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Top management quality, corporate finance, and corporate innovation

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ADB Working Paper Series

**TOP MANAGEMENT QUALITY,
CORPORATE FINANCE, AND
CORPORATE INNOVATION**

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and Karen Simonyan

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Abstract

In this paper, we review the theoretical and empirical literature on measuring the top management quality of firms, and its relation to various aspects of corporate financial policies and corporate innovation, and draw policy implications for enhancing corporate innovation. First, we discuss how management quality has been measured in the recent empirical literature. Second, we address theoretical models of the effect of the top management quality of a firm on its corporate financial and investment policies, and on corporate innovation. Third, we consider the recent empirical literature on the relationship between top management quality and the financial and investment policies of a firm, and how these affect the firm's inputs into innovation, its innovation outputs, and innovation productivity. Fourth, we review the literature on the relationship between a firm's top management quality, the anti-takeover provisions incorporated into its corporate charter, and corporate innovation. Fifth, we discuss the relationship between venture capital investments in entrepreneurial firms, their top management quality, and innovation by these firms. Sixth, we review the literature on the relationship between top management quality, the going public decisions of entrepreneurial firms, and the innovation outputs from these firms. We conclude with a discussion of the lessons from the theoretical literature and US evidence on corporate innovation for policymakers in various countries in Asia and elsewhere, and draw implications for public policy aimed at enhancing corporate innovation in these countries.

JEL Classification: J24, O31, O32, O33, O38

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1. INTRODUCTION

It is now well-recognized that innovation is an important ingredient in generating the competitive advantage and long-term growth of nations, ultimately affecting their economic development (see, e.g., Porter, 1992). Schumpeter (1942: 83) viewed innovation as “a process of industrial mutation that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one.” It has been argued that since innovation is a process involving great uncertainty and a high risk of failure (see, e.g., Holmstrom 1989), the drivers of innovation may differ significantly from those of more routine tasks. Manso (2011) argues that motivating innovation needs significant tolerance for failure in the short term and reward for success in the long term. Given the increasing recognition of innovation as an important driver of economic development, there has been considerable interest in the determinants of innovation, not only in the corporate sector, but among policymakers around the world.

One important aspect of firms and other organizations (such as non-profit institutions) that may significantly affect their ability to achieve high-quality innovation outcomes is the human capital or “quality” of the top management teams of these entities. Thus, the effectiveness of a firm’s top management team in selecting, investing in, and implementing innovative projects may determine the long-term success of the firm. Indeed, it is well known that venture capitalists and other early-stage investors analyze the top management quality of a private firm before investing in that firm. Given that a significant fraction of cutting-edge innovation is undertaken by small private firms, this underscores the importance of top management quality as a determinant of corporate innovation. However, finance researchers have, until recently, stayed away from analyzing the relationship between top management quality and innovation, perhaps because of difficulties in quantifying top management quality and the lack of theories regarding precisely how top management quality affects corporate financial policies and corporate innovation. This, in turn, has led to a paucity of research on the relationship between the top management quality of a firm and various aspects of its innovation activities.

However, several recent studies have attempted to measure top management quality and analyze its effects on various aspects of a firm’s organization, governance, financial and investment policies, and innovation activities. In this paper, we review the theoretical and empirical literature on measuring the top management quality of firms, and its relation to various aspects of corporate financial policies and corporate innovation, and draw policy implications for enhancing corporate innovation. First, we discuss how management quality has been measured in the recent empirical literature. Second, we address theoretical models of the effect of the top management quality of a firm on its corporate financial and investment policies and on corporate innovation. Third, we consider the recent empirical literature on the relationship between top management quality and the financial and investment policies of a firm and how these affect the firm’s inputs into innovation and its innovation outputs and innovation productivity. Fourth, we review the literature on the relationship between a firm’s top management quality, the anti-takeover provisions incorporated into its corporate charter, and corporate innovation. Fifth, we discuss the relationship between venture capital investments in entrepreneurial firms, their top management quality, and innovation by these firms. Sixth, we review the literature on the relationship between top management quality, the going public decisions of entrepreneurial firms, and the innovation outputs from these firms. We conclude with a discussion of the lessons from the theoretical literature and the US evidence on corporate innovation for policymakers

in various countries in Asia and elsewhere, and draw implications for public policy aimed at enhancing corporate innovation in these countries.

The rest of this paper is organized as follows. Section 2 describes how management quality is measured. Section 3 discusses theoretical models of the relationship between management quality, corporate investment, and corporate innovation. Section 4 addresses the empirical literature on the relationship between top management quality, investment and financial policies, and firm inputs in innovation. Section 5 reviews the empirical literature on the direct relationship between management quality and the productivity of corporate innovation. Section 6 discusses the empirical literature on the relationship between management quality, anti-takeover provisions, and corporate innovation. Section 7 reviews the empirical literature on the relationship between venture capital backing, top management quality, and corporate innovation. Section 8 discusses theoretical models, as well as the empirical literature on the relationship between top management quality, the going public decision of private firms, and corporate innovation by private and public firms. Section 9 concludes with a discussion of the lessons learned from the existing literature and suggests implications for public policy aimed at enhancing corporate innovation by firms in Asia and elsewhere.

2. HOW IS MANAGEMENT QUALITY MEASURED?

Several recent studies have used different methodologies to measure and quantify the management quality of a firm. One of these methodologies makes use of several observable individual proxies of top management team quality capturing the human, knowledge, experiential, and educational resources available to the top management team, the uniformity/heterogeneity in the tenures of top management team members and their relative importance to the team, and the reputation and visibility of top management team members in the business community. To derive a single measure of top management team quality, these individual proxies of top management team quality are aggregated using common factor analysis.

In particular, the following individual proxies of a firm's top management team's quality have been used in several recent studies making use of this methodology: the top management team size (the number of executive officers with the rank of vice president or higher on the top management team), the percentage of top management team members with master in business administration (MBA) degrees, the percentage of top management team members who are certified public accountants (CPAs), the percentage of top management team members who have served as top executive officers at other companies before joining the firm, the percentage of top management team members who have served as law and accounting partners prior to joining the firm, the chief executive officer (CEO) dominance (the ratio of CEO compensation over the average compensation of other management team members), the percentage of top management team members in core functional areas (operations and production, sales and marketing, finance, and research and development [R&D]), the average tenure of top management team members (the average number of years top management team members have worked for the firm), the heterogeneity in the tenures of top management team members (the coefficient of variation in top management team members' tenures), the number of top management team members serving on the boards of non-profit organizations, and the number of top management team members serving on the boards of other firms. Larger values of these proxies indicate higher management quality.

Given that each of the above individual observable proxies of top management team quality may have unique limitations in measuring the underlying unobservable construct, common factor analysis is conducted on these individual top management team quality proxies and one single measure (factor) of top management team quality is derived. To ensure that individual proxies of top management team quality capture management quality only and not firm quality, before conducting the common factor analysis, individual management quality proxies are adjusted for firm quality measures, such as firm size, firm age, and industry dummies. This adjustment is performed by regressing individual top management team quality proxies on firm quality measures, and the residuals from the regressions are used as firm size-, firm age-, and industry dummies-adjusted individual top management team quality proxies in the common factor analysis.

Common factor analysis generates several factors that account for common variance (correlation) between individual top management team quality proxies. Harman (1976) suggests that the number of factors necessary to approximate the original correlations between the individual measures is equal to the number of summed eigenvalues needed to exceed the sum of communalities (a communality of an individual management quality proxy is the squared multiple correlation obtained from the regression of that management quality proxy on other management quality proxies used in common factor analysis).

To provide an example of the practical implementation of this methodology, we can refer to Chemmanur, Paeglis, and Simonyan (2011), who study the effect of management quality on the prevalence of anti-takeover provisions in the corporate charters of firms going public. They conduct common factor analysis using six individual proxies of top management team quality: the top management team size, the number of MBAs in the top management team, the number of CPAs in the top management team, the number of management team members who served as executive officers at other firms prior to joining the initial public offering (IPO) firm, the number of management team members who served as law and accounting partners prior to joining the IPO firm, and CEO dominance (the ratio of CEO compensation over the average compensation of other management team members). These six individual proxies of top management team quality are adjusted for firm size before conducting the common factor analysis. The average tenure of management team members and the heterogeneity in such tenures are excluded from the common factor analysis given that these two individual proxies of top management quality have negative loadings in the common factor analysis.¹ Instead, these two proxies are used as control variables in multivariate regressions.

The common factor analysis generates six factors. The first factor from the common factor analysis of the six individual proxies of top management team quality is retained to be used as a single measure of top management team quality. This is because the sum of the communalities of the individual proxies is equal to 0.62, which is less than the eigenvalue of the first factor (0.80) from the common factor analysis. Thus the first factor on its own is enough to explain parsimoniously the intercorrelations between the

¹ The negative loadings of the average tenure of management team members and the heterogeneity in their tenures in the common factor analysis is driven by the fact that these two top management team quality proxies have negative correlations with other top management team quality proxies (such as the percentage of management team members with prior managerial experience and the percentage of management team members with MBA degrees) used in the common factor analysis. These negative correlations can be explained by the fact that those managers who have longer tenures with their firms are likely to have grown internally within the firm rather than being invited from outside, and are likely to have acquired their managerial skills internally within the firm rather than at an educational institution.

individual proxies of top management team quality. Table 1 shows the summary statistics of the individual proxies of top management team quality, as well as the top management team quality factor (first factor) generated as a result of the common factor analysis in Chemmanur, Paeglis, and Simonyan (2011). Table 2 presents the summary statistics on the common factor analysis from the same study, namely, estimated communalities of the six individual proxies of top management team quality, eigenvalues of the reduced correlation matrix, and correlations between the first common factor (used as a single measure of top management team quality) and the six individual proxies of top management team quality. The top management team quality common factor has positive correlations with the six individual proxies of management quality and by construction has a mean of zero. The larger values of the management quality common factor correspond to higher top management team quality.

