Golden Parachutes, Takeover Incentive, and Risk-Taking*

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Abstract

We examine the relations between golden parachutes (GPs), pay-performance sensitivity (delta), and managerial risk-taking. We find an insignificant effect of GPs, but a negative and significant interaction of GPs with delta, on risk-taking. These results are consistent with the "takeover incentive hypothesis," an original proposition stating that GPs influence risk-taking through the incentive of a CEO with a GP to accept a takeover, as well as delta's role in affecting the weight of the CEO's incentive to maximize the expected takeover-associated equity portfolio wealth. The findings do not support the proposition that GPs influence risk-taking through an insurance effect.

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1. Introduction

Golden parachutes (GPs) are severance agreements that provide a CEO with compensation pay if the CEO is fired, demoted, or resigns following a change in control. We conduct an empirical analysis of the effect of GPs on the incentives of CEO risk-taking. Our study is motivated by two possible interpretations of GPs that have implications on managerial risk-taking. First, a growing strand of literature examines the effect of conventional (non-takeover-related) severance agreements on managerial risk-taking (Ju et al., 2003; Cadman et al., 2011; Huang, 2011; Brown et al., 2012; Mansi et al., 2013).[3] The consensus finding is that severance contracts promote risk-taking. This is consistent with the idea that downside compensation is important to induce a risk-averse manager to take risks. If worse performance results in a higher chance of a firm being acquired (Palepu, 1986; Bates et al., 2008; Brar et al., 2009), and if acquisitions imply loss of jobs for managers,[4] GPs could be viewed as a means for downside compensation as well. We extend the analysis of the effect of downside compensation on managerial risk-taking to GPs.

The analogy between GPs and conventional severance agreements has an important qualification. An implicit assumption behind the risk-inducing effect of conventional severance agreements is that managers have little means to retain their jobs should boards of directors attempt to fire them upon the unfavorable outcome of risk-taking. Therefore, without a severance agreement, a rational manager attempts to minimize the chance of being fired by taking fewer risks. Conventional severance agreements thus can promote the risk-taking incentives of the

[3] For additional papers on conventional severance agreements, see, e.g., Berkovitch et al. (2000), Rusticus (2006), Yermack (2006), Goldman and Huang (2011) and Rau and Xu (2013).

[4] Hartzell et al. (2004) present evidence that nearly two-thirds of target firm CEOs leave their firms either at the time of or within one year of the acquisitions. Most of these departures represent the end of careers for these CEOs. Two years after acquisitions, fifty-eight percent of all target firm CEOs in their sample were either retired, working for a government or non-profit organization, or the authors were unable to identify any subsequent positions.

manager. However, managers faced with a takeover threat may have resources to defend themselves and protect their jobs. Corporate executives typically have a slate of antitakeover devices at their disposal (e.g., poison pills), and some of them can be readily installed should unfriendly acquirers attempt to take over their firms (Ryngaert, 1988; Bebchuk et al., 2002).

In light of antitakeover devices, the role of GPs may be less about compensating a CEO for her downside losses, but more about increasing the attractiveness of a takeover to the CEO.[5] These two interpretations look similar but are different. While the former interpretation of GPs rests on the CEO being passive and powerless in the face of a takeover threat, the latter interpretation recognizes the takeover defenses she typically commands. As Lambert and Larcker (1985) point out, aligning the interests of a manager with shareholders during a takeover and increasing the incentive of the manager to accept the takeover (henceforth abbreviated as "takeover incentive") is one of the most important functions of GPs. Though the evidence is mixed, the results in most studies are consistent with this role of GPs (Born et al., 1993; Machlin et al., 1993; Agrawal and Knoeber, 1998; Bates et al., 2008; Sokolyk, 2011; Bebchuk et al., 2012; Fich et al., 2012). Prior literature has examined how the takeover incentive of a manager affects acquisition premiums and target and acquirer stock returns (e.g., Lefanowicz et al., 2000; Bebchuk et al., 2012; Fich et al., 2012; Offenberg and Officer, 2013). However, while takeovers are generally rare, the incidence of GPs is prevalent and increasing over time (Bebchuk et al., 2012). Therefore, compared with the takeover-related outcomes such as acquisition premiums, the examination of takeover incentive on managerial behaviors during regular business operations may be more important. Some studies document that GPs are associated with lower

[5] Theoretically speaking GPs could also serve as an antitakeover device, as GPs increase the cost of a takeover and hence may reduce the attractiveness of a firm as a target. Though this is implicitly assumed by many studies which use antitakeover indexes such as the G-index (Gompers et al., 2003), of which GPs are a component, the empirical support for the antitakeover effect of GPs is absent.

firm performance, which suggests the effect of GPs on managerial shirking (e.g., Bebchuk et al., 2009; Bebchuk et al., 2012). We extend this line of inquiry to study the effect of takeover incentive on another important managerial function, risk-taking.

The takeover incentive of a CEO suggests that takeover-related total compensation is attractive to the CEO.[6] Because corporate executives typically hold significant amounts of stocks and options, and because target firms often receive a significant premium over their stock prices,[7] a takeover-willing CEO should be concerned about both her equity wealth upon a takeover and her GP payment.[8] This is especially the case because a change-in-control often leads to accelerated vesting of a manager's restricted stocks and options (Elkinawy and Offenberg, 2013). Therefore, a study of the effect of GPs on managerial risk-taking in light of the takeover incentive necessitates the examination of the interaction of managerial equity portfolio incentive and GPs on risk-taking.

The two interpretations for GPs as discussed above lead to our two hypotheses, the "insurance hypothesis" and the "takeover incentive hypothesis" respectively, on the relations between GPs and risk-taking, as well as between the interaction of pay-performance sensitivity (delta), our measure of the equity incentive of a CEO, with GPs and risk-taking.[9] We test the two hypotheses using a sample of S&P 1,500 firms (excluding dual-class, financial, and utility firms) between 1992 and 2006. We document an insignificant relation between GPs and risk-taking, but a

[6] This does not necessarily imply that takeover-related managerial total compensation must be higher than the expected lost compensation due to job terminations as a result of a change-in-control. Actually, because a manager is typically risk-averse, a certainty equivalent argument suggests that it is not irrational for the manager to be willing to accept a takeover even if the total compensation she receives during the takeover is less than the expected lost compensation due to job terminations.
[7] The takeover premium often exceeds 30% and sometimes even 50% (e.g., Officer, 2003; Eckbo, 2009; Fich et al., 2012).
[8] Because other components of CEO compensation such as salary and bonus are not conditional on a takeover, they are not relevant in determining CEO risk-taking in light of the takeover incentive.
[9] Pay-volatility sensitivity (vega) is a more common measure of managerial risk-taking incentive. We retain it as a control variable in our models but it is not the focus of the present study because, unlike delta, vega can not be conveniently interpreted as a measure of the equity incentive of a manager.

negative and highly significant interaction of GPs with delta on risk-taking. These and subsequent findings are most consistent with the takeover incentive hypothesis. We also establish evidence that rules out a potential entrenchment effect of GPs that may also explain a negative interaction of GPs with delta on risk-taking.

