance level and the loss (positive correlation between a_0^p and L^p).
- iii. There is a positive relation between the pre-regulation compliance level and the expected loss (positive correlation between a_0^p and $a_*^p L^p (1 - a_*^p)$).

Table 10 summarizes our results when we split the sample by tertiles in terms of the pre-regulation levels.

<<Insert Table 10 about here>>

The results suggest significantly different dynamics as a function of the average initial adoption rate. Once more, we find that the constant in specification 1.A is not significant, so we concentrate on interpreting the results in specification 1.B. In the case of the first tertile, we find concavity as a function of time, the estimated loss rate (0.09) is relatively low (when compared with the other tertiles) and the efficacy level (1.01) is not significantly different from one. In the second tertile, the estimated loss rate (0.28) is larger than in the first tertile and the efficacy level (0.63) is significantly different from zero and significantly lower than 1. Finally, in the third tertile, the loss rate (0.93) is the largest among all tertiles, and the efficacy level (0.33) is the smallest among all tertiles. This last estimate is significantly different from zero and significantly smaller than 1.

Table 11 summarizes the results that directly allow us to link the discussion to hypothesis 3.

<<Insert Table 11 about here>>

It is direct that, with the exception of the efficacy level (i. in hypothesis 3), results do not seem to support the presence of institutional elements at the pre-regulatory stage. Parameter a_0^p is negatively correlated with L^p and $a_*^p L^p (1 - a_*^p)$. Probably, we require exogenous estimates of a_*^p and L^p to derive more solid conclusions, but our estimates suggest the existence of a trade-off at the pre-regulatory stage. In the absence of soft-regulation, firms seem to prefer the adoption of practices with higher rates of efficacy at avoiding value-destroying events with small losses instead of practices with low rates of efficacy at avoiding value-destroying events with large losses. Perhaps this is happening because those are the practices with the lowest implementation costs. For example, in 2015, 93% of the firms had an “easy access” web page and 71% of the firms had whistle-blowing procedures. On the other side, in the same year, only 20% of the firms had formal policies to check and share managerial compensation schemes and only 5% of the firms had procedures in which their Boards would analyze and discuss their ESG practices with a CSR unit.

6.3 AN ALTERNATIVE MODEL: A REPRESENTATIVE FIRM

Here we show that we can retrieve equation (1) if we model the decision made by a representative firm. This is relevant because it shows that more than one set of assumptions leads to the same conclusion: the adoption of best corporate governance practices follows a diffusion process.

Suppose that at period t a representative firm chooses the level of compliance $a_t^p \in [0,1]$ associated with practice p . Once more the efficacy *level* of the practice is $a_*^p \in [0,1]$ in which $a_*^p > a_0^p$. Because more investors want to invest in the firm the closer its level of compliance is to the efficacy level, the level of compliance benefits the firm in $u^p(1 - (a_t^p - a_*^p)^2)$ in which $u^p \geq 0$ is a constant. Also, suppose that the firm’s level of compliance

at period $t - 1$ was $a_{t-1}^p \in [0,1]$ such that the adjustment in the level of compliance at period t costs the firm $c^p (a_t^p - a_{t-1}^p)^2$ in which $c^p \geq 0$ is another constant. Finally, a firm exposes itself to a value destroying event with probability $1 - a_t^p$, in that case the firm suffers a loss equal to $L^p (a_*^p - a_{t-1}^p)(a_{t-1}^p - 0)$ with $L^p \geq 0$. Without loss of generality we write $L^p = x c^p$ in which x is a non-negative constant. The expression $(a_*^p - a_{t-1}^p)(a_{t-1}^p - 0)$ imposes that the expected loss associate with a value-destroying event is proportional to the variance in the level of compliance of practice p in the last period.

Summarizing, at period t a representative firm chooses the value of a_t^p that maximizes

$$u^p (1 - (a_t^p - a_*^p)^2) - c^p (a_t^p - a_{t-1}^p)^2 - L^p (1 - a_t^p)(a_*^p - a_{t-1}^p)a_{t-1}^p$$

The first order condition of this problem is:

$$FOC: 2u^p (a_*^p - a_t^p) - 2c^p (a_t^p - a_{t-1}^p) + L^p (a_*^p - a_{t-1}^p)a_{t-1}^p = 0$$

It follows that a_t^p is a combination of the level of compliance in the previous period and the efficacy level of compliance. That is:

$$a_t^p = \frac{c^p a_{t-1}^p + u^p a_*^p}{(u^p + c^p)} + \frac{L^p}{2(u^p + c^p)} (a_*^p - a_{t-1}^p)a_{t-1}^p$$

Once more, the recursion converges to a_*^p and $a_t^p > a_{t-1}^p$ because

$$a_t^p - a_{t-1}^p = \frac{u^p}{c^p} (a_*^p - a_{t-1}^p) + \frac{x}{2} (a_*^p - a_{t-1}^p)a_{t-1}^p > 0$$

In addition, the speed of convergence decreases with time because

$$\frac{a_t^p - a_{t-1}^p}{a_{t-1}^p} = \frac{u^p}{c^p} \frac{a_*^p - a_{t-1}^p}{a_{t-1}^p} + \frac{x}{2} (a_*^p - a_{t-1}^p)$$

Which is a decreasing function in t given that $\frac{a_*^p - a_{t-1}^p}{a_{t-1}^p}$ and $a_*^p - a_{t-1}^p$ are decreasing in t . Even more relevant for us, if $\frac{x}{2}$ plays the role of the normalized loss associated with the

destructive event then we exactly retrieve (1) and (2) when $u^p = 0$, that is when investors do not value more the firm the closer its compliance level is to its efficacy level.

6.4 POLICY IMPLICATIONS

Our results have important implications for both firms and regulators. Regulators interested in promoting good corporate governance practices should consider that it is not optimal to demand a 100% compliance in all practices. Besides possibly wrong preconceptions of the regulator, we reveal in our study that there are reasons to believe that there is an important level of heterogeneity in the costs and benefits as well as in the efficacy associated with different practices. The inadequacy of the one-size-fits-all message becomes evident. In addition, our model reveals that regulators have different tools through which they can encourage dissemination of desirable practices.

The first tool in the hands of regulators is to increase the efficacy of the practices. Although this might sound difficult to achieve and contingent to each practice, it is enough to consider that there are many alternative ways to implement a whistleblowing mechanism. Specialized literature (Pitroff, 2014; Friebel and Guriev, 2012; Lee and Fargher, 2013 and Latan *et al*, 2019) has largely identified more and less effective procedures/policies. Seminars or training activities could be used to educate interested firms on ways to implement the most effective mechanism.