Table 1: Summary Statistics of Management Quality Variables for the Sample of IPO Firms in 1993–2000

	N	Mean	Median	Minimum	Maximum	St. Dev.
TSIZE	719	5.424	5.000	1.000	15.000	2.223
PMBA	719	0.075	0.000	0.000	0.800	0.145
PCPA	719	0.118	0.077	0.000	0.833	0.141
PFTEAM	719	0.381	0.333	0.000	1.000	0.277
PLAWACC	719	0.031	0.000	0.000	0.750	0.088
FCEO	711	1.381	1.259	0.000	5.425	0.584
TENURE	719	6.482	5.000	1.000	30.500	5.239
TENHET	718	2.172	0.940	0.000	22.854	2.911
MQFACT	711	0.000	-0.099	-1.311	3.132	0.703

TSIZE is the size of a firm's management team, defined as the number of executive officers and vice presidents on a firm's management team. PMBA is the percentage of a firm's management team with MBA degrees. PCPA is the percentage of a firm's management team who are CPAs. PFTEAM is the percentage of a firm's management team having served as executive officers and/or vice presidents prior to joining the IPO firm. PLAWACC is the percentage of a firm's management team having previously been partners in a law or accounting firm. FCEO is the ratio of CEO salary and bonus to the average salary and bonus of other management team members in the fiscal year preceding the IPO. TENURE is the median number of years that management team members have been with a firm. TENHET is the coefficient of variation of the team members' tenure. MQFACT is the management quality factor score.

Table 2: Common Factor Analysis of Six Measures of Management Quality for the Sample of IPO Firms in 1993–2000

Panel A: Estimated Communalities of Six Management Quality Measures

TSIZE	MBA	CPA	FTEAM	LAWACC	FCEO
0.2320	0.0394	0.0756	0.1941	0.0666	0.0136

Panel B: Eigenvalues of the Reduced Correlation Matrix

Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
0.79795	0.23436	0.05479	-0.02431	-0.17019	-0.27131

continued on next page

Table 2 *continued*

Panel C: Correlations between the Common Factor and Six Management Quality Measures

TSIZE	MBA	CPA	FTEAM	LAWACC	FCEO
0.8382	0.3379	0.3856	0.7281	0.3377	0.0625

The management quality factor score is obtained using common factor analysis on the firm-size-adjusted TSIZE, MBA, CPA, FTEAM, LAWACC, and FCEO. TSIZE is the size of a firm's management team, defined as the number of executive officers and vice presidents on a firm's management team. MBA is the number of management team members with MBA degrees. CPA is the number of management team members who are CPAs. FTEAM is the number of management team members who have served as executive officers and/or vice presidents prior to joining the IPO firm. LAWACC is the number of management team members who have previously been partners in a law or accounting firm. FCEO is the ratio of CEO salary and bonus to the average salary and bonus of other management team members in the fiscal year preceding the IPO.

The above methodology with somewhat different specifics (different sets of individual proxies of top management team quality and somewhat different procedures for adjusting individual proxies for firm quality) has been used in other recent studies, such as Chemmanur, Simonyan, and Tehranian (2016), Chemmanur, Gupta, and Simonyan (2016), and Chemmanur, Kong, Krishnan, and Yu (2015), to construct a single measure of top management team quality. These studies will be discussed later in this paper.

Another slightly different application of the above methodology can be found in the pioneering work of Chemmanur and Paeglis (2005), who study the effect of top management team quality on the IPO characteristics of firms going public. Individual proxies of top management team quality are categorized into two groups: top management team resources and top management team structure. The first group includes the top management team size, the percentage of top management team members with MBA degrees, the percentage of top management team members who have served as top executive officers at other companies before joining the IPO firm, and the percentage of top management team members who have served as law and accounting partners prior to joining the IPO firm. The second group includes CEO dominance, the average tenure of top management team members, and the heterogeneity in the tenures of top management team members. Common factor analysis is conducted separately using the proxies in the management team resources group and then the proxies in the management team structure group. As a result, two common factors are derived from the two common factor analyses to be used as two measures of top management team quality: one quantifying top management team quality along the management resources dimension and the other quantifying top management team quality along the management structure dimension. Thus, two measures of top management team quality (rather than one) are constructed measuring top management team quality along two different dimensions.²

² A somewhat similar approach is used in Chemmanur, Paeglis, and Simonyan (2009) and Chemmanur, Paeglis, and Simonyan (2010) to measure top management team quality along two dimensions of management team resources and management team structure. The first study will be discussed later in this paper. The second study shows that the positive effect of higher management quality on equity issue characteristics is stronger in IPOs than in secondary equity offerings (SEOs). This stronger effect of management quality in IPOs is due to a larger degree of information asymmetry facing IPO firms in the financial markets compared to SEO firms.

Chemmanur and Paeglis (2005) find that firms with higher management quality (as measured by the management resources common factor and the management structure common factor) have more favorable IPO characteristics, such as underwriters with higher reputation, larger IPO offer sizes, lower underwriting spreads and other offering-related expenses, lower underpricing, and greater institutional investor participation in the firm's IPO, and better post-IPO stock return and operating performance.

In another approach, adopted by Bertrand and Schoar (2003), managerial characteristics are related to firm corporate policies by means of manager fixed effects used in regressions explaining the variation in corporate policy variables across firms. To implement this methodology, a manager–firm matched panel data set is constructed that makes it possible to track individual managers as they move from one firm to another. The application of this methodology demonstrates that manager fixed effects are important determinants of various corporate policy variables and there are general differences in “style” across managers, especially in acquisition and diversification policies, dividends, interest coverage, and cost-cutting. These differences in style are related to observable characteristics of managers, such as their age and whether they have an MBA degree. For example, older managers tend to be more conservative in their decision making (such as holding more cash, investing less in capital expenditures, and having lower levels of leverage), while those holding MBA degrees tend to be more aggressive in their decision making (such as paying less dividends, investing more in capital expenditures, and having higher levels of leverage).

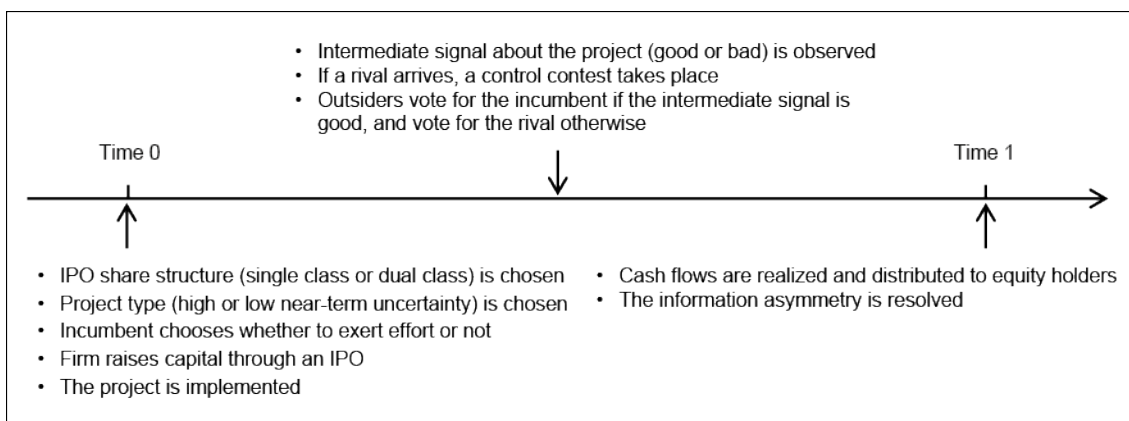
3. THEORETICAL MODELS OF THE RELATIONSHIP BETWEEN TOP MANAGEMENT QUALITY, CORPORATE INVESTMENT, AND INNOVATION

There are several studies in the literature that provide theoretical background on how managerial ability can potentially affect the innovative activities of a firm. One strand in this literature investigates how managerial ability and anti-takeover protection affect firm innovation. In general, the effect of anti-takeover protection on firm value and performance is ambiguous in the literature. On the one hand, the traditional view is that anti-takeover defenses tend to entrench incumbent managers, who are likely to exert less effort and consume perquisites of control. This, in turn, has a negative effect on firm value and performance. However, several recent studies have indicated that anti-takeover defenses may be valuable in the hands of higher quality managers by insulating them from the pressures arising in the market for corporate control and allowing them to implement valuable long-term investment projects (which are likely to be highly innovative).

Chemmanur and Jiao (2012) develop a theoretical model explaining the effect of management quality on the joint decision of entrepreneurial firms to adopt single- or dual-class share structures when conducting IPOs and the type of project to implement. In this model, an incumbent owner/manager of a firm going public wishes to sell equity to outsiders to raise capital for the firm's projects, and has to choose between single- and dual-class share structures. The incumbent enjoys both security benefits as well as the benefits of control from his/her equity holdings in the firm. The firm may have two types of projects: with high or low near-term uncertainty. Projects with high near-term uncertainty are intrinsically more valuable (can be more innovative); however, this higher intrinsic value is not revealed in the near term but over a longer time span, which may cause the share price of the firm to be temporarily

undervalued while the project is being implemented. If the firm’s manager undertakes a project with high near-term uncertainty, he/she may be more likely to lose control of the firm to a rival under a single-class share structure (in other words if the firm has weak anti-takeover protection) if the project does not progress well in the short term and outside investors choose to vote for the rival in a control contest. The incumbent may be talented (higher quality manager) or untalented (lower quality manager); a talented manager has a lower cost of exerting effort and an advantage in implementing projects compared with an untalented manager. Further, high near-term uncertainty projects generate higher cash flows than low near-term uncertainty projects if managed by talented managers. While the incumbent knows his/her true type, outside investors observe only a prior probability of the incumbent being talented (in other words, outsiders observe only the manager’s reputation). In this setup, the incumbent jointly decides on the IPO share structure (single- or dual-class), the type of a project to undertake, and the amount of effort to exert in implementing this project. Figure 1, taken from Chemmanur and Jiao (2012), demonstrates the sequence of events in this model.