We aim to contribute to the literature in at least two ways. The contrast between the insignificant effect of GPs on managerial risk-taking in our study and the positive impact of conventional severance agreements on risk-taking in the previous literature suggests a different nature of GPs compared to conventional severance agreements, at least in the context of managerial risk-taking. Though the term golden parachute is often used loosely to refer to both takeover-specific severance agreements (GPs) and conventional non-takeover-related severance agreements,[10] our analysis and evidence suggest that the mechanisms through which takeover-specific GPs and conventional severance agreements affect risk-taking are different. Unlike conventional severance agreements, downside compensation does not seem to be the dominant effect of GPs that affects CEO risk-taking. In contrast to the *negative* interactive effect of GPs and delta on risk-taking according to our takeover incentive hypothesis, our analysis would predict a *positive* interaction of conventional severance agreements with delta on risk-taking, based on the idea that the downside compensation of severance contracts should be more important if a CEO is more concerned about her downside losses with an increase of delta. Testing this prediction is left for future research.

Our study also demonstrates the interactive effect of GPs and managerial compensation incentives in influencing risk-taking, which is novel to the literature. The significant interaction of GPs with delta on risk-taking points to a differential impact of GPs on risk-taking conditional

[10] See, for example, the description of golden parachutes in Wikipedia (http://en.wikipedia.org/wiki/Golden_parachute).

on the strength of delta and, conversely, a differential impact of delta on risk-taking conditional on the presence of GPs. These results add to the related studies which have focused on examining the individual effects of severance contracts and delta on risk-taking (e.g., Coles et al., 2006; Low, 2009; Brick et al., 2012).

The remainder of the paper is structured as follows. Section 2 develops the two hypotheses on GPs and risk-taking, as well as the interaction of GPs with delta on risk-taking. Section 3 describes the data and the variables used in the empirical analysis. Section 4 presents the empirical results. Section 5 conducts robustness checks to substantiate our major findings. Finally, Section 6 concludes.

2. Hypothesis Development

In this section we develop two hypotheses on the relationship between GPs and risk-taking, and the interaction of GPs with delta on risk-taking, based on the two interpretations of GPs discussed above. To assist the reader, Table 1 provides a brief summary of the predictions and intuitions for each of the two hypotheses.

Insert Table 1 about here

2.1. Insurance Hypothesis

The insurance hypothesis relies on an interpretation of GPs as a downside compensation mechanism, which is similar to conventional severance agreements. If a CEO undertakes risks that generate outcomes deleterious to firm performance, the probability of a takeover is likely to increase (Palepu, 1986; Bates et al., 2008; Brar et al., 2009), which may increase the chance that the CEO will lose her job. By offering CEOs insurance against the potential downside wealth consequences, GPs raise CEOs' expected returns from risk-taking. The insurance hypothesis therefore predicts that GPs should be positively associated with risk-taking.[11]

As delta measures the sensitivity of CEO equity portfolio wealth to firm stock price and GPs promote CEO risk-taking because they compensate a CEO upon a takeover, the risk-inducing effect of GPs will be more pronounced if the CEO is more concerned about takeover-related portfolio losses. Whether a CEO suffers a loss or enjoys a gain for her equity portfolio wealth will further depend on whether the final price as offered by the acquirer is lower or higher than the current stock price at the time of risk-taking. Because acquirers typically offer a significant premium over the stock price at the time of bidding, it is uncertain whether the final takeover offer will be lower or higher than the current stock price. Therefore, it is also uncertain whether the downside compensation of GPs is more or less important for a CEO with an increase of delta, and hence the interactive effect of GPs with delta on risk-taking is ambiguous.

As discussed in the introduction, however, the above arguments would imply a positive interactive effect of conventional severance agreements and delta on risk-taking because, unlike GPs which are conditional on takeovers and hence acquisition premiums, a CEO's equity portfolio does not enjoy a premium over the stock price at the time of job termination when conventional severance payments are made. A test of this prediction, however, is beyond the scope of this paper.

2.2. Takeover Incentive Hypothesis

The takeover incentive hypothesis is predicated on another potential role of GPs, which is to promote the incentive of a CEO to accept a takeover. Prior literature suggests that a CEO's personal gains at the time of a takeover are very important in determining her attitude toward the

[11] As mentioned above these arguments are implicitly predicated on the assumption that a CEO has few resources to protect her job by blocking a hostile takeover, which may not hold.

takeover (e.g., Walkling and Long, 1984). The GP payment is generally a multiple of the CEO's cash compensation (salary plus bonus), and hence is frequently very significant.[12] There could also be additional compensation or benefits associated with a GP payment, such as excise tax gross-up, pension adjustments, outplacement services, etc. (Offenberg and Officer, 2013). Therefore, GPs potentially increase the incentive of a CEO to accept a takeover. Consistent with this idea, some studies find that upon a takeover bid, a CEO with a GP is willing to negotiate for a lower premium to avoid jeopardizing a potential merger, even if that implies a lower equity portfolio gain for the CEO (Lefanowicz et al., 2000; Bebchuk et al., 2012; Fich et al., 2012). Furthermore, if managers are willing to welcome a takeover, they may initiate takeovers themselves. Indeed, Fich et al. (2012) show that more than 39% of mergers are initiated by target firms rather than acquirers, while a supermajority of the target firm CEOs have GPs. The willingness of a CEO to accept a takeover should be reflected by a positive relationship between GPs and the ex-ante probability of completed takeovers, which is born out by most empirical evidence (Born et al., 1993; Machlin et al., 1993; Agrawal and Knoeber, 1998; Bates et al., 2008; Sokolyk, 2011; Bebchuk et al., 2012; Fich et al., 2012). We also examine the relation between GPs and takeover probability in our sample, and confirm previous findings.

The takeover incentive of a CEO does not imply that the CEO desires the payment of a GP at any cost. In addition to GP payment, equity portfolio incentives are also highly relevant to a CEO at a takeover, because target firms often receive a significant premium over their stock price, and managers are increasingly compensated with equities. Managers also frequently enjoy accelerated vesting of their restricted stocks and options as a result of takeovers (Elkinawy and Offenberg, 2013). Consequently, the equity portfolio gains often represent the largest component of a CEO's total takeover-related compensation (Hartzell et al., 2004). From this perspective, a

[12] Fich et al. (2012) report that the mean GP payment for their 851 target firm CEOs is $4.87 million.

positive relationship between GPs and takeover probability should be interpreted as suggesting an average effect of GPs on takeover probability, which does not conflict with a possibly higher probability of takeovers for a firm with both a GP and higher equity incentives for its CEO. Our subsequent empirical analysis is consistent with this argument.