A second tool that regulators could use is to reduce asymmetries of information. Our model does not say anything on whether α_*^p and L^p are actual parameters. The diffusion process could be driven by perceived levels of efficacy and normalized loss, about which the regulatory authorities might have better information. Note that errors might go in both directions (too much or too little compliance), in any case, social welfare will improve if

regulators are able to convey reliable information on efficacy and expected losses associated with different types of value-destroying events.

A third and final option is that regulators could use incentives. Given that the dynamics in the regulatory stage is centrally driven by positive (market premium) or negative effects (larger loss) associated with the decisions made by other firms, regulators could use either subsidies or taxes to make firms internalize these externalities into their decisions.

On the side of corporations, our results suggest that normalized loss rates would be smaller in practices that deal with control and risk management than practices that protect relations with shareholders and stakeholders and these last loss rates would be smaller than the loss rates for practices associated with the functioning of the board. This result may sound difficult to believe as the intuition is that some of the most harmful events that firms can face derive from conflicts with their stakeholders (i.e., communities, environmental associations, animal right activists) and conflicts among its shareholders (majority and minority). However, these magnitudes make more sense after we recall that losses are normalized by the cost of implementing the practices. Even more, the order in the efficacy of practices per category is exactly the opposite than in the loss rates, that is, first is RMC, then RSS and last FCB. That is captured by higher levels of both a_0^p and a_t^p in the FCB category.

Finally, if from the beginning (pre-regulatory stage) firms incorporated rational and institutional considerations at the same time, then compliance would not follow a classic diffusion process, and convergence will not be to a_*^p .⁵⁵ In particular, compliance at the pre-regulatory stage would always increase with a_*^p and L^p . The fact that our results do not support this regularity suggests that firms do not actively incorporate legitimacy

⁵⁵ To see that, it is enough to study the dynamics of $a_t^p = b_0 + (1 + b_1)a_{t-1}^p + b_2(a_{t-1}^p)^2$ with $b_0 \neq 0$.

considerations at the pre-regulatory stage and only comply with practices that make administration more efficient. If firms were forward looking, they would be able to anticipate the regulatory stage with a certain probability. In that case, the trade-off between the selection of best practices for the pre-regulatory stage and the best practices for the regulatory stage would disappear.

7. CONCLUSIONS

We introduced a formal model that characterizes the firms' decisions to comply with specific corporate governance practices. We show that Chilean data from the self-regulatory Code currently in place fits the model with high significance. The model and the data suggest that after a pre-regulatory stage in which decisions are driven by a traditional cost-benefit analysis, firms make decisions mainly driven by other firms' decisions and by their expectations to avoid a loss associated with a value-destroying event. We discuss extensions and implications for firms and regulators.

There are several avenues for future research. More research is needed to help us understand the events happening before a Code is introduced. In that line, a more systematic identification of the costs and benefits associated with each particular practice would be of great value. Could there be other ways, not the ones followed in this paper, of gathering practices? In particular, is there a better way of identifying the efficacy of each practice? In that line, the information associated with a number of value-destroying events worldwide can be used to learn about the losses suffered by firms. Overall, we hope that this study will contribute to a better understanding of the elements that are key for companies to achieve better corporate governance practices.

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APPENDIX

Proof of Proposition 1:

We first show that a_t^p indeed follows the formula

$$a_t^p = a_0^p \prod_{i=1}^t (1 + L^P(a_*^p - a_0^p)H_i) \quad (2)$$

Direct algebra from (1) gives us

$$\begin{aligned} a_1^p &= a_0^p (1 + L^P(a_*^p - a_0^p)) \\ a_2^p &= a_0^p (1 + L^P(a_*^p - a_0^p))(1 + L^P(a_*^p - a_0^p)(1 - L^P a_0^p)) \\ a_3^p &= a_0^p (1 + L^P(a_*^p - a_0^p)) (1 + L^P(a_*^p - a_0^p)(1 - L^P a_0^p)) \left(1 \right. \\ &\quad \left. + L^P(a_*^p - a_0^p)(1 - L^P a_0^p) \left(1 - L^P a_0^p (1 + L^P(a_*^p - a_0^p)) \right) \right) \\ a_4^p &= a_0^p (1 + L^P(a_*^p - a_0^p)) (1 + L^P(a_*^p - a_0^p)(1 - L^P a_0^p)) \\ &\quad \left(1 + L^P(a_*^p - a_0^p)(1 - L^P a_0^p) \left(1 - L^P a_0^p (1 + L^P(a_*^p - a_0^p)) \right) \right) \left(1 \right. \\ &\quad \left. + L^P(a_*^p - a_0^p)(1 - L^P a_0^p) \left(1 - L^P a_0^p (1 + L^P(a_*^p - a_0^p)) \right) \right) \left(1 \right. \\ &\quad \left. - L^P a_0^p (1 + L^P(a_*^p - a_0^p)) \left(1 + L^P(a_*^p - a_0^p)(1 - L^P a_0^p) \right) \right) \\ a_5^p &= a_0^p (1 + L^P(a_*^p - a_0^p)) (1 + L^P(a_*^p - a_0^p)(1 - L^P a_0^p)) \\ &\quad \left(1 + L^P(a_*^p - a_0^p)(1 - L^P a_0^p) \left(1 - L^P a_0^p (1 + L^P(a_*^p - a_0^p)) \right) \right) \\ &\quad \left(1 + L^P(a_*^p - a_0^p)(1 - L^P a_0^p) \left(1 - L^P a_0^p (1 + L^P(a_*^p - a_0^p)) \right) \right) \\ &\quad \left(1 - L^P a_0^p (1 + L^P(a_*^p - a_0^p)) \left(1 + L^P(a_*^p - a_0^p)(1 - L^P a_0^p) \right) \right) \\ &\quad \left(1 + L^P(a_*^p - a_0^p)(1 - L^P a_0^p) \left(1 - L^P a_0^p (1 + L^P(a_*^p - a_0^p)) \right) \right) \\ &\quad \left(1 - L^P a_0^p (1 + L^P(a_*^p - a_0^p)) \left(1 + L^P(a_*^p - a_0^p)(1 - L^P a_0^p) \right) \right) \\ &\quad \left(1 + L^P(a_*^p - a_0^p)(1 - L^P a_0^p) \left(1 - L^P a_0^p (1 + L^P(a_*^p - a_0^p)) \right) \right) \\ &\quad \left(1 - L^P a_0^p (1 + L^P(a_*^p - a_0^p)) \left(1 + L^P(a_*^p - a_0^p)(1 - L^P a_0^p) \right) \right) \\ &\quad \left(1 - L^P a_0^p (1 + L^P(a_*^p - a_0^p)) \left(1 + L^P(a_*^p - a_0^p)(1 - L^P a_0^p) \right) \right) \\ &\quad \left(1 + L^P(a_*^p - a_0^p)(1 - L^P a_0^p) \left(1 - L^P a_0^p (1 + L^P(a_*^p - a_0^p)) \right) \right) \\ &\quad \left(1 - L^P a_0^p (1 + L^P(a_*^p - a_0^p)) \left(1 + L^P(a_*^p - a_0^p)(1 - L^P a_0^p) \right) \right) \\ &\quad \left(1 - L^P a_0^p (1 + L^P(a_*^p - a_0^p)) \left(1 + L^P(a_*^p - a_0^p)(1 - L^P a_0^p) \right) \right) \\ &\quad \left(1 + L^P(a_*^p - a_0^p)(1 - L^P a_0^p) \left(1 - L^P a_0^p (1 + L^P(a_*^p - a_0^p)) \right) \right) \end{aligned}$$