Figure 1: Sequence of Events



The equilibrium in this model is driven by the choices of talented incumbents as untalented incumbents simply mimic these choices so as not to reveal their true type. There are three factors that affect the choice of the talented incumbent between single- and dual-class share structures. First, under a dual-class share structure (in other words if a firm has stronger anti-takeover defenses) the incumbent may create greater value by implementing projects with high near-term uncertainty as he/she will be protected from the takeover advances of rival firms. Given that the type of the project the incumbent chooses to implement is observable to outsiders, this value creation will be reflected in the IPO share price and will allow the incumbent to reduce the dilution effect due to the IPO. Second, under the dual-class share structure untalented incumbents will be protected from the disciplining effect of the market for corporate control, allowing them to slack off and dissipate value. Since outside investors cannot distinguish between talented and untalented incumbents, this loss of disciplining effects will be reflected in the IPO share price if the incumbent chooses to go public with a dual-class share structure. Third, given that there is a greater chance of losing control of the firm under the single-class share structure (regardless of the type of the project chosen), the expected value of the incumbent’s private benefits of control are higher under the dual-class share structure. This last factor does not directly affect the IPO share price but is an important consideration for the incumbent when choosing which share structure to adopt.

It follows that if the incumbent's reputation (perceived management quality) is high and the difference in the intrinsic values of high and low near-term uncertainty projects is large, the first and third effects above dominate the second effect, and the incumbent adopts a dual-class share structure in equilibrium and implements a high near-term uncertainty project. However, if the incumbent's reputation (perceived management quality) is low and the difference in the intrinsic values of high and low near-term uncertainty projects is small, the second effect above dominates the first and third effects, and the incumbent adopts a single-class share structure in equilibrium and implements a low near-term uncertainty project.

This theoretical model generates two important predictions. First, dual-class share structures are more likely in three types of firms: in industries in which considerable value can be created by ignoring temporary trends, family firms or firms run by founders who have high reputations (high management quality), and firms with large private benefits of control. Second, the post-IPO operating performance of firms with dual-class share structures will be better than that of firms with single-class share structures if the former are managed by higher reputation incumbents (higher quality managers), and they operate in industries in which the difference between the intrinsic values of high and low near-term uncertainty projects is large. On the other hand, the post-IPO operating performance of firms with single-class share structures will be better than that of firms with dual-class share structures if the former are managed by lower reputation incumbents (lower quality managers), and they operate in industries in which the difference between the intrinsic values of high and low near-term uncertainty projects is small.

In summary, the above discussion implies that higher quality managers will use stronger anti-takeover defenses to implement valuable long-term projects (which can be more innovative); however, lower quality managers will use stronger anti-takeover defenses to dissipate value. Thus, anti-takeover protection can add value in the hands of higher quality managers, who may use this protection to invest in rather uncertain (in the short term) but highly innovative projects that are expected to generate greater value in the long term. These conclusions challenge the traditional view of anti-takeover provisions and indicate that the effect of anti-takeover protection on firm value is more nuanced. On the one hand, anti-takeover provisions can be valuable in the hands of higher quality managers; on the other hand, they may dissipate value in the hands of lower quality managers.

The above discussion implies that the management quality of a firm is instrumental in stimulating innovation within the firm. A theoretical study by Manso (2011) analyzes how firms (or firm managers) can motivate innovative activities by their employees. The argument here is that traditional pay-for-performance incentive schemes may not motivate managers and employees to innovate given that innovative activities explore new and untested approaches that are likely to fail in many instances. In this model, an agent (manager or employee) is faced with a choice between the exploitation of well-known actions and exploration of new untested actions (innovation). The former promises reasonable payoffs but precludes the discovery of new superior actions. The latter is likely to reveal valuable information about new superior actions or waste time with inferior actions. The model is a two-period model in which the agent chooses between shirking, the exploitation of existing actions, and the exploration of new actions with uncertain payoffs. The optimal contract that motivates exploitation is a standard pay-for-performance contract, which rewards success but punishes failure (with low compensation or termination) and therefore is unlikely to motivate innovation. On the other hand, the optimal contract that motivates exploration (innovation) is the one with substantial tolerance for early failures (and in some instances even rewarding

failure) and rewarding long-term success. In this model, the compensation that a manager or employee earns depends not only on total performance but also on the path of performance; thus, someone who performs well initially but fails subsequently earns less than someone who fails initially but succeeds subsequently or someone who fails repeatedly. The important factors in motivating innovation are long-term compensation plans, job security, and timely feedback. Further, in terms of executive compensation plans, options with longer vesting periods, option repricing, golden parachutes, and managerial entrenchment further motivate managers to innovate as they increase the tolerance for early failure and reward long-term success. The findings of this model thus imply that managers who aim to motivate their employees to be innovative must have a certain degree of tolerance for failure and reward long-term rather than short-term success.

4. MANAGEMENT QUALITY, INVESTMENT AND FINANCIAL POLICIES, AND INPUTS IN CORPORATE INNOVATION

The effect of the management quality of a firm on its corporate policies is analyzed in Chemmanur, Paeglis, and Simonyan (2009). They hypothesize that higher quality managers are able to convey the intrinsic value of their firm to the equity market (or “certify” the value of their firm) more credibly, thus reducing the extent of information asymmetry facing the firm in the equity market. The lower extent of information asymmetry between the firm and the equity market, in turn, may affect the investment and financial policies of the firm.

The reduction in the extent of information asymmetry facing firms with higher quality managers occurs in the following manner. The top managers of a firm build reputational capital over the course of their careers, engaging in numerous dealings with the financial markets (arranging financing for their firms or issuing debt and equity securities). This reputational capital is important to top managers as it is likely to affect their prospects of joining other firms in the future, as well as their future compensation. The top managers of a firm who mislead financial markets by overpricing the stock of their firm (or deceiving the markets in other ways) are likely to have their reputation tarnished and their future job prospects (as well as future compensation) greatly diminished. Thus, more reputable top managers (or higher quality managers) are more likely to convey credible information about their firms to the financial markets since the potential loss to such managers (in terms of diminished future compensation and diminished future job prospects) is greater if they deceive or mislead the financial markets. Therefore, those firms that are managed by higher quality top management teams are likely to face a lower extent of information asymmetry in the financial markets.

Consequently, firms facing a lower extent of information asymmetry in the equity market will be able to access the equity market more easily—they will be more likely to issue equity since they can get a fairer price for the shares they sell in the equity market. This is likely to result in lower leverage ratios for firms with higher quality top managers. Further, a lower extent of information asymmetry facing a firm makes signaling to the equity market through dividends less important. Therefore, firms with higher quality top managers are likely to have lower dividend payout ratios.

Higher management quality of a firm may affect its corporate policies not only through the certification channel, as described above, but also through the ability channel. Higher quality managers are likely to select better projects (characterized by a higher net present value for any given scale) and implement them more ably. This, in turn, will result in a larger equilibrium scale of investment for higher management quality firms, and thus higher levels of capital expenditures and higher levels of inputs in corporate innovation, measured by the level of R&D expenses.

The above predictions are empirically tested using data on management quality hand-collected from the prospectuses filed by firms conducting seasoned equity offerings in 1993–1996. In this sample of firms, those with higher management quality in general have significantly greater levels of capital expenditures and R&D expenses, and significantly lower leverage and dividend payout ratios. Table 3, taken from the working paper version of Chemmanur, Paeglis, and Simonyan (2009), reports the results of seemingly unrelated regressions of leverage, dividend payout ratio, and investment and R&D levels on two top management team quality variables: the top management team resources common factor and the top management team structure common factor (as described in section 2).³ This table shows that the top management team resources common factor has a significantly negative effect on leverage and the dividend payout ratio, and a significantly positive effect on the levels of investment and R&D expenses, whereas the effect of the top management team structure common factor is only significant for the levels of investment and R&D expenses (this last effect is negative, contrary to expectation). These findings provide support for the hypothesized certification and ability channels through which the management quality of a firm is likely to affect its investment and financial policies as well as inputs in innovation, such as R&D expenses.

Additional evidence in support of the certification channel is provided in this study, in which the effect of top management team quality on the extent of information asymmetry facing a firm is empirically investigated. As hypothesized, firms with higher top management team quality do indeed face a lower degree of information asymmetry in the market and their equity is more liquid. In particular, higher management quality firms are followed by a larger number of financial analysts, are associated with smaller analyst earnings forecast errors, lower bid–ask spreads, and larger trading volume and equity turnover.

In summary, the empirical evidence shows that raising equity capital (and financing in general) is facilitated by having higher quality top management teams, which reduces the information asymmetry faced by firms in the equity market. This, in turn, helps firms invest larger amounts of capital in various projects, including innovative projects (i.e., firms with higher quality management teams are associated with greater R&D expenses). As we will see from the literature reviewed in the next section, the higher level of investment and inputs in corporate innovation (R&D expenses) facilitated by higher quality top management teams seem to translate into greater productivity in terms of corporate innovation.

³ The seemingly unrelated regressions technique is employed here to account for the fact that various investment and financial policies of a firm are likely to be determined simultaneously with its management quality.