In light of the takeover incentive, a CEO would naturally want to maximize the expected takeover-related total compensation, which includes both equity portfolio wealth and GPs. Because GP payments are relatively fixed, the maximization of the expected GP payment implies the maximization of the probability of takeovers. This will motivate the CEO to take more risks, because the unfavorable outcome of risk-taking will increase the takeover probability. On the other hand, the maximization of the expected equity portfolio wealth associated with a takeover suggests the maximization of the product of the probability of a takeover and the equity portfolio value associated with the takeover, which further depends on the takeover offer. If a CEO conducts risk-taking, the probabilities of both favorable and unfavorable outcomes increase. Under the unfavorable outcome, takeover probability is likely to increase because of the lower firm performance (Palepu, 1986; Bates et al., 2008; Brar et al., 2009). However, the takeover offer is likely to decrease hence compromising the equity portfolio wealth of the CEO, because takeover offer is based on the stock price at the time of bidding, which is lower.[13] Conversely, under the favorable outcome of risk-taking, the probability of takeovers is likely to decrease but the final takeover offer may increase as a result of the higher stock price. Because of the possibly conflicting effects of risk-taking on takeover probability and acquisition offer, the implication of the maximization of the expected takeover-associated equity portfolio wealth on the risk-taking incentive of a CEO is generally unclear. However, as mentioned an important consequence of the

[13] Eckbo (2009) shows that target firm stock runup is often associated with a markup to the initial bid, which is suggestive of the relation between takeover offer and target stock price at the time of bidding.

takeover incentive of a CEO with a GP is the elevated probability of takeovers. The increase in the takeover probability is associated with the presence of a GP itself without the risk-taking of the CEO, and seems to be consequential. For example, Bebchuk et al. (2012) show that compared with a firm without a GP, the likelihood of an acquisition for a firm with a GP increases dramatically by 32.2%. Our evidence presented below points to an even more substantial effect of GPs on takeover probability. In light of the conflict between higher (lower) takeover probability and lower (higher) takeover offer in maximizing the expected takeover-associated equity wealth, the substantial increase of the takeover probability would decrease the risk-taking incentive of the CEO. This is because the dramatic increase of takeover probability would decrease its importance in the maximization of the expected takeover-associated equity wealth. Relatively speaking, this increases the importance of a higher takeover offer in maximizing the expected equity wealth, which would decrease the risk-taking incentive of a risk-averse CEO, because the unfavorable outcome of the risk-taking is likely to decrease the takeover offer despite a potentially higher offer associated with the favorable outcome.

To understand the latter part of this argument, it is informative to note that most empirical studies document a risk-reducing effect of delta (e.g., Chakraborty et al., 2007; Chava and Purnanandam, 2010; Brick et al., 2012; Gormley et al., 2013), which is consistent with the notion that compared with the potential for upside gains, a risk-averse CEO is more concerned about downside losses in response to a higher delta. Analogously, the argument above is also consistent with the findings in the literature that conditional on a takeover bid (hence very high chance of a completed takeover, analogously similar to a substantial increase of the takeover probability in the presence of a GP), a CEO with a GP is willing to negotiate for a lower premium to avoid driving away the acquirer, as discussed above (Lefanowicz et al., 2000; Bebchuk et al., 2012;

Fich et al., 2012). Therefore, the takeover incentive of a CEO in light of her incentive to maximize the expected takeover-associated equity portfolio wealth suggests that the CEO should reduce risk-taking.

Our discussion above points to opposite effects of takeover incentive on CEO risk-taking in terms of maximizing the expected GP payment, and in terms of maximizing the expected equity portfolio wealth. Consequently, the takeover incentive hypothesis predicts an uncertain impact of GPs on managerial risk-taking.

The increase of delta suggests that a CEO is more concerned about firm stock price. In light of the takeover incentive, this will increase the weight on a CEO's object function to maximize the expected takeover-associated equity portfolio wealth, which implies a higher weight on the part of CEO incentives to reduce risk-taking based on the analysis above. Therefore, the takeover incentive hypothesis would predict a negative interaction of GPs with delta on risk-taking.

3. Sample, Variables, and Summary Statistics

3.1. Data and Sample

Our sample is an intersection of several databases. Data for GPs and the G-index (Gompers et al., 2003), of which GPs are a component, are obtained from RiskMetrics, which mainly covers S&P 1,500 firms. The data are available as of the first day of September 1990, July 1993, July 1995, February 1998, February 2000, February 2002, January 2004, and January 2006.[14] Because not every year's data are covered, we make the following assumptions to fill in the data for a year not covered by the database: if the firm experienced a CEO change during that year, GPs are assumed to be the same as the next year's data; in other events, GPs are assumed to be

[14] RickMetrics was acquired by Institutional Shareholder Service (ISS) in 2005 and changed its format for data collection after 2006. Some of the components required to calculate the G-index are no longer collected. Therefore, our sample ends in 2006.

the same as the previous year's data.[15] In order to merge the RiskMetrics data with the financial data from COMPUSTAT, starting in 1998 we convert year t in RiskMetrics to year t-1.[16]

Our risk-taking variables are calculated using CRSP daily and COMPUSTAT quarterly databases. The compensation data are from EXECUCOMP, from which delta and another commonly employed measure of risk-taking incentive, pay-volatility sensitivity (vega), are estimated. Because the coverage of EXECUCOMP starts at 1992, our sample also starts at 1992. Data on CEO characteristics such as tenure and age are also obtained from EXECUCOMP. The risk-free interest rates in the estimation of delta and vega are the yields-to-maturity of constant-maturity Treasury bonds, which are obtained from Federal Reserve H15 Report. The acquisition target data used to test the association between GPs and takeover probability are obtained from Thomson One Banker.

We delete firms with dual-class stocks from our sample because the special voting structure of these firms may imply a very different role for other governance mechanisms. Consistent with the convention in the literature, we also delete finance (one-digit SIC code equals 6) and utility (two-digit SIC code equals 49) firms due to the highly regulated nature of those industries.

After merging the relevant data sets, our primary sample to examine the risk-taking effects of GPs includes 8,199 firm-year observations from 1992 to 2006, and 1,543 unique firms.[17] Our primary sample to test the relation between GPs and takeover probability has 10,771 firm-years.

3.2. Variables

[15] Our results are substantively the same when we follow the convention in the literature (e.g., Gompers et al., 2003) and assume that a firm's data for a year not covered by the database are the same as those in the previous year.
[16] COMPUSTAT sets a year to be t if the ending month of a fiscal year is between June of year t and May of year t+1. Starting in 1998, the RiskMetrics data are available at either January or February of a specific year, which would correspond to the previous year following the convention in COMPUSTAT.
[17] There are some small variations of sample sizes depending on the specific risk-taking variables, due to data availability. The sample size reported here refers to the sample size with respect to the volatility of stock returns.