⋮

From where

$$\begin{aligned}
H_1 &= 1; H_2 = (1 - L^P a_0^p) \\
H_3 &= (1 - L^P a_0^p) \left(1 - L^P a_0^p \left(1 + L^P (a_*^p - a_0^p) \right) \right) \\
H_4 &= (1 - L^P a_0^p) \left(1 - L^P a_0^p \left(1 + L^P (a_*^p - a_0^p) \right) \right) \left(1 - L^P a_0^p \left(1 + L^P (a_*^p - a_0^p) \right) \left(1 + L^P (a_*^p - a_0^p) (1 - L^P a_0^p) \right) \right) \\
H_5 &= (1 - L^P a_0^p) \left(1 - L^P a_0^p \left(1 + L^P (a_*^p - a_0^p) \right) \right) \left(1 - L^P a_0^p \left(1 + L^P (a_*^p - a_0^p) \right) \left(1 + L^P (a_*^p - a_0^p) (1 - L^P a_0^p) \right) \right) \\
&\quad + L^P (a_*^p - a_0^p) \left(1 - L^P a_0^p \left(1 + L^P (a_*^p - a_0^p) \right) \right) \left(1 + L^P (a_*^p - a_0^p) (1 - L^P a_0^p) \right) \\
&\quad \left(1 - L^P a_0^p \left(1 + L^P (a_*^p - a_0^p) \right) \right) \left(1 + L^P (a_*^p - a_0^p) (1 - L^P a_0^p) \right) \left(1 - L^P a_0^p \left(1 + L^P (a_*^p - a_0^p) \right) \right) \left(1 + L^P (a_*^p - a_0^p) (1 - L^P a_0^p) \right)
\end{aligned}$$

That implies that H_t is decreasing in t and converges to 0. The proof of the first is direct after we note by inspection that

$$H_t = H_{t-1} (1 - L^P a_0^p C_t), \forall t \geq 1$$

with $C_t \geq 1$. Hence $H_t \leq H_{t-1}, \forall t \geq 1$. To prove convergence to 0 we use that $a_\infty^p = a_{\infty-1}^p = a_*^p$ which implies

$$a_\infty^p = a_*^p = a_{\infty-1}^p (1 + L^P (a_*^p - a_0^p) H_{\infty-1}) = a_*^p (1 + L^P (a_*^p - a_0^p) H_{\infty-1})$$

Which can only be true if $H_{\infty-1} = 0$.

Proofs for i., ii. and iii. are provided in the main text. The proof for iv is made by mathematical induction. We first show that it is true for a_1^p , we assume it is true for a_{t-1}^p and then prove it for a_t^p . Indeed

$$\frac{\partial a_1^p}{\partial L^P} = a_0^p (a_*^p - a_0^p) > 0; \frac{\partial a_1^p}{\partial a_*^p} = a_0^p L^P > 0; \frac{\partial a_1^p}{\partial a_0^p} = 1 + L^P (a_*^p - 2a_0^p) > 0$$

The last derivative is positive when $a_0^p < \frac{1+L^P a_*^p}{2L^P}$ which indeed is the case because $\frac{1+L^P a_*^p}{2L^P} > a_*^p$. To see that, note that

$$\frac{1 + L^P a_*^p}{2L^P} > a_*^p \leftrightarrow L^P < \frac{1}{a_*^p}$$

Which we know is the condition that assures no backrolling. Next, we assume that $\frac{\partial a_{t-1}^p}{\partial L^P}$, $\frac{\partial a_{t-1}^p}{\partial a_*^p}$

and $\frac{\partial a_{t-1}^p}{\partial a_0^p}$ are all positive and derive (1) with respect to L^P , a_*^p and a_0^p

$$\frac{\partial a_t^p}{\partial L^P} = \frac{\partial a_{t-1}^p}{\partial L^P} (1 + L^P (a_*^p - 2a_{t-1}^p)) + a_*^p a_{t-1}^p$$

$$\frac{\partial a_t^p}{\partial a_*^p} = \frac{\partial a_{t-1}^p}{\partial a_*^p} (1 + L^P (a_*^p - 2a_{t-1}^p)) + L^P a_{t-1}^p$$

$$\frac{\partial a_t^p}{\partial a_0^p} = \frac{\partial a_{t-1}^p}{\partial a_0^p} (1 + L^P (a_*^p - 2a_{t-1}^p))$$

These expressions allow us to conclude that $\frac{\partial a_t^p}{\partial L^P}$, $\frac{\partial a_t^p}{\partial a_*^p}$ and $\frac{\partial a_t^p}{\partial a_0^p}$ are all positive as well because

$(1 + L^P (a_*^p - 2a_{t-1}^p))$ is positive given that $L^P < \frac{1}{a_*^p}$.

The proof for v. follows from iii., iv and

$$\frac{a_t^p - a_{t-1}^p}{a_{t-1}^p} = L^P (a_*^p - a_{t-1}^p)$$

Because a_{t-1}^p increases with t and with a_0^p then $L^P (a_*^p - a_{t-1}^p)$ decreases with these same two variables. **End of the Proof.**

FIGURES

Figure 1a. The dynamics in the change of compliance

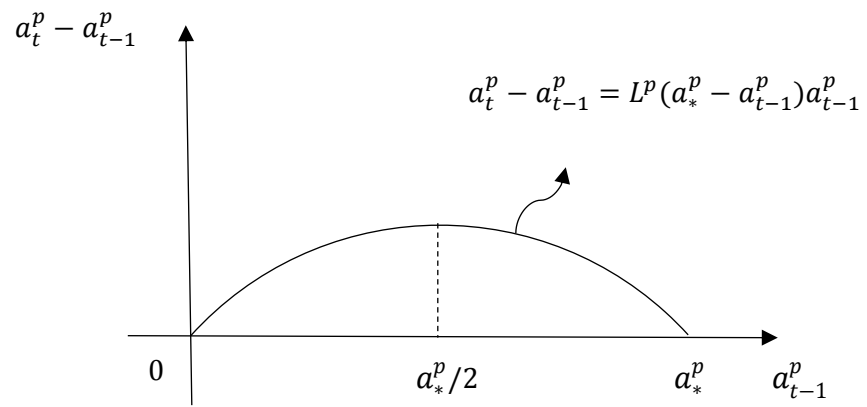


Figure 1b. The dynamics of compliance (if $L^p < \frac{1}{a_*^p}$)