Table 3: Seemingly Unrelated Regressions of Leverage, Dividend Payout Ratio, Investment, and R&D Levels on Management Quality and Reputation, and Other Control Variables

Dependent Variable	1	2	3	1	2	3
	LEVER	TRF	TSF	DIVID	TRF	TSF
Intercept	-1.062 (-8.22)***	-0.849 (-3.57)***	-0.142 (-0.79)	-0.063 (-2.69)***	-0.520 (-2.23)**	-0.172 (-0.96)
BOARDS	-0.002 (-0.45)			0.001 (1.60)		
LNBVA	0.080 (18.35)***	0.062 (7.39)***	0.004 (0.67)	0.003 (3.29)***	0.036 (4.73)***	0.006 (1.03)
LFAGE	-0.020 (-3.79)***	-0.066 (-6.28)***	0.016 (2.05)**	0.003 (2.65)***	-0.055 (-5.15)***	0.010 (1.26)
ODIR	-0.000 (-0.16)	-0.004 (-0.90)	-0.007 (-1.95)*	0.002 (3.45)***	-0.001 (-0.25)	-0.007 (-2.00)**
TOBINQ	-0.021 (-8.47)***	0.002 (0.31)	-0.001 (-0.20)	0.000 (0.16)	0.009 (1.75)*	0.001 (0.28)
ROA	-0.052 (-5.81)***	-0.025 (-1.40)	0.036 (2.70)***	0.001 (0.81)	-0.006 (-0.31)	0.036 (2.56)**
LEVER		-0.340 (-6.82)***	-0.027 (-0.71)			
DIVID					-1.293 (-5.06)***	0.027 (0.14)
INVEST						
RD						
RETS	-0.258 (-0.56)					
TRF	-0.088 (-6.79)***			-0.013 (-5.09)***		
TSF	-0.020 (-1.15)			-0.001 (-0.17)		
R ²	0.4422	0.1359	0.0929	0.1309	0.1313	0.0856
N	1,528	1,528	1,528	1,504	1,504	1,504
Dependent Variable	1	2	3	1	2	3
	INVEST	TRF	TSF	RD	TRF	TSF
Intercept	0.724 (5.28)***	-0.686 (-2.91)***	-0.131 (-0.72)	0.801 (4.77)***	-0.975 (-3.27)***	0.129 (0.60)
BOARDS	0.005 (0.99)			0.012 (2.14)**		
LNBVA	-0.027 (-6.06)***	0.042 (5.49)***	0.005 (0.87)	-0.046 (-8.12)***	0.052 (5.13)***	-0.006 (-0.77)
LFAGE	-0.024 (-3.80)***	-0.051 (-4.82)***	0.011 (1.32)	-0.000 (-0.04)	-0.060 (-4.42)***	0.023 (2.32)**
ODIR	-0.003 (-0.96)	-0.003 (-0.58)	-0.009 (-2.42)**	0.011 (2.92)***	-0.013 (-1.98)**	-0.004 (-0.94)
TOBINQ	0.001 (0.45)	0.008 (1.71)*	0.000 (0.03)	0.008 (2.61)***	0.004 (0.61)	-0.006 (-1.38)
ROA	-0.042 (-4.45)***	0.013 (0.82)	0.020 (1.56)	-0.266 (-17.91)***	0.170 (5.65)***	0.035 (1.64)

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Table 3 continued

Dependent Variable	1	2	3	1	2	3
	INVEST	TRF	TSF	RD	TRF	TSF
LEVER						
DIVID						
INVEST		0.311 (7.17)***	-0.089 (-2.64)***			
RD					0.559 (9.96)***	-0.123 (-3.02)***
RETSD						
TRF	0.104 (6.97)***			0.175 (9.73)***		
TSF	-0.040 (-2.08)**			-0.056 (-2.23)**		
R ²	0.3168	0.1296	0.0881	0.5597	0.1042	0.0868
N	1,518	1,518	1,518	938	938	938

LEVER is the ratio of the long-term debt plus debt in current liabilities to the long-term debt plus debt in current liabilities plus the book value of common equity. DIVID is the ratio of the sum of common and preferred dividends to earnings before depreciation, interest, and taxes. INVEST is the ratio of capital expenditure to the book value of assets. RD is the ratio of R&D expenses to the book value of assets. TRF is the team resources factor score obtained using common factor analysis on TSIZE, PMBA, PCPA, PFTEAM, and CORE. TSF is the team structure factor score obtained using common factor analysis on TENURE, TENHET, and FCEO. TSIZE is the size of a firm's management team, defined as executive officers with the rank of vice president or higher. PMBA is the percentage of a firm's management team with MBA degrees. PCPA is the percentage of a firm's management team who are CPAs. PFTEAM is the percentage of the management team having served as executive officers and/or vice presidents prior to joining the SEO firm. CORE is the percentage of the management team having core functional expertise, namely, holding positions in operations, sales and marketing, R&D, and finance. TENURE is the average number of years that management team members have been with the team. TENHET is the coefficient of variation of the team members' tenure. FCEO is the ratio of CEO salary and bonus in the fiscal year preceding the SEO to the average salary and bonus of other management team members. BOARDS is the number of other companies' boards on which management team members sit. LNBVA is the natural logarithm of the book value of the firm's assets at the end of the fiscal year prior to the SEO. LFAGE is the firm age, defined as the natural logarithm of one plus the number of years the firm has return data available from CRSP. ODIR is the number of outside directors. TOBINQ is the market value of assets divided by the book value of assets, where the market value of assets equals the book value of assets plus the market value of common equity less the sum of the book value of common equity and balance sheet deferred taxes. ROA is the ratio of earnings before extraordinary items to the book value of total assets. RETSD is the standard deviation of the total stock return calculated over 255 trading days for the fiscal year of the issue. LEVER, DIVID, INVEST, and RD are winsorized at the 99th percentile. Only observations with positive LEVER and DIVID are included in the regressions. All regressions include two-digit SIC code industry dummies. z-statistics are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

5. MANAGEMENT QUALITY AND THE PRODUCTIVITY OF CORPORATE INNOVATION

Several recent studies have analyzed the direct impact of management quality on corporate innovation. A study by Chemmanur, Kong, Krishnan, and Yu (2015) empirically analyzes how the quality of a seasoned firm's top management team affects its innovation activity and shows that firms with higher top management team quality innovate more as measured by the higher levels of R&D expenses, as well as greater numbers of patents and citations per patent. These findings are confirmed even after controlling for the endogeneity of top management team quality using the instrumental variable regression technique. In particular, the instrument used is a function of the number of management team members facing the military draft during the Viet Nam War and with an incentive to go to a graduate school to defer conscription.

One of the channels through which seasoned firms with higher top management team quality boost their innovation activity is by hiring a greater number of innovators and by hiring higher quality innovators, as evidenced by the number of citations per their patents. Further, seasoned firms with higher top management team quality engage in both exploratory and exploitative innovation strategies. Specifically, firms with higher top management team quality have a greater number of very successful innovations (patents that receive the highest number of citations), a greater number of unsuccessful innovations (patents that receive no citations at all), as well as a greater number of moderately successful innovations (patents that receive a number of citations somewhere in between) compared with firms with lower top management team quality. The first two findings are indicative of exploratory innovation strategies since such strategies are very risky and result in either highly successful or failed innovations. The latter finding is indicative of exploitative innovation strategies since such strategies employ more conventional technologies in areas that are more familiar to the firm.

Another recent study analyzing the effect of management quality on innovation in private firms is that of Chemmanur, Gupta, and Simonyan (2016), who show that entrepreneurial firms with higher top management team quality exhibit significantly greater pre-IPO innovation productivity as measured by the greater amount of R&D expenses, the greater number of patents, and the greater number of citations per patent compared with lower top management team quality firms. These relationships hold even after controlling for the endogeneity of management quality using the instrumental variable regression technique. The instrument used for top management quality is the number of acquisitions in the IPO firm's industry in the last four years before the firm goes public.

Private firms that have higher top management team quality and are also more innovative (have a greater number of patents) pre-IPO receive significantly higher valuations both in the IPO market and in the immediate secondary market, are able to go public at a younger age, and realize significant growth in post-IPO operating performance compared with other firms. Private firms with higher top management team quality and greater pre-IPO innovativeness also have a significantly greater number of anti-takeover provisions in their corporate charters at the time of going public. This last finding is consistent with the idea that higher quality managers use anti-takeover provisions to implement valuable long-term investment projects (which are likely to be more innovative).

One more recent study by Custodio, Ferreira, and Matos (2017) shows that CEOs with general managerial skills obtained over their professional career (skills that are transferable across firms and industries and are not firm-specific) produce more patents. A manager who has more general skills will be more likely to undertake risky innovative projects as he/she will be less sensitive to the risk of termination if the project is a failure. The more diverse work experience of "generalist" managers (compared to "specialist" managers) allows them to move easily from one job to another, even if they fail at a particular job, since their general skill sets and abilities are likely to be sought after in other industries and firms. Thus, the broad set of managerial skills possessed by "generalist" managers makes them more failure tolerant and as a result leads to greater innovation productivity. Further, given their diverse work experience in multiple fields, "generalist" managers can support innovation activities with a greater degree of originality. Indeed, the patents of "generalist" managers cite other patents belonging to a wider set of technological classes (as a measure of originality of patents) and receive more citations by subsequent patents across a wide range of technological fields (as a measure of generality of patents). "Generalist"

managers also engage in more explorative than exploitative innovation activities, indicating that their innovation activities are more likely to result in technological breakthroughs.

6. MANAGEMENT QUALITY, ANTI-TAKEOVER PROVISIONS, AND CORPORATE INNOVATION

As discussed previously, one of the ways in which the higher management quality of a firm can affect its innovation productivity is through better anti-takeover protection. Chemmanur, Paeglis, and Simonyan (2011) empirically investigate the relationship between the top management team quality of a firm going public and the prevalence of anti-takeover provisions in its corporate charter, and test the implications of two competing hypotheses: “management entrenchment” and “long-term value creation.”