We describe the major variables used in our empirical analysis in this subsection. The discussion is classified on the two types of regression models: risk-taking and takeover probability. For space concerns, the description is cursory. The detailed definition for each variable is listed in the Appendix.

Our GP measure is a dummy variable that equals one if the firm has a GP, and zero otherwise. As mentioned previously, governance provisions that are components of the G-index, including GP, often cluster. Therefore, we also control for a Net G-index, defined as the G-index net of GP, throughout our analysis.

3.2.1. Risk-Taking

We employ the volatilities of both stock returns and earnings as our risk-taking variables. Our first risk-taking variable is the standard deviation of daily stock returns over the fiscal year (Volat_stk), following the convention in the literature (e.g., Guay, 1999; Coles et al., 2006; Brick et al., 2012). We also estimate the idiosyncratic risk as the standard deviation of the residuals from the market model on daily stock returns over the fiscal year (Idio_stk).[18] Similar to John et al. (2008), we also calculate the volatility of earnings as indicated by the standard deviation of return on assets (ROA).[19] Unlike stock returns that have daily observations, however, earnings data are only available quarterly. To increase the number of observations for the calculation of the volatilities, we estimate the standard deviations of ROA over the past 20 quarters, including current year's quarters. This may raise the concern of endogeneity, because most observations used in the calculation of the standard deviations occur before current year. However, in all our empirical specifications on risk-taking, we include lagged dependent variables as controls. We

[18] Our results are similar if we calculate the idiosyncratic volatility based on Fama-French three-factor model or Fama-French-Carhart four-factor model (Carhart, 1997).
[19] In all of our analyses, unreported results using the volatility of return on equity are similar to the reported results using the volatility of ROA.

further address endogeneity in the robustness checks. We take the logs of all of the risk-taking variables because of their skewed distributions.

We employ the one-year approximation (OA) method in Core and Guay (2002) to estimate delta and vega.[20] Delta is defined as the sensitivity of CEO wealth to a 1% change in stock price. Vega is the sensitivity of CEO wealth to a 0.01 change in the standard deviation of stock returns. Guay (1999) shows that option vega is several orders of magnitude higher than stock vega. Therefore, we follow other studies and use the option vega to approximate the vega of CEO total wealth (e.g., Coles et al., 2006). Similar to many others, we use the annualized standard deviation of monthly stock returns over the past five years as the stock return volatility, and the average dividend yield of the past three years as the dividend yield in the estimation of delta and vega (e.g., Brick et al., 2012).[21] Finally, the risk-free rate is approximated by the yield-to-maturity of the constant-maturity Treasury bonds matched by the closest maturity.[22] Because delta and vega have skewed distributions, we take the logs of both variables.

The control variables in the risk-taking regressions are based on a survey of previous literature. They include CEO tenure, CEO age, CEO cash compensation, operating income, firm

[20] The method in Core and Guay (2002) is based on the Black-Scholes (BS) option pricing model, which assumes that investors can diversify their portfolios. This assumption is likely to be violated for executives. However, models which do not depend on this assumption require data such as executive risk-aversion and the fraction of her wealth invested in her own firm, which are not observable (Hall and Murphy, 2002; Ingersoll, 2006). This may be the primary reason why the vast majority of the empirical work on managerial compensation still employs the BS model for option valuations. We follow this general practice in the literature. This also facilitates the comparison of our results with other studies. Studies which assume executives can not diversify generally assume a constant coefficient of risk-aversion, and a constant degree of diversification across all executives, which is certainly restrictive (e.g., Hall and Murphy, 2002; Ingersoll, 2006). In untabulated analysis, we follow Ingersoll (2006) to calculate the subjective delta and vega. Based on the common practice in the literature (e.g., Hall and Murphy, 2002), we assume that the constant relative risk-aversion is 2 and the fraction of CEO wealth invested in her own firm is 50%, and we apply the market model to calculate idiosyncratic volatility that is required in the Ingersoll model. The results are similar to those based on the BS model. Our results are also robust if the risk-aversion coefficient is 3, the degree of diversification is 25% or 75%, or if we use the Fama-French three-factor model to calculate idiosyncratic volatility. The results are still robust even with an extreme risk-aversion coefficient of 7, as in Ingersoll (2006).

[21] This is also the volatility measure provided by EXECUCOMP in the estimation of Black-Scholes option value.

[22] Our results are not qualitatively changed if we give the options a simple "haircut" by assuming that the maturity of newly-granted options is 70% of the stated maturity. This is the method used by EXECUCOMP and some related studies (e.g., Brick et al., 2012).

size, market-to-book ratio, sales growth rate, capital expenditure, R&D expense, leverage, the number of business segments, and firm age (Coles et al., 2006; John et al., 2008; Cadman et al., 2011; Brick et al., 2012; Brown et al., 2012). Brick et al. (2012) show that it is critical to control for lagged dependent variables to alleviate the omitted variable bias that may plague the empirical relations between delta and vega and managerial risk-taking. Therefore, throughout the risk-taking models we control for the lagged dependent variables. In all of our risk-taking regressions, we also control for two-digit SIC industry dummies and year dummies.

3.2.2. Takeover Probability

Because we examine the incentive of a manager to accept a takeover, we use data on completed takeovers rather than takeover bids, to test the association between GPs and takeover probability. We define a target dummy variable which equals one if the firm is a takeover target in a given year, and zero otherwise. Our takeover targets include both hostile and friendly takeovers, similar to other studies (Billett and Xue, 2007; Cremers et al., 2009; Jenter and Lewellen, 2011; Bebchuk et al., 2012). In addition to GP and the Net G-index, other control variables are based on the literature (Billett and Xue, 2007; Cremers et al., 2009; Jenter and Lewellen, 2011; Bebchuk et al., 2012). Specifically, the controls include CEO tenure, CEO age, stock return, operating income, market capitalization, market-to-book ratio, leverage, tangible assets, firm age, and the takeover vulnerability of the firm's industry (Industry target).[23] To examine the ex-ante probability of takeovers we lag all the control variables by one year, except

[23] We also entertain sales growth rate, Herfindahl index for the degree of competition of the firm's industry, and a dummy variable indicating whether the firm is incorporated in Delaware (Bebchuk et al., 2012). These variables are not significant and hence are omitted.

for CEO tenure and age, and firm age.[24] Models that include Industry target do not include two-digit SIC industry dummies. All regression models control for year effects.

3.3. Summary Statistics

Panel A of Table 2 presents the summary statistics of the major variables in our empirical analysis. In our sample, 67% of the firms have GPs. This statistic matches that in Bebchuk et al. (2012). The mean and median values of delta are $1,370,080 and $242,970, respectively. These statistics are slightly higher than those reported in Coles et al. (2006) and Brick et al. (2012), probably reflecting our more recent data coverage and the general uptrend in the awarding of options and stocks to executives over the sample years. The data also suggest that only 3% of our sample firms are takeover targets during the sample years. The small incidence of targets is consistent with the large size of our sample firms, and the small probability of takeovers in our sample. Nevertheless, we show subsequently that takeover probability matters for managerial risk-taking incentives. The summary statistics of other variables match those reported in the literature (Coles et al., 2006; Cadman et al., 2011; Brick et al., 2012).