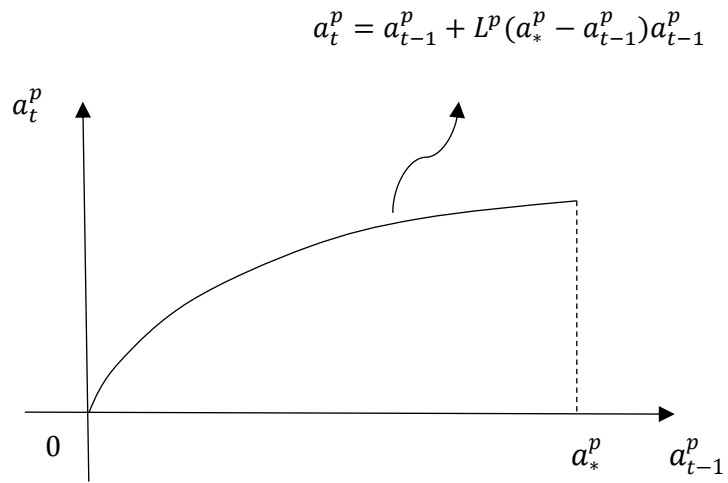
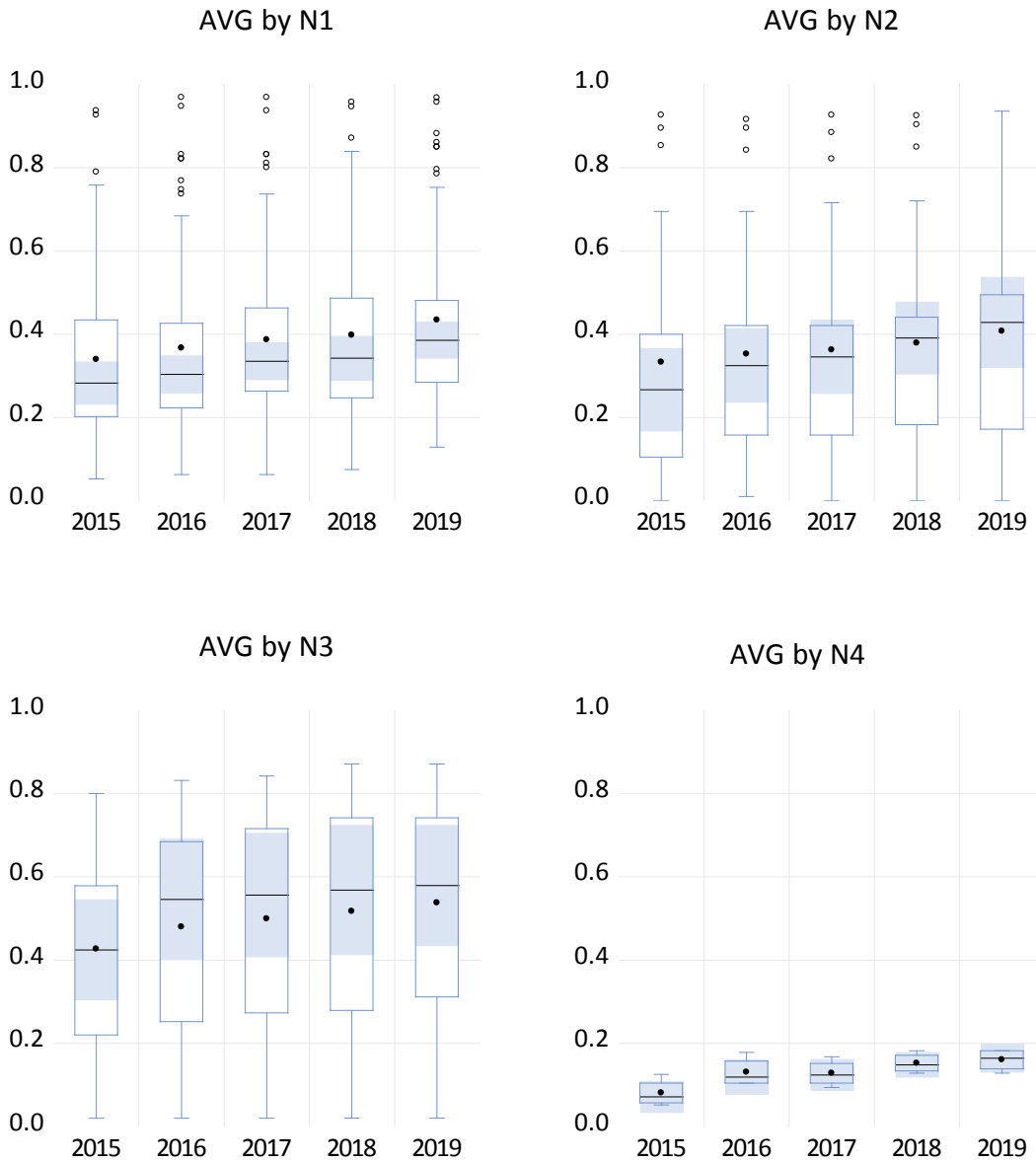


Figure 2: Adoption levels per practice over time



The black dot corresponds to each year's average; the box to the percentiles 25% to 75%, the horizontal line within the box is the median; the shaded area corresponds to the 95% confidence interval for the median; the transparent dots correspond to the outliers, which are out of the range corresponding to 3 times the interquartile ranges. N1, N2 and so on are the Sections corresponding to the practices described in Table 5.

TABLES

Table 1. Administrative Benefits. Some few examples.	
Corporate Practice	Expected Benefits
Periodic meetings with external auditors	Low: Laws usually demand a minimal frequency of meetings between firms and its auditors. In Chile that is twice a year. Literature has questioned the benefits of increasing this periodicity (Vafeas [1999], AlHares <i>et al</i> [2018]). It is a question of quality vs quantity
Periodic meetings with internal auditors	Questionable or High: Insiders such as accountants or financial managers know better than anyone the pin-downs of a firm. In that context, some literature (Eulerich, A. K., and Eulerich, M. [2020]) has suggested large benefits if internal procedures verify accountability in parallel or before external auditors do.
Communications and public relations unit.	High: Today's standards make it unimaginable that large firms will operate without investor relations or specialized units that will respond to doubts or inform markets about material events. High benefits are almost self-evident.
Company has adopted compensation policies which are publicly revealed, regularly revised, discussed by externals and approved by shareholders.	Questionable or Low: Although some literature argue in favor (Moriarty [2018], Bartol and Martin [1988], Burroughs [1982]) of practices that reveal the compensation schemes used by firms, the majority of literature questions their strategic (Colella <i>et al</i> [2007]), and legitimacy (Walsh [2000]) benefits.
Board has implemented procedures to control and manage risks which includes: specialized unit, policy code, goals and monitoring process.	High: Although in Table 2 we emphasize that risk management can be very expensive, its potential benefits are evident at the strategic (business is more sustainable) and financial levels (it reduces risks).