According to the first hypothesis, anti-takeover provisions serve to entrench firm management by reducing the likelihood of being acquired by rival firms and insulating firm managers from the discipline imposed by the market for corporate control. Such entrenchment allows firm managers to exert less effort in running their firm and to extract a greater amount of control benefits. Thus, firms with lower management quality will be more likely to have stronger anti-takeover defenses (or a larger number of anti-takeover provisions in their corporate charters). This hypothesis also implies that regardless of management quality, better anti-takeover protection will result in lower firm valuation and worse operating performance because of the reduced disciplining effect of the market for corporate control on firm management. According to the second hypothesis, which is derived based on the theoretical model of Chemmanur and Jiao (2012), stronger anti-takeover defenses allow firm managers to invest in valuable but risky long-term investment projects without worrying about losing control of their firms to rival companies in control contests if such projects do not show any signs of success in the short term. Therefore, firms with higher quality managers (who have a greater ability to create long-term value) will be more likely to have stronger anti-takeover defenses since higher quality managers are more likely to use such defenses to implement long-term value-enhancing projects. Further, this hypothesis also predicts that those firms that have both higher quality managers and stronger anti-takeover defenses will have higher market valuations and better operating performance.

The above hypotheses are empirically tested using hand-collected data on the top management team quality of 719 IPO firms in 1993–2000, as well as hand-collected data on 19 firm-level anti-takeover provisions (to measure the degree of a firm’s anti-takeover protection). Among these IPO firms, those with higher top management team quality have a greater number of anti-takeover provisions in their corporate charters at the time of going public than those with lower top management team quality. Table 4, taken from Chemmanur, Paeglis, and Simonyan (2011), reports the means (frequencies) and medians of individual firm-level anti-takeover provisions, as well as the total number of anti-takeover provisions in the corporate charters of firms with higher top management team quality (firms with above median values for the top management team quality common factor) and firms with lower top management team quality (firms with below median values for the top management team quality common factor).⁴ Firms with higher top management team quality have significantly greater frequencies of provisions requiring staggered boards, meetings called only by directors

⁴ The descriptions of these firm-level anti-takeover provisions are provided in Appendix A, taken from Chemmanur, Paeglis, and Simonyan (2011).

or executive officers, advance notice requirements, restrictions on actions with written consent, and a supermajority necessary to replace directors. Overall, firms with higher top management team quality have a significantly greater number of anti-takeover provisions (4.5 on average) compared with firms with lower top management team quality (4.1 on average).

Table 4: Summary Statistics of Firm-level Anti-takeover Provisions for the Sample of IPO Firms in 1993–2000

	Overall Sample			Firms with Above Median Management Quality Factor Score		
	Mean	Median	St. Dev.	Mean	Median	St. Dev.
Individual firm-level anti-takeover provisions						
1. Anti-greenmail provision	0.0153	0	0.1228	0.0056	0	0.0750
2. Blank check preferred stock	0.9360	1	0.2449	0.9493	1	0.2197
3. Staggered boards	0.4353	0	0.4961	0.4761	0	0.5001
4. Fair price provision	0.0348	0	0.1833	0.0282	0	0.1657
5. Poison pills	0.0139	0	0.1172	0.0169	0	0.1291
6. Stakeholder clause	0.0695	0	0.2545	0.0676	0	0.2514
Shareholder meeting restrictions						
7. Meetings called only by directors or executives	0.3727	0	0.4839	0.4338	0	0.4963
8. Supermajority required to call special meetings	0.0181	0	0.1333	0.0169	0	0.1291
9. Advanced notice requirement	0.4117	0	0.4925	0.4620	0	0.4993
10. Restrictions on action by written consent	0.2601	0	0.4390	0.3070	0	0.4619
Supermajority vote requirements						
11. Supermajority required to approve mergers	0.1377	0	0.3448	0.1324	0	0.3394
12. Supermajority required to replace directors	0.1433	0	0.3506	0.1690	0	0.3753
13. Supermajority required to amend charter and bylaws	0.2976	0	0.4575	0.3042	0	0.4607
14. Unequal voting rights	0.1029	0	0.3041	0.0958	0	0.2947
Miscellaneous anti-takeover provisions						
15. Directors can be removed only for cause	0.2448	0	0.4303	0.2704	0	0.4448
16. Merger must be approved by inside directors	0.0028	0	0.0527	0.0056	0	0.0750
17. Restrictions on transfer of common stock	0.0362	0	0.1868	0.0310	0	0.1735
18. Restrictions on votes each shareholder may cast	0.0097	0	0.0983	0.0085	0	0.0917
19. Prohibition of cumulative voting for election of director	0.7413	1	0.4382	0.7239	1	0.4477
Total number of a firm's anti-takeover provisions	4.2837	4	2.5905	4.5042	4	2.5505

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Table 4 *continued*

	Firms with Below Median Management Quality Factor Score			Difference in Means t-statistic	Difference in Medians z-statistic
	Mean	Median	St. Dev.		
Individual firm-level anti-takeover provisions					
1. Anti-greenmail provision	0.0253	0	0.1572	-2.126**	-2.121**
2. Blank check preferred stock	0.9298	1	0.2559	1.091	1.091
3. Staggered boards	0.4017	0	0.4909	2.001**	1.997**
4. Fair price provision	0.0421	0	0.2012	-1.010	-1.010
5. Poison pills	0.0112	0	0.1056	0.641	0.641
6. Stakeholder clause	0.0730	0	0.2606	-0.283	-0.283
Shareholder meeting restrictions					
7. Meetings called only by directors or executives	0.3174	0	0.4661	3.223***	3.202***
8. Supermajority required to call special meetings	0.0197	0	0.1390	-0.274	-0.275
9. Advanced notice requirement	0.3652	0	0.4822	2.630***	2.619***
10. Restrictions on action by written consent	0.2163	0	0.4123	2.764***	2.751***
Supermajority vote requirements					
11. Supermajority required to approve mergers	0.1461	0	0.3537	-0.526	-0.526
12. Supermajority required to replace directors	0.1180	0	0.3230	1.944*	1.940*
13. Supermajority required to amend charter and bylaws	0.2949	0	0.4567	0.270	0.270
14. Unequal voting rights	0.1124	0	0.3163	-0.723	-0.724
Miscellaneous anti-takeover provisions					
15. Directors can be removed only for cause	0.2219	0	0.4161	1.502	1.500
16. Merger must be approved by inside directors	0.0000	0	0.0000	1.418	1.417
17. Restrictions on transfer of common stock	0.0421	0	0.2012	-0.791	-0.791
18. Restrictions on votes each shareholder may cast	0.0112	0	0.1056	-0.376	-0.376
19. Prohibition of cumulative voting for election of director	0.7612	1	0.4269	-1.137	-1.136
Total number of a firm's anti-takeover provisions	4.1096	3	2.6145	2.037**	2.318**

This table reports the means (frequencies) and medians of individual firm-level anti-takeover provisions and the total number of a firm's anti-takeover provisions for the overall sample of IPO firms and two sub-samples of IPO firms with above and below median management quality factor score. The management quality factor score is obtained using common factor analysis on firm-size-adjusted TSIZE, MBA, CPA, FTEAM, LAWACC, and FCEO. TSIZE is the size of a firm's management team, defined as the number of executive officers and vice presidents on a firm's management team. MBA is the number of management team members with MBA degrees. CPA is the number of management team members who are CPAs. FTEAM is the number of management team members who have served as executive officers and/or vice presidents prior to joining the IPO firm. LAWACC is the number of management team members who have previously been partners in a law or accounting firm. FCEO is the ratio of CEO salary and bonus to the average salary and bonus of other management team members in the fiscal year preceding the IPO. Significance levels are based on the parametric *t*-test for the difference in means between the two sub-samples and the Wilcoxon rank-sum test for the difference in medians between the two sub-samples. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 5, also taken from Chemmanur, Paeglis, and Simonyan (2011), shows the results of Poisson and logit regressions of the total number of anti-takeover provisions in an IPO firm's corporate charter at the time of going public on the top management team quality factor, as well as individual management quality proxies and other control variables. The top management team quality factor has a significantly positive effect on the number of anti-takeover provisions in all specifications. Among the individual top management team quality proxies, team size, the percentage of MBAs in the top management team, the percentage of team members who are CPAs, and CEO dominance have a significantly positive effect on the number of anti-takeover provisions. Thus, even after controlling for firm characteristics (such as firm size, growth options, leverage), firm internal governance (such as insider ownership, percentage of outside directors on the board of directors, CEO/Chairman of the board duality), IPO underwriter reputation, and IPO firm's state of incorporation, management quality is still important in increasing the number of anti-takeover provisions in an IPO firm's corporate charter.

Table 5: Relationship between Management Quality and the Prevalence of Anti-takeover Provisions for the Sample of IPO Firms in 1993–2000

	Poisson Maximum-likelihood Regressions with Total Number of Anti-takeover Provisions (1 through 19 in Appendix A) as Dependent Variable				Logit Regressions with Dependent Variable Equal to One if a Firm has Four or More Anti-takeover Provisions (as in Appendix A), and Zero Otherwise			
	1	2	3	4	5	6	7	8
Constant	-1.278 (-2.35)**	-1.207 (-2.24)**			-9.642 (-7.04)***	-9.682 (-7.28)***		
MQFACT		0.067 (2.29)**		0.052 (1.71)*		0.400 (2.89)***		0.357 (2.47)**
TSIZE	0.023 (2.36)**		0.020 (1.98)**		0.108 (2.31)**		0.106 (2.17)**	
PMBA	0.351 (2.79)***		0.246 (1.91)*		1.901 (2.97)***		1.602 (2.40)**	
PCPA	0.309 (2.08)**		0.176 (1.15)		1.800 (2.76)***		1.647 (2.42)**	
PFTEAM	-0.067 (-0.82)		-0.108 (-1.27)		-0.036 (-0.10)		-0.195 (-0.52)	
PLAWACC	0.287 (1.22)		0.405 (1.68)*		0.943 (0.91)		1.545 (1.40)	
FCEO	0.058 (1.74)*		0.041 (1.21)		0.368 (2.25)**		0.250 (1.53)	
TENURE	0.004 (0.81)	0.005 (1.13)	0.002 (0.46)	0.004 (0.90)	0.004 (0.19)	0.011 (0.56)	-0.000 (-0.01)	0.009 (0.43)
TENHET	0.000 (0.07)	0.004 (0.59)	0.004 (0.57)	0.007 (1.01)	0.033 (0.94)	0.043 (1.25)	0.042 (1.15)	0.055 (1.57)
CERDA	0.048 (0.89)	0.050 (0.94)	0.030 (0.51)	0.034 (0.58)	0.192 (0.93)	0.166 (0.80)	0.083 (0.37)	0.064 (0.28)
INSIDERB	-0.081 (-0.88)	-0.073 (-0.80)	-0.102 (-1.07)	-0.096 (-1.01)	-0.749 (-1.75)*	-0.710 (-1.70)*	-0.707 (-1.58)	-0.694 (-1.57)
ODIR	0.021 (0.28)	0.018 (0.24)	0.071 (0.91)	0.068 (0.87)	-0.182 (-0.53)	-0.151 (-0.45)	-0.020 (-0.05)	-0.010 (-0.03)
BOSS	-0.003 (-0.07)	0.002 (0.05)	0.003 (0.06)	0.005 (0.11)	-0.095 (-0.47)	-0.097 (-0.49)	-0.101 (-0.47)	-0.110 (-0.52)