Insert Table 2 about here

Panel B reports the correlations among GP and other major variables. The correlation coefficient between GP and the Net G-index is 0.18. This positive and significant correlation is consistent with the evidence in Gompers et al. (2003) that governance provisions often cluster. The statistics in Panel B also suggest that the correlations between GP and the risk-taking variables are mixed. While the correlation between GP and the volatility of ROA is positive, GP is negatively correlated with the total and idiosyncratic volatilities of stock returns. As expected, there are high correlations among the three risk-taking variables.

[24] We do not lag the GP dummy and the Net G-index because these variables are highly time-persistent, and we subsequently calculate the marginal probability of takeovers associated with GP. In unreported analysis, we note that the lagged GP dummy is still positive and highly significantly associated with takeover probability.

4. Empirical Results

In this section we empirically examine the two hypotheses we developed in Section 2. Throughout our analysis, the standard errors are adjusted for heteroskedasticity and clustered at the firm level (Petersen, 2009).

4.1. Golden Parachutes and Risk-Taking

We first examine the direct effects of GPs on risk-taking. While the insurance hypothesis predicts a positive effect, the takeover incentive hypothesis makes no prediction about the direction of the relationship between GPs and risk-taking. The results from tests of the association between GPs and the three proxies of risk-taking are reported in Table 3.

Table 3 shows that GP is not significantly associated with any of the risk-taking variables. These results are not consistent with the insurance hypothesis. Because the takeover incentive hypothesis makes no directional prediction about the relationship between GP and risk-taking, the insignificant result is also not informative about this hypothesis. Overall, the results in Table 3 contrast with the consensus finding in studies on conventional severance agreements that severance contracts encourage managerial risk-taking, suggesting a distinct role for GPs.

Table 3 also shows that the Net G-index is negative and significantly associated with risk-taking throughout the models. In unreported analysis, we also find similar results for the G-index, confirming the findings in John et al. (2008) that managerial entrenchment as proxied by the G-index discourages managers from risk-taking.

Insert Table 3 about here

Consistent with Brick et al. (2012), Table 3 shows that both delta and vega are negatively associated with risk-taking and most of the coefficients are significant. Therefore, our results suggest that the sensitivities of CEO wealth to both stock price and stock return volatility discourage CEO risk-taking. The results with respect to delta accord with the argument that compared with upside potential, risk-averse CEOs are more concerned about downside losses, and hence reduce risk-taking in response to a higher delta. The risk-reducing effect of vega, however, is harder to explain, because a higher vega suggests that a CEO's option value is more sensitive to firm risk, and therefore the CEO is expected to take more risks.[25] But as Hjortshoj (2007) demonstrates, the sensitivity of option value to volatility may not be equivalent to the sensitivity of the certainty equivalent of option cash flows to volatility, especially for an undiversified CEO with sufficient in-the-money options. Therefore, a higher vega may imply a reduced certainty equivalent of option cash flows in response to an increase in volatility, and hence discourages a CEO from risk-taking.

The control variables generally have their expected signs. The results are consistent with some papers but not others. For example, while both Brick et al. (2012) and we document a positive association between market-to-book ratio and managerial risk-taking, Coles et al. (2006) find a negative one. The same is true for capital expenditure. Consistent with the serial dependency of the risk-taking variables, all the lagged dependent variables are positive and highly significant.

Though the control of the lagged dependent variables alleviates the concern for endogeneity, the results may still suffer from this concern. Two common methods in the literature to address this concern are the natural experiment approach and the instrumental variable (IV) approach. We are unaware of an event that changes the incidence of GPs exogenously to employ as a natural experiment. An IV approach may also not be applicable here because rigorous theoretical modeling of the determinants of GPs is lacking in the literature, and empirically it is difficult to

[25] Indeed, most studies on executive compensation find a positive association between vega and managerial risk-taking (e.g., Coles et al., 2006; Low, 2009; Gormley et al., 2013).

find a valid IV for GP.[26] Another common method to address the endogeneity concern is to use the fixed-effects (FE) models. These models are robust to the unobservable time-invariant characteristics that may be related to the dependent variable. However, in governance studies in general and our analysis in particular, the small time-variation of GPs may render FE models ineffective (Zhou, 2001).[27] Nevertheless, in unreported analysis, we find that the association between GPs and the risk-taking variables continues to be insignificant using specifications with CEO-firm fixed effects. The control of the fixed CEO effects besides the firm effects considers the possibility that inherent characteristics of CEOs may influence their risk-taking propensity, as recent evidence suggests (e.g., Hilary and Hui, 2009; Cain and Mckeon, 2013).

4.2. Interaction of Golden Parachutes and Delta on Risk-Taking

While the examination of the direct effect of GP on risk-taking as in Table 3 may test our insurance hypothesis, an examination of the interactive effect of GP with delta on risk-taking may test the takeover incentive hypothesis. Econometrically, examining the interactive effects may be subject less to the concern of endogeneity, because a significant interaction of GP and delta implies a differential effect of GPs on risk-taking depending on the level of delta, which is harder to explain based on reverse causality.[28] The results are presented in Table 4.

Insert Table 4 about here

[26] Though some studies in the literature analyze the determinants of GPs empirically, these determinants can hardly be argued to be unrelated to managerial risk-taking, and hence may not be used as an IV for GP. For example, many governance variables have been shown to influence the awarding of GPs (e.g., Singh and Harianto, 1989; Wade et al., 1990), but the literature also suggests that governance matters for risk-taking (e.g., John et al., 2008). It is notable that Fich et al. (2012) employ the CEO founder dummy as an IV for GP in the regression of acquisition premiums. However, Adams et al. (2005) show that founder CEOs are associated with more volatile firm performance, thus making this variable invalid as an IV in our context. Although Mansi et al. (2013) use whether a CEO is younger than 51 and whether the firm was incorporated in Delaware in the prior year as the IVs for GP, prior literature has often employed age as a proxy for risk-aversion (e.g., Chok and Sun, 2007), and Delaware-incorporation has been shown to affect risk-taking (Low, 2009), hence making the validity of these IVs questionable. As Mansi et al. (2013) also acknowledge, the substantially higher coefficient on GP based on the IV method should be interpreted with caution.

[27] In our sample of 8,199 firm-year observations, only 881 (10.7%) experienced changes in GPs over the past year.

[28] In Section 5 we further examine another common form of endogeneity, omitted variable bias.

The three models in Table 4 show a consistently negative and highly significant interactive effect of GP with delta on risk-taking. These results provide evidence that is consistent with the takeover incentive hypothesis. Because the takeover incentive hypothesis is novel to the literature, we provide additional supportive evidence for it in the next subsection.