Table 2. Implementation Costs. Some examples.	
Corporate Practice	High Cost
Board of directors meets regularly to discuss issues about risk management which include: process, sources, improvements, contingency plans	A large literature documents the high costs associated with practices that define a risk matrix, and monitor as well as implement risk practices in companies (Tufano [1998], Leland [1998]).
Company divulgates its CSR policies which includes: risks, interested groups, stakeholders, indicators and evolution of the indicators.	Although there is an extensive literature that tends to suggest overall benefits for firms that embrace CSR and ESG practices (Friede <i>et al</i> [2015], Koller <i>et al</i> [2019]), there is also agreement that implementing and following policies associated with economic, social and environmental impact are extremely expensive (Auer and Schuhmacher [2016]) as well.
Board has introduced procedures that will reduce organization, social and cultural diversity.	Because of the ramifications and complexity of the topic firms would have to implement a large range of practices including hiring and firing policies, training, coaching and strategic definitions that will make this a permanent and potentially very expensive endeavor.
Corporate Practice	Low Cost
Mechanisms to induce new members to the Board which includes learning about: i. Business; ii. Stakeholders; iii. Firm's Mission; iv. Judicial Framework; v. Fiduciary Duties; vi. Main Contractual Agreements.	Main job by the company is to provide new directors with the relevant information and training regarding these topics. The information can be handed in physical or digital formats; it usually includes presentations, interviews and meetings on a director's role, the board and the organization. None of these has excessively high costs.
Whistle Blowing mechanisms which includes: i. A channel (such as email o telephone); ii. Anonymity protection; iii. Whistle blower knows the resolution of the denouncement.	Corporate denouncement systems includes anonymous emails, videos, phone-calls or letters which are usually processed and responded by HH.RR departments. These costs are moderate. That said, whistleblowers face potentially important negative side effects (Kenny and Fotaki [2021]).
Company has an actualized web page which contains all the public information of interest to shareholders which can be easily accessed and understood.	Today, companies' web pages are standard. A communications or public relations area is in charge of keeping all the strategic, financial and legal information uploaded. Their costs tend to be low or at most moderate.

Table 3. Conceptual sources of the Model		
	Theories	
Stages	Rational	Institutional
Pre-Regulation	Efficient Administration	None
Regulation	Avoid value-destroying events	Utility affected by number of compliers

Table 4. Average adoption rates for the 99 practices in NCG 385

	2015	2016	2017	2018	2019
1. Functioning and composition of the board	0.34	0.37	0.39	0.40	0.43
a) Immersion mechanisms - relevant issues	0.76	0.82	0.83	0.84	0.86
i) Business risks	0.73	0.83	0.83	0.84	0.85
ii) Stakeholders	0.66	0.74	0.74	0.75	0.75
iii) Mission, sustainability and risk management	0.56	0.68	0.71	0.75	0.78
iv) Regulatory environment	0.94	0.97	0.97	0.96	0.97
v) Fiduciary duties	0.76	0.82	0.81	0.81	0.86
vi) Principal board agreements	0.72	0.77	0.80	0.78	0.85
vii) Financial statements - accounting principles	0.93	0.95	0.94	0.95	0.96
viii) Conflicts of interests	0.79	0.82	0.83	0.87	0.88
b) Training mechanisms	0.26	0.32	0.35	0.34	0.38
i) Annual agenda	0.27	0.35	0.39	0.34	0.39
ii) Corporate governance best practices	0.32	0.37	0.38	0.38	0.43
iii) Sustainability reports	0.20	0.25	0.31	0.29	0.30
iv) Risk management	0.28	0.36	0.38	0.39	0.43
v) Fiduciary duties	0.31	0.35	0.38	0.37	0.42
vi) Conflicts of interest	0.26	0.31	0.34	0.32	0.38
vii) Diffusion of the annual agenda	0.21	0.26	0.31	0.30	0.32
c) Policy for hiring external advisors	0.14	0.15	0.15	0.16	0.16
i) Possibility of vetoes by external advisors	0.16	0.17	0.17	0.19	0.19
ii) Quorum required for hiring (one board member)	0.12	0.12	0.13	0.13	0.13
iii) Public diffusion of required external assessments	0.15	0.17	0.17	0.17	0.17
d) Meeting with external auditors - analysis	0.30	0.30	0.36	0.37	0.43
i) Auditing program	0.28	0.29	0.36	0.37	0.43

ii) Detected discrepancies	0.31	0.32	0.37	0.37	0.43
iii) Detected defficiencies	0.32	0.31	0.37	0.37	0.43
iv) Results of the annual program	0.28	0.31	0.37	0.37	0.43
v) Conflicts of interest	0.31	0.29	0.36	0.37	0.42
e) Meetings with risk management unit - analysis	0.19	0.25	0.27	0.31	0.33
i) Risk management process	0.20	0.26	0.29	0.31	0.33
ii) Risk matrix	0.21	0.29	0.31	0.34	0.38
iii) Recommendations	0.21	0.29	0.31	0.34	0.37
iv) Contingency plans	0.13	0.16	0.18	0.23	0.26
f) Meetings with internal auditing unit - analysis	0.32	0.31	0.29	0.29	0.37
i) Annual auditing plan	0.31	0.26	0.26	0.24	0.33
ii) Detected defficiencies	0.35	0.35	0.32	0.31	0.40
iii) Recommendations	0.33	0.31	0.28	0.29	0.38
iv) Crime prevention manual	0.32	0.33	0.31	0.33	0.39
g) Meetings with the social responsibility unit - analysis	0.05	0.07	0.07	0.08	0.18
i) Previously approved policies	0.05	0.06	0.07	0.08	0.18
ii) Barriers to diversity	0.05	0.06	0.06	0.09	0.17
iii) Public sustainability reports	0.05	0.07	0.07	0.09	0.17
h) Field visits	0.49	0.46	0.50	0.52	0.50
i) Working conditions	0.54	0.51	0.54	0.56	0.54
ii) Workers' concerns	0.47	0.43	0.48	0.49	0.48
iii) Recommendations to those in charge	0.47	0.43	0.47	0.49	0.47
i) Quarterly meetings with internal auditing, risk management and external auditing units	0.17	0.18	0.16	0.14	0.16
i) One annual meeting without the CEO	0.17	0.18	0.16	0.14	0.16
j) Operating procedures for continuous improvement for:	0.22	0.24	0.27	0.28	0.30
i) Board detection of improvement opportunities	0.32	0.33	0.37	0.39	0.40
ii) Board has instance to detect areas for improvement and training	0.28	0.29	0.34	0.35	0.37