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Table 5 continued

	Poisson Maximum-likelihood Regressions with Total Number of Anti-takeover Provisions (1 through 19 in Appendix A) as Dependent Variable				Logit Regressions with Dependent Variable Equal to One if a Firm has Four or More Anti-takeover Provisions (as in Appendix A), and Zero Otherwise			
	1	2	3	4	5	6	7	8
LNBVA	0.105 (5.95)***	0.126 (7.81)***	0.092 (5.00)***	0.110 (6.52)***	0.389 (5.02)***	0.482 (6.56)***	0.369 (4.58)***	0.445 (5.79)***
LEVERAGE	-0.064 (-1.11)	-0.075 (-1.34)	-0.111 (-1.81)*	-0.120 (-2.00)**	0.079 (0.35)	0.010 (0.05)	-0.046 (-0.19)	-0.090 (-0.40)
REP	0.282 (0.54)	0.328 (0.62)	0.532 (0.99)	0.612 (1.15)	5.094 (1.63)	4.636 (1.54)	5.192 (1.65)*	4.855 (1.59)
STATELAW	0.563 (5.93)***	0.566 (6.00)***			2.015 (4.92)***	1.961 (4.93)***		
DELAWARE	0.040 (0.99)	0.032 (0.81)			0.112 (0.61)	0.044 (0.25)		
State fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	No	No	No	No
N	711	711	707	707	711	711	678	678
Pseudo R ²	0.0925	0.0871			0.1855	0.1644	0.1545	0.1346

TSIZE is the number of executive officers and vice presidents on a firm's management team. PMBA is the percentage of a firm's management team with MBA degrees. PCPA is the percentage of a firm's management team who are CPAs. PFTEAM is the percentage of a firm's management team having served as executive officers and/or vice presidents prior to joining the IPO firm. PLAWACC is the percentage of a firm's management team having previously been partners in a law or accounting firm. FCEO is the ratio of CEO salary and bonus to the average salary and bonus of other management team members in the fiscal year preceding the IPO. TENURE is the median number of years that management team members have been with a firm. TENHET is the coefficient of variation of the team members' tenures. CERDA is the ratio of the sum of capital expenditures and R&D expenses to the book value of assets at the end of the fiscal year prior to IPO. INSIDERB is the proportion of voting power owned by firm officers and directors immediately prior to IPO. ODIR is the proportion of outside directors on the board of directors. BOSS is equal to one if a CEO is also Chairman of the board of directors, and zero otherwise. LNBVA is the natural logarithm of the book value of assets immediately prior to IPO. LEVERAGE is the ratio of long-term debt to the book value of assets prior to IPO. REP is the underwriter reputation measured as the lead underwriter's share of the total proceeds raised by all IPOs in 1993–2000. STATELAW is equal to one if the state in which a firm is incorporated has at least one state anti-takeover provision, and zero otherwise. DELAWARE is equal to one if a firm is incorporated in the state of Delaware, and zero otherwise. MQFACT is the management quality factor score obtained using common factor analysis on firm-size-adjusted TSIZE, MBA, CPA, FTEAM, LAWACC, and FCEO. *t*-statistics are in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Other empirical findings indicate that IPO firms with higher top management team quality and greater growth options have a significantly larger number of anti-takeover provisions in their corporate charters compared with other firms. IPO firms with higher management quality that also have a greater number of anti-takeover provisions in their corporate charters realize better post-IPO operating and stock return performance, as well as receive higher IPO valuations. All these findings are consistent with the long-term value creation hypothesis and contradict the management entrenchment hypothesis, indicating that anti-takeover provisions may be valuable if used by higher quality managers as they are more likely to use anti-takeover protection to implement long-term value-enhancing projects (which are likely to be highly innovative).

The empirical evidence above suggests that the higher management quality of a firm leads to stronger anti-takeover defenses in its corporate charter. But how do the stronger anti-takeover defenses of a firm affect its innovation productivity? A study by Chemmanur and Tian (2016) shows that established firms with a greater number of anti-takeover provisions (as measured by the G-index developed by Gompers, Ishii, and Metrick [2003]) exhibit greater innovation productivity. In particular, firms with a greater number of anti-takeover provisions have a greater number of patents (quantity of innovation) as well as a greater number of citations per patent (quality of innovation). It is important to recognize that the number of anti-takeover provisions in a firm's corporate charter is endogenous given that some unobservable firm characteristics may jointly determine both the innovation productivity of the firm and the number of anti-takeover provisions in its corporate charter. To establish causality, Chemmanur and Tian (2016) use regression discontinuity methodology, which relies on "locally" exogenous variation in the number of anti-takeover provisions generated by the governance proposal votes that either pass or fail to pass by a small margin of votes during annual shareholder meetings. For these close-call votes, passing a proposal is a random, independent event that is unlikely to be correlated with firm characteristics. This randomized variation in the number of anti-takeover provisions is a result of voters' inability to control precisely the number of votes near the cutoff that determines the vote outcome.

After controlling for the endogeneity of the number of anti-takeover provisions using regression discontinuity methodology, the number of anti-takeover provisions still has a positive effect on a firm's innovation. Specifically, the proposals that intend to reduce the number of anti-takeover provisions lead to a decrease in the number of patents and a decrease in the number of citations per patent over the next three years after the vote. Further, the positive effect of anti-takeover provisions on innovation is stronger for firms facing a greater extent of information asymmetry in the financial market and more competition in the product market (these are the characteristics of firms that are more likely to be subject to short-term pressure from public market investors). This last finding provides further support for the "long-term value creation" hypothesis discussed above.⁵

Anti-takeover provisions also increase firm value, but only if a firm is highly productive in its innovation activities. On the other hand, the valuations of those firms with lower innovation productivity (or no innovation activities at all) decrease with the number of anti-takeover provisions in their corporate charters. This suggests that anti-takeover provisions are value-enhancing for those firms that are innovative, but are value-destroying for those firms that are not engaged in significant innovation activities.

⁵ While Chemmanur and Tian (2016) demonstrate that a greater number of firm-level anti-takeover provisions are associated with more corporate innovation, Atanassov (2013) shows that state-level anti-takeover provisions stifle innovation. In fact, firms incorporated in states that pass anti-takeover laws experience a significant decline in their innovation productivity within two years after such laws are passed compared to firms incorporated in states that do not pass anti-takeover laws. Sapra, Subramanian, and Subramanian (2014) predict a U-shaped relationship between corporate innovation and external takeover pressure, and show that corporate innovation is fostered if state antitakeover laws are either practically non-existent or severe enough to be effective in warding off unwanted takeover attempts.

7. VENTURE CAPITAL BACKING, MANAGEMENT QUALITY, AND CORPORATE INNOVATION

Venture capital backing is shown in the literature to be one of the important factors contributing to the innovation productivity of a firm. A study by Kortum and Lerner (2000) demonstrates that the increases in venture capital activity in manufacturing industries (while controlling for R&D spending) are associated with greater innovation productivity as measured by higher patenting rates. Given that both venture capital funding and patenting can be positively related to an unobservable factor, such as the arrival of new technologies, the causality between venture capital funding and innovation is established by means of instrumental variable analysis. The 1979 US Labor Department's clarification of the Employee Retirement Income Security Act is used as an instrument in this analysis. This clarification allowed pension funds to invest in venture capital firms, sharply increasing the inflow of funds to the venture capital industry. Since this exogenous policy change is unlikely to be correlated with the arrival of new technologies, the instrument satisfies the exclusion restriction. The causality concern can be addressed by also using the number of patents over R&D expenses ratios as dependent variables in the regression analysis rather than the number of patents, thus using R&D expenses as a control for the arrival of new technologies. Regardless of the way the causality concern is addressed, the empirical evidence suggests that venture capital backing has a strong positive effect on innovation. Finally, in a small sample of Massachusetts firms (with and without venture capital backing), the patents of venture capital-backed firms are more frequently cited by other patents and are more aggressively litigated, indicating that the patents of venture capital-backed firms are not of lower quality.

One of the channels through which venture capital backing can affect innovation is through management quality. A study by Chemmanur, Simonyan, and Tehranian (2016) analyzes the relationship between venture capital backing and top management team quality, and shows that IPO firms backed by venture capital have higher top management team quality at the time of going public compared to firms not backed by venture capital. In particular, IPO firms backed by venture capital have significantly higher percentages of top management team members with MBA degrees, with prior managerial experience at other firms, and with core functional expertise compared to IPO firms not backed by venture capital. At the same time, IPO firms backed by venture capital have significantly lower percentages of CPAs, shorter tenures, and less heterogeneity in tenures. However, the overall effect of venture capital backing on top management team quality (as measured by the top management team quality common factor) is positive, implying that top management team quality is an important channel through which venture capital affects innovation.