Table 4 also shows that once the interaction term is controlled for, GP is positive and highly significantly associated with all three risk-taking variables. These results suggest that while GPs may increase risk-taking when delta is low, GPs decrease risk-taking when delta is high. The differential effect of GPs on risk-taking conditional on the level of delta provides an explanation for the insignificant average relation between GPs and risk-taking as documented in Table 3. However, a concern about the interactive results is that because GP and delta are significantly correlated as shown in Panel B of Table 2 (the correlation coefficient is -0.19), the relation we document in Table 4 may be spurious. To rule out this possibility, in an untabulated analysis we run regressions using the models in Table 3 on subsamples characterized by different levels of delta. To highlight the difference between the coefficients across subsamples, we compare the impacts of GPs on risk-taking for firms with delta above the third quartile to firms with delta at or below the first quartile. The results show that while GP is positively and significantly associated with all three risk-taking variables for firms with low CEO delta, GP is not significantly associated with risk-taking when delta is high. Further, Chow tests suggest that the GP coefficients across the subsamples are statistically different. Therefore, the subsample results qualitatively confirm the results with the interaction terms. The results in Table 4 also show that after netting out the interactive effects of GP with delta, the effects of delta on risk-taking become either weaker or insignificant.[29]

4.3. Further Examination of the Takeover Incentive Hypothesis

The negative interaction of GP with delta on CEO risk-taking is consistent with the takeover incentive hypothesis, which is predicated upon the incentive of a CEO to welcome a takeover in the presence of a GP. Because the willingness of a CEO to accept a takeover should result in a higher chance of a firm being acquired, we examine whether GPs are indeed positively associated with takeover probability, and whether the marginal probability of takeovers associated with GP has a similarly negative interactive effect with delta on risk-taking. Compared with the GP dummy which does not vary across the firms with GPs, the marginal takeover probability associated with GP should better proxy for the differential incentives of CEOs to accept a takeover.

We first examine whether GP is positively associated with takeover probability. We employ probit regressions on the target dummy as defined previously. We entertain three model specifications to check the robustness of our findings. In the first model, we control for industry effects but do not adjust the control variables based on their industry medians. In the second model, we do not include industry effects but industry-adjust stock return, operating income, and leverage, following Billett and Xue (2007) and Jenter and Lewellen (2011). Finally, in the third model, we follow Cremers et al. (2009) and Bebchuk et al. (2012) and further industry-adjust market-to-book ratio, market capitalization, and PPE. The results are reported in Table 5.

The first three models in Table 5 document a consistently positive and significant association between GP and takeover probability, which is consistent with the implication of the takeover

[29] An interesting topic for future study is how the relative magnitudes of a CEO's equity portfolio, expected future compensation, and GP payments influence managerial risk-taking. Data for the amount of GP payment are not readily available in database format, and so this topic is beyond the scope of this paper.

incentive hypothesis. Table 5 also shows that stock return is negative and significantly associated with the takeover probability, which is consistent with previous literature and our assumption in developing the two hypotheses. In untabulated analysis, we show that the takeover probability increases from 1.7% for a firm without a GP (based on Model 3, if setting the control variables at their mean values) to 2.4% for a firm with a GP, a substantial 41.2% increase. In contrast, if increasing the industry-adjusted stock return from its mean value (6.25%) by one standard deviation (51.16%), the takeover probability only decreases from 2.15% to 1.71%, a 20.5% change. Therefore, the effect of GP on takeover probability is not only statistically significant, but highly economically significant as well.

Because we use completed takeovers rather than takeover bids to define targets, a positive association between GP and takeover probability is consistent with the stronger incentive of CEOs with GPs to accept takeovers. However, as suggested in Lambert and Larcker (1985), the positive association between GPs and takeover probability may also suggest that CEOs install GPs if they are privately informed of the takeover attempts, to compensate themselves for the welfare loss associated with takeovers. If the "private information" effect drives the positive association of GPs with takeover probability, it is expected that the positive association should not hold with a sample consisting of firms without any changes in the incidence of GPs over our sample period. In untabulated analysis, we show that the positive and significant effect of GP on takeover probability continues to hold with such a sample, and the coefficients on GP are similar to those reported in Table 5. Therefore, similar to Bebchuk et al. (2012), our results suggest that the positive association between GPs and takeover probability is at least partly due to the incentive of a CEO to accept a takeover.

Insert Table 5 about here

As argued in Section 2, in addition to the GP payment, a takeover also affects a CEO's wealth if she holds equity portfolios. Therefore, the incentive of a CEO with a GP to welcome a takeover should increase with her equity holdings, which is measured by delta. These arguments predict a positive interaction of GP and delta on takeover probability. To examine this prediction, we control for the interaction of GP and delta in Model 4 of Table 5.[30] For completeness, we also control for delta. Consistent with stronger incentive of a CEO to accept a takeover if she is awarded both with a GP and a higher delta, Model 4 shows a positive interactive effect of GP and delta on takeover probability, although the interaction is significant only at the 10% level. As pointed out by Ai and Norton (2003), however, interpreting the interaction terms in a nonlinear model such as probit models can be problematic. To circumvent this problem, in undocumented analysis, we examine a differential effect of GP on takeover probability conditional on different levels of delta. Consistent with the interaction results, the analysis shows that while the effect of GP on takeover probability is positive and significant (coefficient=0.289 for Model 3 of Table 5) when delta is high (above the sample median), it is not significant (coefficient=0.047) when delta is low (at or below the sample median). The differential impact of GP on takeover probability also provides additional evidence against the "private information" hypothesis that may explain the positive association between GP and takeover probability, because the incentive of a CEO facing a takeover threat to install a GP should be higher if her equity holdings are lower hence her equity portfolio gains are lower as a result of the takeover, which is contrary to our evidence.

[30] The results are qualitatively similar if controlling for the interaction term in Models 1 and 2 of Table 5, but the interaction term is only significant at the 12% level. However, the sub-sample results conditional on different levels of delta are similar to the sub-sample results using Model 3.