iii) Board has instance to detect barriers to diversity	0.11	0.15	0.20	0.25	0.26
iv) Formalities regarding number and length of sessions	0.20	0.20	0.20	0.19	0.24
v) Planned changes in board functioning under crisis	0.23	0.25	0.27	0.27	0.31
vi) External counseling for the Board	0.21	0.22	0.26	0.25	0.25
vii) Annual revisions (improvements, capacities and barriers)	0.22	0.21	0.27	0.28	0.28
k) Funtioning information system for board members	0.34	0.38	0.39	0.43	0.47
i) Access to board minutes of three previous years	0.34	0.41	0.43	0.46	0.57
ii) Access to board citation minutes	0.46	0.48	0.48	0.57	0.62
iii) Timely access (5 days) to board citation minutes	0.22	0.23	0.21	0.25	0.30
iv) Whistleblowing procedure implemented	0.26	0.31	0.34	0.40	0.40
v) Minute revision of the corresponding board meeting	0.67	0.75	0.74	0.75	0.80
vi) Timely minute revision (5 days later)	0.11	0.11	0.13	0.13	0.15
2. Relations with society, shareholders and the general public	0.33	0.35	0.36	0.38	0.41
a) Board has implemented formal procedures such that shareholders can be informed	0.31	0.30	0.31	0.31	0.33
i) Board suggestions regarding its future composition	0.07	0.06	0.06	0.08	0.08
ii) Suggestions regarding maximum number of seats per board member	0.05	0.04	0.04	0.04	0.04
iii) Background information of board member candidates	0.69	0.69	0.72	0.72	0.75
iv) Identifies board member candidate's interests with controlling shareholder	0.40	0.40	0.40	0.41	0.43
b) Board has implemented systems that allow for	0.08	0.08	0.09	0.10	0.11
i) Remote voting by shareholders	0.00	0.01	0.00	0.00	0.00
ii) Remote participation by shareholders	0.05	0.06	0.08	0.10	0.12
iii) Instantaneous public access to agreements	0.09	0.11	0.12	0.13	0.14
iv) Difussion of agreements	0.16	0.16	0.17	0.18	0.17
c) Approved annual information diffusion policies regarding	0.22	0.29	0.32	0.36	0.41
i) CSR policies	0.32	0.37	0.40	0.44	0.49
ii) Stakeholders	0.26	0.33	0.35	0.39	0.44
iii) Relevant risks	0.25	0.33	0.35	0.40	0.44

iv) CSR indicators	0.18	0.24	0.28	0.32	0.38
v) Evolution of CSR indicators	0.11	0.18	0.22	0.25	0.31
d) Applicable international CSR standards	0.27	0.32	0.38	0.41	0.46
i) ISO, GRI (among others)	0.27	0.32	0.38	0.41	0.46
e) Unit that relates with stockholders, investors and media	0.73	0.73	0.72	0.73	0.77
i) Access to public information	0.85	0.84	0.82	0.85	0.88
ii) Unit with English speaking persons	0.89	0.89	0.88	0.90	0.91
iii) Unique counterpart	0.44	0.45	0.45	0.45	0.51
f) Operating improvement procedures for:	0.32	0.34	0.33	0.34	0.37
i) Revealed information is understandable	0.40	0.42	0.42	0.41	0.43
ii) Timely information revelation	0.40	0.41	0.42	0.41	0.44
iii) Considers external counseling	0.15	0.17	0.16	0.18	0.22
iv) Annual detection of improvement opportunities	0.35	0.36	0.33	0.35	0.39
g) Access to public information by shareholders	0.93	0.92	0.93	0.92	0.94
i) Updated website	0.93	0.92	0.93	0.92	0.94
3. Risk management and control	0.43	0.48	0.50	0.52	0.54
a) The board has implemented a formal process for risk management and control that:	0.48	0.57	0.60	0.62	0.64
i) Guidelines: Board approved policies	0.58	0.69	0.74	0.74	0.74
ii) Has a risk management unit	0.41	0.47	0.48	0.54	0.61
iii) Has an internal auditing unit	0.55	0.61	0.67	0.70	0.71
iv) Incorporates direct and indirect risks	0.38	0.48	0.48	0.55	0.54
ix) Is revised and updated annually	0.43	0.55	0.56	0.57	0.61
v) Considers potential impact on sustainability risks	0.41	0.55	0.56	0.57	0.57
vi) Uses national and international guidelines	0.51	0.59	0.62	0.63	0.67
vii) Considers a Code of Conduct	0.65	0.72	0.77	0.75	0.77
viii) Contemplates information and training of the relevant actors	0.42	0.47	0.52	0.51	0.57
b) The board has implemented a formal whistleblowing process that:	0.71	0.76	0.78	0.82	0.82

i) Directs them, independently of the source's link to the company	0.78	0.83	0.84	0.87	0.87
ii) Guarantees anonymity of the whistleblower	0.80	0.82	0.84	0.87	0.87
iii) Whistleblower can follow the state of the complaint	0.64	0.68	0.72	0.76	0.76
iv) Is revealed to the relevant public	0.63	0.72	0.73	0.78	0.77
c) The board has implemented a formal process for:	0.28	0.31	0.33	0.34	0.36
i) Detects and reduces barriers within the company	0.16	0.21	0.21	0.26	0.27
ii) Detects desirable skills in top management executives	0.22	0.25	0.27	0.28	0.31
iii) Identifies potential successors of CEO and top executives	0.33	0.35	0.37	0.35	0.37
iv) Timely replacement of CEO and top executives	0.55	0.57	0.58	0.58	0.59
v) Annual detection of barriers and skills	0.16	0.19	0.22	0.24	0.28
d) Formal procedures for reviewing incentives and compensation	0.20	0.20	0.20	0.21	0.24
ii) Contemplates using external counseling	0.18	0.19	0.20	0.20	0.23
iii) Contemplates revealing incentive structures in company website	0.05	0.03	0.03	0.03	0.13
iv) Policies and structures subject to shareholder approval	0.02	0.02	0.02	0.02	0.02
vi) Annual review of payment schemes for CEO and top executives	0.55	0.56	0.56	0.57	0.57
4. Third party assessment	0.08	0.13	0.13	0.15	0.16
a) Board self-evaluation regarding adoption of NCG 385 practices	0.08	0.13	0.13	0.15	0.16
i) Checked and validated by a third party	0.13	0.18	0.17	0.18	0.18
ii) Third party has at least 5 years of experience	0.08	0.14	0.14	0.16	0.18
iii) Third party is registered with the CMF	0.06	0.11	0.09	0.13	0.13
iv) Third party is listed in local stock exchanges	0.05	0.11	0.12	0.14	0.15