Another study on how venture capital backing affects a firm's management is that of Hellmann and Puri (2002), who investigate 170 Silicon Valley start-up firms and show that venture capital backing leads to the professionalization of such firms, including the formulation of human resource policies, adoption of stock option plans, and hiring of marketing vice presidents. Firms backed by venture capital are more likely to replace the founder of a firm with an outside chief executive officer and do so faster, and venture capitalists take both supportive and controlling roles in such replacement decisions. The effect of venture capital backing is more pronounced for firms in early stages of their development. These findings suggest that venture capitalists act not only as financial intermediaries but also have a broader value-added impact on the development of firms backed by them, in particular in terms of putting together resources for the firm.

Venture capitalists also play a role in the “standardization” of family firms in terms of transforming their corporate governance and top management. A study of a sample of Chinese firms by Chemmanur, Hu, and Wu (2016) shows that family members are more likely to leave management positions in firms backed by venture capital compared to firms not backed by venture capital. This effect is stronger if venture capitalists have larger equity holdings in the firms they back and greater representation on their boards of directors. Family control rights, cash flow rights, and the separation between the two drops to a greater extent in firms backed by venture capital. In the firms backed by venture capital, the drop in family control rights and the separation of family control and cash flow rights leads to improved post-IPO operating performance and higher firm valuation immediately after the IPO. These effects indicate that venture capitalists not only standardize the firms they back by facilitating the departure of family members from management positions and reducing family control rights, but also help firms in other ways enabling them to translate these changes in corporate governance into better operating performance and higher valuations.

Even though venture capital backing for a firm is associated with the firm’s greater innovation productivity, not all venture capitalists may have the same effect in this respect. A study by Chemmanur, Loutskina, and Tian (2014) shows that IPO firms backed by corporate venture capital (venture capital funds established by corporations) are more innovative (produce more patents and receive more citations per patent) but are younger, riskier, and less profitable compared with IPO firms backed by independent venture capital (venture capital funds established by independent venture capital firms). There are several reasons for the difference between corporate and independent venture capital. First, corporate venture capital funds have longer lives given that they are organized as subsidiaries of their parent firms, whereas the lifespans of independent venture capital funds are shorter since they are organized as limited partnerships and have contractually enforced lifespans of around 10 years. Thus corporate venture capital funds have longer investment horizons. Second, corporate venture capital funds pursue both the strategic objectives of their parent firms as well as financial objectives, whereas the objectives of independent venture capital funds are mostly financial (such as earning higher investment returns). Third, the compensation schemes of the managers of corporate venture capital funds are not purely performance-based (unlike those of the managers of independent venture capital funds), and are in the form of fixed salary and bonuses tied to the performance of their parent firms. The above differences are likely to make corporate venture capital more open to experimentation and more tolerant of occasional failures of the firms they back, which in turn are likely to foster greater innovation productivity. Further, corporate venture capitalists are better equipped with industrial and technological knowledge due to the presence of their corporate parent firms, and therefore are more efficient in using the soft information on the R&D activities of the private firms they back.

Does tolerance for failure indeed drive innovation? A study of a sample of venture capital-backed IPO firms by Tian and Wang (2014) demonstrates that entrepreneurial firms backed by more failure-tolerant venture capital firms have greater innovation productivity, measured both by the number of patents produced and by the number of citations per patent. The effect of failure tolerance on innovation is much stronger in riskier ventures (ventures started in times of recession, ventures in early development stages, and ventures in industries in which innovation is hard to achieve) for which failure tolerance is more important for ultimate success. Thus, the empirical evidence suggests that venture capitalists (as well as entrepreneurial firm managers) must have a certain degree of failure tolerance to be successful in fostering innovation.

8. MANAGEMENT QUALITY, THE GOING PUBLIC DECISION OF ENTREPRENEURIAL FIRMS, AND CORPORATE INNOVATION

The management quality of an entrepreneurial firm may affect its decision to go public, to be acquired, or to stay private. This decision has been theoretically modeled by He and Li (2016), who argue that an innovative entrepreneurial firm may have an incentive to choose to go public as an exit decision versus being acquired or staying private because this choice allows the firm to motivate its employees (managers) to make a greater effort in developing the long-term growth potential of the firm. This is because being a public company, the firm is able to design more effective equity-based compensation schemes for its employees tied to the firm's stock price and the stock price provides a higher signal-to-noise ratio regarding the employees' human capital input. Clearly, if the firm is acquired (instead of going public) and thus becomes part of a larger firm, providing such equity-based compensation is less efficient since the only equity trading represents the performance of various units of the acquirer (and the target firm's performance may be only a small part of overall firm performance). Similarly, a private firm's equity is also not suitable for providing such incentives since the equity is not traded at all, so its value does not reflect the firm's current performance.

This model predicts that firms with greater human capital intensity and with higher management quality will go public at a younger age. The intuition behind this prediction is that higher quality management teams have a lower cost of effort, so it is cheaper to provide efficient equity-based compensation schemes even when the stock price is less informative about true firm performance (as may be the case for younger firms). This prediction is supported by the empirical evidence of Chemmanur, Simonyan, and Tehranian (2016), who show that firms with higher quality top management teams go public at a younger age.

Going public (rather than remaining private), however, may not be unambiguously beneficial from the point of view of corporate innovation. As argued in a seminal paper by Stein (1988), public firms have the problem of short-termism or "corporate myopia," which induces them to underinvest in long-term projects and undertake short-term projects under the pressure of showing good results to stock market investors. One solution to this problem has been suggested by Chemmanur and Jiao (2012), namely, dual-class share structures, or more generally stronger anti-takeover provisions in a firm's corporate charter (as discussed in section 3). In contrast to the above two studies, the theoretical analysis of Ferreira, Manso, and Silva (2014) argues that while public firms may suffer from short-termism, private firms may suffer from inefficient "long-termism." If the stock market does not punish short-term declines in earnings, managers of private firms may become rationally biased toward innovative projects, which are risky but very profitable if successful. Thus, they may choose innovation even if it is inferior to conventional methods. This model predicts that whether remaining private or going public is best for corporate innovation depends on the nature of the innovative projects available to the firm. Therefore, it is optimal for a firm to go public when exploiting existing ideas and it is optimal to stay private when exploring new ideas.⁶ This prediction is consistent with empirical evidence provided

⁶ Bhattacharya and Ritter (1983) analyze a model in which firms may compromise their ability to innovate if they disclose information to outside investors. Maksimovic and Pichler (2001) develop a model that is based on a similar trade-off facing firms when choosing between a new or existing technology and deciding whether to finance investment with public or private offerings. Public offerings are cheaper, but

by Chemmanur, He, and Nandy (2010), who find that firms go public at the peak of their productivity and their performance declines after going public. In other words, firms go public only after they perfect a new technology and become public in the “harvesting” period.

Evidence relevant to the above prediction of Ferreira, Manso, and Silva’s (2014) model is also provided by Bernstein (2015), who studies how the decision to go public affects corporate innovation by comparing the innovation activity of firms that go public with that of firms that withdraw their IPO filing and remain private. On the one hand, firms going public experience a decline in the quality of their internal innovation post-IPO, as well as face an exodus of skilled inventors and a decline in the productivity of the remaining inventors. On the other hand, public firms attract new human capital and acquire external innovation. Thus the going public decision changes firms’ strategies in pursuing innovation.

In summary, the effect of management quality on corporate innovation through the timing of the going public decision (timing in terms of the firms’ life cycle) is complex: on the one hand, firms with higher quality management teams are able to go public at a younger age; on the other hand, whether it is optimal for them to do so depends on the nature of the innovative activities undertaken by the firm.

9. LESSONS FROM THE LITERATURE AND IMPLICATIONS FOR PUBLIC POLICY IN ASIAN COUNTRIES

We now discuss the lessons that may be drawn from the theoretical literature discussed in section 3 for policymakers in various countries in Asia and elsewhere, and draw implications for public policy aimed at enhancing corporate innovation in these countries. Unfortunately, there is currently no evidence concerning the relationship between top management quality and innovation directly based on analyzing firms located in Asian countries. However, while the evidence presented in this paper on the effect of management quality on corporate innovation is based largely on US firms, we believe that this evidence is generalizable to firms all over the world, given the fact that the relationship between management quality and innovation holds for firms in a variety of different US contexts, such as private and public firms, firms newly going public and seasoned firms, venture-backed and non-venture-backed firms, etc. Thus, one would expect the relationship between management quality and innovation we document in this paper also to hold for Asian firms. We therefore now turn to drawing policy implications for firm managers and other practitioners in Asia.

Lesson 1. Firms with higher quality top management teams will provide greater inputs in innovation (such as R&D expenses) and will generate greater innovation productivity (as measured by the number of patents and the number of citations per patent). Such firms will also have greater innovation efficiency (measured by the number of patents per R&D dollar).

they reveal information about industry profitability to potential competitors. Thus, firms may strategically delay financing or resort to private offerings to prevent competition. Spiegel and Tookes (2013) develop and estimate a dynamic oligopoly model that incorporates somewhat similar trade-offs.

Policy Implication. Investment in the development of high quality top management teams (such as, for example, investment in educational and other institutions that train corporate managers, management development programs for senior managers, etc.) will lead to significant increases in investment in innovation (R&D spending), as well as to increases in innovation productivity. Improving the corporate governance of such firms by requiring them to have more independent board members will also lead to increases in innovation productivity, as documented in Balsmeier, Fleming, and Manso (2017). Further, encouraging firms to have board members with a background in high-tech industries will have a positive effect on shareholder value through the channel of corporate innovation. For example, Kim, Shim, and Yoo (2016) show that the announcement effects of acquisitions of target firms with independent directors with PhD degrees in science, technology, engineering, and mathematics (STEM directors) are higher compared to those of firms with non-STEM directors. This positive effect of STEM directors on shareholder value is more pronounced when target firms are in high-tech industries and invest more in R&D.