Table 5 also shows that except for stock return, CEO tenure, and firm age, most other control variables are not significant.[31]

The positive association between GPs and takeover probability is consistent with the incentive of a CEO to accept a takeover in the presence of a GP. Higher incentive of the CEO should be better reflected in a higher marginal probability of takeovers associated with the GP, rather than the GP itself. If, as argued in Section 2, the takeover incentive of a CEO leads to the negative interaction of delta with GP on risk-taking, the interaction of delta with the marginal probability of takeovers associated with GP should have a similar effect. To examine this, we employ Model 3 of Table 5 to calculate marginal takeover probabilities, but the results are similar using other models. To rule out the possibility that the effect of GP may be mechanically driven by the marginal probability because of its significant correlation with GP, we also decompose GP into two parts using a linear regression of GP on this marginal probability and a constant term. The predicted value of this regression is the component of GP that is related to takeover probability (Mp_gp). The residual of this regression orthogonal to Mp_gp is the non-takeover-related component of GP (Rs_gp). It is notable that the correlations between GP and Mp_gp and Rs_gp are 0.73 and 0.69, respectively. Therefore, if the effect of GP is mechanically driven by Mp_gp because of their high correlation, similar result should also be observed for Rs_gp. To test this, we replace GP with Mp_gp in the models of Table 4, and control for Rs_gp and Rs_gp * Delta. The results are reported in Table 6. Consistent with the takeover incentive hypothesis, the interaction term Mp_gp * Delta for all three risk-taking models is negative and highly

[31] In particular, except for Model 4, the Net G-index is not significantly associated with takeover likelihood. In unreported analysis, we document a similarly insignificant effect of the Net E-index, which is defined as the E-index (Bebchuk et al., 2009) net of GP on takeover probability. The effects of the G-index and the E-index on takeover probability are similar. However, we find that among the six components of the E-index, which Bebchuk et al. (2009) argue as the most important among all G-index components, the presence of a poison pill is negatively associated with takeover probability, which suggests that individual components of the composite antitakeover indexes may still have the antitakeover effect.

significant. Also similar to the results in Table 4, Mp_gp is positive and highly significant. In contrast, neither the interaction term Rs_gp * Delta nor Rs_gp is significant. The results in Table 6 demonstrate that the significant effects of GP * Delta and GP on risk-taking are driven by the takeover-related component of GP.

Insert Table 6 about here

The results in Table 6 may be subject to the concerns of multicollinearity and spurious correlations due to the inclusion of two interaction terms. We employ two methods to examine the robustness of our results: excluding an interaction term and analyzing subsamples. The results are not reported for space concerns. First, we exclude Rs_gp * Delta from the models. The results are similar. We also exclude Mp_gp * Delta and find the terms involving Rs_gp are still not significant, similar to the results in Table 6. Second, we run regressions similar to the models in Table 3 but conditional on subsamples characterized by different levels of delta, similar to the robustness check we did for the results in Table 4. We replace GP with its takeover-related component and the non-takeover-related component. Our takeover incentive hypothesis would predict a more negative effect of Mp_gp on risk-taking when the level of delta is high. To highlight the differential impact of Mp_gp on risk-taking conditional on the levels of delta, we run regressions separately on the subsample with delta above its third quartile, and the subsample with delta at or below its first quartile. Consistent with the interaction results in Table 6, our results show that while Mp_gp is negatively and significantly associated with risk-taking when delta is high (except for the model with respect to the volatility of earnings, in which case it is negative but not significant), it is positively and significantly associated with risk-taking when delta is low. The differential impacts of Mp_gp on risk-taking conditional on the levels of delta are also statistically significant based on the Chow tests. In contrast, the effects of Rs_gp on risk-taking are not statistically different across different levels of delta. Overall, the subsample results confirm the results with interaction terms and provide further support to our takeover incentive hypothesis. Because the marginal probabilities of takeovers associated with GP are small (the maximum is only 3.2%), the results in Table 6 also demonstrate that small probabilities still matter for managerial incentives.

4.4. Alternative Explanation for the Negative Interaction of GP with Delta on Risk-Taking

An alternative explanation for the negative interaction of GP with delta on risk-taking is based on the idea that a GP is an indicator of managerial entrenchment. A positive association between GPs and takeover probability is not consistent with the entrenchment effect of a GP per se, but a GP could signal managerial entrenchment through other means. Gompers et al. (2003) calculate correlations between GPs and twenty-one other firm-level governance provisions that enhance the power of CEOs and boards relative to shareholders, and find ten significantly positive correlations and only one negative one. Consistent with managerial entrenchment, Mogavero and Toyne (1995) and Hall and Anderson (1997) find that stock prices react negatively to the adoption of GPs.

Prior literature has found the entrenchment of a manager often results in her reduced incentives to take risks, presumably due to her concerns for private benefits (Berger et al., 1997; John et al., 2008). Because compensation delta is also negatively associated with risk-taking (e.g., Chakraborty et al., 2007; Chava and Purnanandam, 2010; Brick et al., 2012; Gormley et al., 2013), the negative interactive effect of GP with delta on risk-taking could be due to the heightened concerns of an entrenched manager for not only her private benefits, but also her downside portfolio losses. We examine this entrenchment hypothesis in this subsection.

If CEO entrenchment drives the negative interactive effect of GP and delta on risk-taking, then the effect should be more pronounced for a CEO who may be entrenched by other means besides a GP. We entertain several proxies of entrenchment based on the literature. First, longer CEO tenure may indicate greater entrenchment (Berger et al., 1997). A higher percentage of independent directors is generally associated with better monitoring and hence may reduce CEO entrenchment (see, e.g., the evidence as surveyed in Hermalin and Weisbach, 2003). We define a dummy variable that equals one if the firm does not have a majority of independent directors on its board, and zero otherwise, so that a higher value suggests greater entrenchment. Agrawal and Nasser (2012) show that an independent director who holds a block of shares has both strong incentive and the ability to monitor the CEO. We define a dummy variable to equal one if the firm does not have an independent blockholder with at least 5% ownership, and zero otherwise. The literature also suggests that other blockholders have strong incentives to incur monitoring costs and reduce entrenchment (e.g., Bertrand and Mullainathan, 2001). We define a dummy variable to equal one if the firm does not have an institutional blockholder with at least 5% ownership, and zero otherwise.[32] In addition, provisions in the G-index such as classified boards may entrench a CEO. We expect that a higher Net G-index should be associated with higher entrenchment. We also consider a combination of entrenchment mechanisms and define a CEO power dummy similar to Moeller (2005), which equals one if the CEO ownership and the percentage of non-independent directors are above their respective sample medians, the CEO is also the chairman, and CEO tenure is at least five years, and zero otherwise.[33, 34]

[32] The data for independent directors and the block ownership of independent directors are obtained from RiskMetrics. The data for institutional ownership are from Thomson Reuters.
[33] This definition of the CEO power dummy selects around 17% of the sample firms with high CEO entrenchment, which is similar to the percentage in Moeller (2005).
[34] The correlations between these six proxies of managerial entrenchment and GP are -0.16, -0.24, 0.08, -0.11, 0.20, and -0.21, respectively. It is clear from these statistics that these proxies indicate managerial entrenchment that is distinct from the entrenchment as proxied by GP.

To test the entrenchment hypothesis, we run regressions using the specification of Model 1 in Table 4, but conditional on subsamples characterized by different degrees of CEO entrenchment as indicated by the mechanisms above.[35] In the case of CEO tenure and the Net G-index, the subsamples are stratified by the sample medians. We then test the statistical differences between the coefficients on GP * Delta across the subsamples. The entrenchment hypothesis would predict that GP * Delta is more negative and significant in the subsamples characterized by higher degree of CEO entrenchment. We report the results in Table 7, together with the *p*-values for the Chow tests for the statistical differences. The results show that the coefficients on GP * Delta are not statistically different across any pair of the subsamples.[36] Therefore, the results in Table 7 are not consistent with the entrenchment hypothesis.