SOURCE: own calculations based on the data from Novoa, Walker and Zegers (2022)

Table 5. Evolution of the average adoption rate for each of the 4 sections

Section	Number of questions	2015	2016	2017	2018	2019
1. Functioning and composition of the board of directors	51	0.3397	0.3672	0.3870	0.3978	0.4343
2. Relations between the firm, its shareholders and the general public	22	0.3330	0.3526	0.3627	0.3793	0.4076
3. Risk management and control	22	0.4273	0.4799	0.4995	0.5176	0.5379
4. Evaluations by a third party of NCG 385 compliance	4	0.0816	0.1316	0.1289	0.1532	0.1613
Total / Average	99	0.3473	0.3795	0.3962	0.4104	0.4404
Number of answers		95	95	95	93	93

SOURCE: own calculations based on the data from Novoa, Walker and Zegers (2022)

Table 6. Pooled least-squares regressions for the different sections of NCG 385 using IV

$$A. a_t^p - a_{t-1}^p = b_0 + b_1 a_{t-1}^p + b_2 (a_{t-1}^p)^2 + \varepsilon_t$$

$$B. g_t^p = b_1 + b_2 a_{t-1}^p + \varepsilon_t; g_t^p \equiv \frac{a_t^p - a_{t-1}^p}{a_{t-1}^p}$$

$$-\widehat{b}_2 = \widehat{L} \text{ and } -\frac{\widehat{b}_1}{\widehat{b}_2} = \widehat{a}_*^p$$

	Section 1 - Functioning and composition of the board of directors (FCB)		Section 2 - Relations between the firm, its shareholders and the general public (RSS)		Section 3 - Risk management and control (RMC)	
	A	B ⁽¹⁾	A	B ⁽¹⁾	A	B ⁽¹⁾
Periods included:	3	3	3	3	3	3
Cross-sections (practices) included:	51	51	22	20	22	20
Total panel (balanced) observations:	153	153	66	60	66	60
Specification	A	B ⁽¹⁾	A	B ⁽¹⁾	A	B ⁽¹⁾
\widehat{b}_0	0.0167**		0.0038		0.0126	
$t\text{-test}^{(2)}$	1.9981		0.7773		1.2035	
\widehat{b}_1	0.0453	0.1827***	0.1005***	0.1416***	0.0451	0.1048***
$t\text{-test}(\widehat{b}_1)$	1.1885	5.0021	2.9004	5.3512	0.9313	5.2907
\widehat{b}_2	-0.0585*	-0.2365***	-0.1096***	-0.1646***	-0.0512	-0.1104***
$t\text{-test}(\widehat{b}_2)$	-1.7450	-3.6062	-3.1275	-4.0446	-1.0911	-3.8158
Key estimated parameters and their significance						
\widehat{L}	0.0585*	0.2365***	0.1096***	0.1646***	0.0512	0.1104***
$t\text{-test}$	1.7450	3.6062	3.1275	4.0446	1.0911	3.8158
\widehat{a}_*^p	0.7749***	0.7725***	0.9173***	0.8604***	0.8811***	0.9490***
$t\text{-test}$	3.5016	11.3574	19.0280	11.1963	4.6462	11.3793
$t\text{-test}(\widehat{a}_*^p = 1)$	-1.0171	-3.3450***	-1.7160*	-1.8165*	-0.6272	-0.6121
R-squared	0.0271	0.0969	0.1698	0.2228	0.0156	0.1914
Adjusted R-squared	0.0142	0.0909	0.1435	0.2094	-0.0157	0.1775
S.E. of regression	0.0295	0.1726	0.0200	0.0752	0.0236	0.0485
Sum squared resid	0.1306	4.4982	0.0252	0.3278	0.0351	0.1364
Durbin-Watson stat	2.3127	1.6940	1.3539	1.4234	2.4747	2.7904
Mean dependent var	0.0224	0.0919	0.0183	0.0759	0.0193	0.0445
S.D. dependent var	0.0297	0.1810	0.0216	0.0846	0.0234	0.0535

⁽¹⁾Average lagged adoption rates greater than 0.05; ⁽²⁾ $t\text{-tests}$ estimated with robust standard errors. Regressions are estimated using the corresponding lagged explanatory variables with one additional lag as instruments. *** $p\text{-value}<0.01$; ** $p\text{-value}<0.05$; * $p\text{-value}<0.1$

Table 7. Key parameters of the model distinguishing per section in NCG 385			
	Sections		
Parameters	FCB	RSS	RMC
a_{15}^p	0.34	0.33	0.43
L^p	0.23	0.17	0.11
a_*^p	0.77	0.86	0.95
a_{19}^p	0.43	0.41	0.53
$\frac{a_{19}^p - a_{15}^p}{a_{15}^p}$	0.26	0.24	0.23
$L^p(a_*^p - a_{15}^p)$	0.10	0.09	0.06

Table 8. Average adoption rates for the 19 practices in NCG 341

	Adoption rate in 2012	Adoption rate in 2014
Section 1 – Functioning of the board	0.556	0.622
1.A.a) Immersion process of new board members	0.890	0.951
1.A.b) Policy for hiring external advisors	0.622	0.683
1.A.c) Board meetings with external auditors	0.598	0.756
1.B.a) Board evaluation by third parties	0.195	0.28
1.B.b) Minimum dedication by board members	0.061	0.061
1.B.c) Information documentation	0.988	0.988
1.C.a) Code of conduct	0.537	0.634
Section 2 – Relations between the firm, its shareholders and others	0.528	0.569
2.A.a) Information regarding board member candidates	0.732	0.793
2.A.b) Remote voting	-	-
2.A.c) Mechanisms to reveal information during shareholder meetings	0.134	0.183
2.A.d) Investor relations unit	0.780	0.817
2.A.e) Timely and sufficient revelations	0.585	0.671
2.A.f) Company Website	0.939	0.951
Section 3 – Executives replacement and compensations	0.671	0.744
3.A.a) Replacement policy of principal executives	0.634	0.720
3.A.b) Avoid inadequate monetary incentives	0.707	0.768
Section 4 – Internal control and risk management	0.701	0.790
4.A.a) Risk management policy	0.793	0.817
4.A.b) Risk committee reporting to the board	0.610	0.683
4.A.c) Whistleblowing procedures	0.732	0.829
4.A.d) Code of ethics	0.671	0.829
AVERAGE	0.590	0.653

Source: Godoy, Walker and Zegers (2018); translated into English by the authors.