The empirical finding that higher quality top management teams generate greater quantity and quality of innovation has important implications for governments, firm managers, and other practitioners in Asian countries. The evidence we have reviewed in this paper suggests that given the large untapped human capital resources of Asian countries (e.g., the proportion of the total population of less than 30 years of age is 53.30% in Pakistan, 45.70% in India, and 45.02% in Malaysia, to name just a few), it makes sense for the governments of Asian countries to invest not only in developing technical and scientific education, and improving the technical skills of employees directly involved in innovative activities (such as preparing high-quality scientists and researchers), but also to invest in developing management education and training so as to increase the managerial skills and the human capital of the managers of various firms.⁷ This is because, in order to increase innovation productivity, it is important that innovative resources are managed well.

Lesson 2. Anti-takeover provisions in corporate charters of firms that lengthen their managerial horizons will lead to increases in corporate innovation productivity, especially if the firms are managed by higher quality top management teams.

Policy Implication. Firms (especially those in high-tech and other innovative industries) should be allowed to have anti-takeover provisions in their corporate charters. Thus, corporate and business laws, and stock exchange listing requirements should not discourage the use of dual-class share structures, staggered boards, and other firm-level anti-takeover provisions since these lengthen corporate investment horizons and foster corporate innovation. Further, for very innovative firms such anti-takeover provisions will increase shareholder value, as documented in Chemmanur and Tian (2016).

Lesson 3. Venture capital backing directly affects corporate innovation in entrepreneurial firms by increasing the productivity of such innovation, and also does so indirectly through the management quality channel, by increasing the quality of top management teams.

⁷ The demographic data are taken from www.indexmundi.com

Policy Implication. Encouraging the growth of local venture capital industries in various Asian countries may pay rich dividends by enhancing inputs in innovation and the productivity of corporate innovation. In addition to encouraging the development of local venture capital industries, fostering the participation of highly reputable foreign venture capitalists (who may have more expertise in backing high-tech and other innovative entrepreneurial firms) may also be conducive to enhancing innovation in Asian countries since there is much that local venture capitalists can learn from making syndicated investments with foreign venture capitalists in entrepreneurial firms. Each type of venture capitalists may bring their own strengths to the investment—proximity and local market knowledge in the case of local venture capitalists and venture capital investing expertise in the case of international venture capitalists. For example, Chemmanur, Hull, and Krishnan (2016) show that when foreign venture capitalists invest in emerging market countries, the type of venture capital syndicates that is best at helping entrepreneurial firms succeed is that involving a combination of foreign and local venture capitalists. While this study measures success for entrepreneurial firms using the ability to go public or to be acquired (i.e., successful exit), we can also extrapolate the results of this study to success in innovation.

Lesson 4. While the public capital market is the cheapest source of external financing and therefore the best way for a firm to grow, remaining private is more conducive to exploring new ideas, with firms going public only after perfecting a new technology, as shown in Bernstein (2015).

Policy Implication. Reducing regulatory and other barriers and the monitoring costs involved in the going public process in Asian countries is likely to allow firms to choose between private and public status optimally, depending upon the nature and stage of their innovation activities, thereby enhancing corporate innovation in these countries. Thus, legislation like the Jumpstart Our Business Startups (JOBS) Act passed by the US Congress and signed into law by President Obama in 2012 may also be a good model for Asian countries, reducing the information that needs to be disclosed by start-up firms while filing to go public. There is some evidence, documented in Dambra, Field, and Gustafson (2015), that the passing of the JOBS Act increased the number of firms conducting IPOs in the US in the years immediately after the amended requirements for going public became effective. However, the reduction in the number of IPOs in the 1990–2011 period may be confined to US IPOs only, since during this period the effects of financial globalization reduced the impact of national institutions on domestic IPO activity and enabled more non-US firms from countries with weak institutions to go public with a global IPO (see Doidge, Karolyi, and Stulz [2013]). Nevertheless, the most important policy implication here is for Asian and other developing countries to develop their IPO and other equity markets to the greatest extent possible, since in many highly innovative industries (e.g., the biotechnology industry) firms require large infusions of capital in their early years, while hardly yielding any profits. Getting efficient access to the IPO market when the firms are very young is the cheapest way for them to raise the capital required.

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APPENDIX A: DESCRIPTIONS OF THE FIRM-LEVEL ANTI-TAKEOVER PROVISIONS IN CORPORATE CHARTERS ANALYZED IN TABLE 4

Provision	Description
1. Anti-greenmail provision	Greenmail refers to targeted stock repurchases of company shares by management, usually at a substantial premium over the market value, from groups or individuals seeking control of the company. Anti-greenmail provisions prohibit managers from entering into such arrangements with bidders, unless they are approved by shareholders or the same repurchase offer is made to all shareholders.
2. Blank check preferred stock	This is preferred stock that is authorized but not issued. It gives a company's board of directors the power to issue shares of preferred stock at its discretion and determine its voting, distribution, conversion, and other rights at the time of the issue. Blank check preferred stock can be placed with friendly parties to deter potential takeover bids by diluting bidders' equity and voting positions. It can be also used to establish poison pills.
3. Staggered (classified) board	A staggered board is a board of directors that is usually divided into three classes, with each class serving a three-year term, and each class being elected in different years. Classifying the board makes it more difficult to change the control of the company through proxy contests since only a minority of directors is elected each year. A bidder who has voting control of the company will be unable to gain control of the board in a single election and will need up to two years to do so.
4. Fair price provision	This provision is usually adopted to defend against two-tiered front-end-loaded tender offers when the bidder first buys a controlling block of shares and then offers a lower price to remaining shareholders. This usually forces the target shareholders to tender their shares in the first stage, regardless of the price offered, since the second-stage price is going to be lower. Fair price provisions usually require the bidders to pay the remaining shareholders the same price as that paid to acquire the controlling block in the first stage. The bidder may avoid such pricing requirements if the offer is approved, typically by the supermajority of disinterested shareholders or the board of directors.
5. Poison pills	Also known as shareholder rights plans, poison pills are financial instruments in the form of rights or warrants issued to shareholders trading with common shares. When triggered by a hostile takeover attempt, poison pills detach, trade separately, and become valuable. Poison pills can dilute a bidder's equity holdings and voting interests in a target company by giving a right to common shareholders to buy additional shares of the target company at a steep discount, or they can dilute a bidder's equity holdings in a merged company by giving the right to target firm shareholders to buy discounted shares of the post-merger company.
6. Stakeholder clause	This provision permits directors, when evaluating takeover bids, to consider the interests of constituencies other than shareholders, such as employees, creditors, suppliers, customers, surrounding communities, and others. The stakeholder clause provides target firm directors with a legal basis to take actions that could be value-decreasing for shareholders, for example, turning down attractive takeover bids.

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Appendix A table continued

Provision	Description
Shareholder meeting restrictions	
7. Meetings called only by directors or executives	This provision authorizes only directors or executives and not common shareholders to call special shareholder meetings to act on matters that arise between regularly scheduled meetings. It can deter potential takeovers by delaying the removal of directors by a controlling bidder or by hindering the ability of common shareholders to vote on attractive bids.
8. Supermajority required to call special meetings	This provision allows common shareholders to call special shareholder meetings if they can get the consent of a shareholder or groups of shareholders holding a supermajority of outstanding shares.
9. Advanced notice requirement	This provision requires shareholders to give advanced notice regarding the matters they intend to present at the shareholders' meeting. It usually specifies a "window" for the earliest and the latest dates for such submissions, e.g., no later than 60 days prior to the meeting, with a submittal window of at least 60 days. Advance notice requirements can deter takeovers by prohibiting shareholders from voting on matters regarding takeover bids if proper advance notice was not submitted.
10. Restrictions on action by written consent	An action by written consent is an action taken without a meeting if shareholders individually or collectively consent in writing to such action. A provision that limits the ability of shareholders to act by written consent, by prohibiting it or requiring unanimous/majority written consent, can delay takeovers by forcing a bidder to take action at the next scheduled meeting.
Supermajority vote requirements	
11. Supermajority required to approve mergers	This provision requires the vote of a supermajority (usually, at least two-thirds and up to 90%) of shareholders to approve mergers, business combinations, or asset sales. Supermajority requirements are often unattainable, either because they exceed the level of shareholder participation at a meeting or because of a large size of insider or employee stock ownership plan (ESOP) shareholdings.
12. Supermajority required to replace directors	This provision requires the vote of a supermajority of shareholders to replace directors and can deter takeovers by limiting the ability of a bidder to remove directors opposing the takeover.
13. Supermajority required to amend charter and bylaws	This provision requires the vote of a supermajority of shareholders to amend a charter or bylaws and restricts the ability of shareholders to repeal other anti-takeover provisions that are usually proposed as amendments to charters and bylaws.
14. Unequal voting rights	Unequal voting rights refer to a share structure with more than one class of common shares that have different voting rights. Usually, insiders of a firm, such as managers and inside directors, hold a class of shares that gives them more than one vote per share compared to the class held by other shareholders with only one vote per share.

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Appendix A table continued

Provision	Description
Miscellaneous anti-takeover provisions	
15. Directors can be removed only for cause	According to this provision, members of a board of directors can be removed only for cause, which limits the ability of potential acquirers to remove directors opposing a takeover.
16. Merger must be approved by inside directors	This provision requires the approval of inside directors or directors not related to a potential bidder for a merger to take effect.
17. Restrictions on transfer of common stock	This type of provision puts various restrictions on the transfer of common stock. For example, a provision like this may require principal shareholders to offer their shares first to other principal shareholders before selling them.
18. Restrictions on votes each shareholder may cast	This type of provision puts various restrictions on the votes each shareholder may cast. For example, shareholders who own more shares than a pre-specified threshold may cast only half of their votes.
19. Prohibition of cumulative voting for election of directors	Cumulative voting permits shareholders to put together (cumulate) all their votes for directors and distribute these votes among one, a few, or all directors when more than one director is nominated for election. Cumulative voting makes it easy for minority shareholders to elect their own representatives and can be particularly important in proxy contests. The prohibition of cumulative voting limits the ability of bidders to elect their own representatives to the board of directors.