Table 9. Pooled least-squares regressions for NCG 385 using IV and excluding practices in NCG 341

$$A. a_t^p - a_{t-1}^p = b_0 + b_1 a_{t-1}^p + b_2 (a_{t-1}^p)^2 + \varepsilon_t$$

$$B. g_t^p = b_1 + b_2 a_{t-1}^p + \varepsilon_t$$

$$-\widehat{b}_2 = \widehat{L} \text{ and } -\frac{\widehat{b}_1}{\widehat{b}_2} = \widehat{a}_*^p$$

Variable	Section 1 - Functioning and composition of the board of directors (FCB)		Section 2 - Relations between the firm, its shareholders and the general public (RSS)		Section 3 - Risk management and control (RMC)	
	A	B ⁽¹⁾	A	B ⁽¹⁾	A	B ⁽¹⁾
Periods included:	3	3	3	3	3	3
Cross-sections (practices) included:	34	34	13	13	13	11
Total panel (balanced) observations:	102	102	39	39	39	33
Specification	A	B ⁽¹⁾	A	B ⁽¹⁾	A	B ⁽¹⁾
\widehat{b}_0	0.0359***		0.0108		0.0118	
<i>t-test</i> ⁽²⁾	5.1250		0.7594		0.9904	
\widehat{b}_1	-0.0626*	0.2371***	0.1002	0.1481***	0.0577	0.1131***
<i>t-test</i> (\widehat{b}_1)	-1.9070	4.5678	1.4913	4.6580	0.9147	5.0141
\widehat{b}_2	0.0550*	-0.3681***	-0.1214*	-0.1646***	-0.0603	-0.1146***
<i>t-test</i> (\widehat{b}_2)	1.6759	-3.4043	-1.9788	-3.0957	-0.8996	-2.9226
Key estimated parameters and their significance						
\widehat{L}	-0.0550*	0.3681***	0.1214*	0.1646***	0.0603	0.1146***
<i>t-test</i>	-1.6759	3.4043	1.9788	3.0957	0.8996	2.9226
\widehat{a}_*^p	1.1380***	0.6442***	0.8251	0.8994***	0.9562***	0.9866***
<i>t-test</i>	5.7939	10.3394	5.4646	7.4594	6.3502	6.1415
<i>t-test</i> ($\widehat{a}_*^p = 1$)	0.7027	-5.7117***	-1.1582	-0.8347	-0.2908	-0.0837
R-squared	0.0132	0.1258	0.1482	0.1545	0.0224	0.1684
Adjusted R-squared	-0.0067	0.1171	0.1008	0.1317	-0.0320	0.1415
S.E. of regression	0.0306	0.1989	0.0215	0.0751	0.0266	0.0580
Sum squared resid	0.0926	3.9549	0.0167	0.2086	0.0254	0.1041
Durbin-Watson stat	2.3063	1.6852	1.3672	1.6199	2.5407	3.0626
Mean dependent var	0.0226	0.1038	0.0261	0.0845	0.0219	0.0610
S.D. dependent var	0.0305	0.2116	0.0227	0.0806	0.0262	0.0625

⁽¹⁾Average lagged adoption rates greater than 0.05; ⁽²⁾*t-tests* estimated with robust standard errors. Regressions are estimated using the corresponding lagged explanatory variables with one additional lag as instruments. ****p-value*<0.01; ***p-value*<0.05; **p-value*<0.1

Table 10. Pooled least-squares regressions for NCG 385 using IV given tertiles of compliance rates in 2015

$$A. a_t^p - a_{t-1}^p = b_0 + b_1 a_{t-1}^p + b_2 (a_{t-1}^p)^2 + \varepsilon_t$$

$$B. g_t^p = b_1 + b_2 a_{t-1}^p + \varepsilon_t$$

$$-\widehat{b}_2 = \widehat{L} \text{ and } -\frac{\widehat{b}_1}{\widehat{b}_2} = \widehat{a}_*^p$$

Variable	T1 - Highest adoption tercile in 2015		T2 - Middle adoption tercile in 2015		T3 - Lowest adoption tercile in 2015	
Periods included:	3	3	3	3	3	3
Cross-sections (practices) included:	32	32	32	32	31	17
Total panel (balanced) observations:	96	96	96	96	93	51
Specification	A	B ⁽¹⁾	A	B ⁽¹⁾	A	B ⁽¹⁾
\widehat{b}_0	-0.0147		0.0588		0.0130	
<i>t-test</i> ⁽²⁾	-0.5005		0.8832		1.4613	
\widehat{b}_1	0.1373*	0.0932***	-0.1804	0.1784***	0.0373	0.3069***
<i>t-test</i> (\widehat{b}_1)	1.6691	5.5129	-0.4221	4.5573	0.3359	4.1004
\widehat{b}_2	-0.1244**	-0.0925***	0.2419	-0.2842**	-0.0231	-0.9253***
<i>t-test</i> (\widehat{b}_2)	-2.2184	-4.5497	0.4028	-2.3533	-0.0756	-2.9464
Key estimated parameters and their significance						
\widehat{L}	0.1244**	0.0925***	-0.2419	0.2842**	0.0231	0.9253***
<i>t-test</i>	2.2184	4.5497	-0.4028	2.3533	0.0756	2.9464
\widehat{a}_*^p	1.1040***	1.0067***	0.7458***	0.6277***	1.6163	0.3317***
<i>t-test</i>	6.1281	23.1757	3.1149	4.7703	0.0965	8.5230
<i>t-test</i> ($\widehat{a}_*^p = 1$)	0.5774	0.1544	-1.0618	-2.8293***	0.0368	-17.1710***
R-squared	0.0773	0.1396	0.0034	0.0572	0.0199	0.0821
Adjusted R-squared	0.0575	0.1305	-0.0181	0.0472	-0.0019	0.0705
S.E. of regression	0.0225	0.0380	0.0311	0.0951	0.0246	0.2187
Sum squared resid	0.0472	0.1357	0.0898	0.8504	0.0544	3.7771
Durbin-Watson stat	2.2431	2.1360	2.4505	2.4368	1.7066	1.5710
Mean dependent var	0.0176	0.0286	0.0262	0.0796	0.0183	0.1345
S.D. dependent var	0.0232	0.0407	0.0308	0.0974	0.0246	0.2268

⁽¹⁾Average lagged adoption rates greater than 0.05; ⁽²⁾*t-tests* estimated with robust standard errors. Regressions are estimated using the corresponding lagged explanatory variables with one additional lag as instruments.****p-value*<0.01; ***p-value*<0.05; **p-value*<0.1

Table 11. Key estimations in the model that distinguishes per tertiles in NCG 385			
	Tertiles		
Parameters	T1 (max)	T2	T3 (min)
L^p	0.09	0.28	0.93
a_*^p	1.01	0.63	0.33
$L^p a_*^p (1 - a_*^p)$	0	0.07	0.21