Insert Table 7 about here

In unreported analysis, we use the other two risk-taking variables to further examine the entrenchment hypothesis, but none of the results supports this hypothesis. We also examine whether the interactions of the proxies for CEO entrenchment (rather than GP) with delta are also negative and significant. If the negative interactions of GP with delta are due to CEO entrenchment, then the interactive effects of other indicators of CEO entrenchment with delta should also be negative. Inconsistent with this prediction, however, our results indicate that none of these interactions is negative and significant. Most of the interactions are insignificant, and two are even positive and significant.[37, 38]

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[35] Another way to test the entrenchment hypothesis is to interact separately the entrenchment variables with GP * Delta. The entrenchment hypothesis would predict that these triple interaction terms are negative and significant. Inconsistent with this prediction, we find in unreported analysis that these interaction terms are either insignificant or positive and weakly significant in the case of CEO tenure. However, triple interaction terms are generally difficult to interpret. Therefore, we choose to present the results based on subsample regressions.

[36] The small number of firms with less than a majority of independent directors is consistent with the fact that our sample period is characterized by active and increasing incidences of shareholder activism, as well as legal arrangements (e.g., the Sarbanes-Oxley Act of 2002) that pushed increasingly independent boards.

[37] Specifically, the interactions involving CEO tenure and CEO power dummy are positive and significant.

Therefore, though both the takeover incentive and entrenchment hypotheses may explain the negative interaction of GPs with delta on risk-taking, the results in Table 7 are inconsistent with the entrenchment hypothesis strengthening the viability of the takeover incentive hypothesis.

5. Robustness Checks

Endogeneity is a primary concern for any governance study. As mentioned previously, our examination of the interaction terms should significantly alleviate this concern. Nonetheless, addressing the endogeneity concern completely is extremely hard. Empirically speaking, one primary source of endogeneity is the potential omitted variables that are correlated with both GP and risk-taking. Our extensive controls based on the literature should reduce this possibility. We apply CEO-firm FE models to further address this concern. As mentioned previously, because governance variables generally change slowly over time, using FE models risks finding an insignificant relationship between a governance variable and the dependent variable, even if a relationship exists (Zhou, 2001). To save space, we only report the FE results on testing the takeover incentive hypothesis as in Table 6. These results are presented in Table 8. In undocumented analysis, we also employ FE models to Table 4 and obtain similar results.

Insert Table 8 about here

The results in Table 8 are similar qualitatively to those in Table 6, albeit weaker statistically. Therefore, our results are robust to the consideration of omitted but fixed firm and CEO characteristics that may affect both GP and managerial risk-taking.[39]

Our volatilities of stock returns are based on daily data, following the convention in the literature. In a robustness check, we also calculate the volatilities of stock returns (both total and

[38] In another untabulated analysis, we also entertain other indicators of CEO entrenchment. These variables include whether the CEO is also the chairman, whether the CEO is an inside hire, the ownership of all institutional shareholders rather than just blockholders, and board classification. These results do not support the entrenchment hypothesis either.

[39] Testing the entrenchment hypothesis using FE models yields results similar to the pooled panel results.

idiosyncratic) based on monthly data. Similar to the calculation of the volatility of earnings, to increase the number of observations, we use five years' data to estimate the volatilities. We repeat all the analysis using these stock return volatilities. The results are similar.

6. Conclusion

In this paper we examine the effect of GPs on managerial risk-taking. We recognize two possible interpretations of GPs that may have implications on risk-taking. On the one hand, similar to conventional non-takeover-related severance agreements, GPs may serve primarily as a downside compensation mechanism, provided that incumbent CEOs have few resources to safeguard their jobs in the face of acquirers. On the other hand, GPs may increase the attractiveness of takeovers to CEOs, which takes into consideration the possibility that corporate executives may command powerful antitakeover devices that can block a takeover, should they fear its negative consequences on themselves. We develop two hypotheses, the insurance hypothesis and the takeover incentive hypothesis, on the relationship between GPs and managerial risk-taking based on the two interpretations of GPs. Because the incentive to accept a takeover implies that a CEO should attempt to maximize the expected takeover-related total compensation, which includes both equity portfolio wealth and GPs, we also develop the predictions for the interactive effect of GPs and compensation delta on risk-taking based on the two hypotheses. Our empirical results are most consistent with the takeover incentive hypothesis. We also provide evidence that is inconsistent with a possible entrenchment effect of GPs that may also explain our results.

Our analysis suggests that the takeover incentive of a manager not only matters for merger-related variables such as offer premiums and target and acquirer returns, it also matters for managerial risk-taking, which is mostly relevant during the normal operations of a firm. The significant interaction of GPs with delta on risk-taking shows that without considering the conditional nature of different components of managerial compensation, a study of the effect of individual component on risk-taking may be incomplete. To our knowledge, little prior research has recognized this possibility and hence the relationships we examine represent original contributions to the financial literature. The contrasting results between our study and the studies on conventional severance agreements demonstrate the unique feature of GPs. Our analysis also generates a prediction for a positive interaction of conventional severance agreements and delta on managerial risk-taking, which is left for future examination.

Appendix

Table A1. Variable Definitions

Variable	Definitions
GP	Dummy variable that equals one if the firm has a golden parachute, and zero otherwise.
Net G-index	The G-index from Gompers et al. (2003) net of GP (G-index minus GP).
Volat_stk	The log of the standard deviation of daily stock returns for at least 100 days over the year.
Idio_stk	The log of the standard deviation of the residuals from the market model (with a constant term) with daily returns over the year.
Volat_roa	The log of the standard deviation of the quarterly returns on assets over the past five years including current year, where return on asset is defined as net income before extraordinary items scaled by total assets.
Delta	The log of one plus the sensitivity of CEO option and stock portfolio value to a 1% change in stock price, where the estimation of the sensitivity follows Core and Guay (2002)'s "one-year approximation" (OA) method. Specifically, the annualized standard deviation of monthly stock returns over the past 60 months and the average dividend yield over the past three years are used as the inputs in the estimation. Risk-free rates are the yields-to-maturity of Treasury bonds matched by the closest maturities.
Vega	The log of one plus the sensitivity of CEO option portfolio value to a 0.01 change in the annualized standard deviation of stock returns. The estimation follows Core and Guay (2002)'s OA method. Specifically, the annualized standard deviation of monthly stock returns over the past 60 months and the average dividend yield over the past three years are used as the inputs in the estimation. Risk-free rates are the yields-to-maturity of Treasury bonds matched by the closest maturities.
CEO Tenure	The log of CEO tenure in years.
CEO Age	The log of CEO age in years.
CEO cash	CEO salary plus bonus.
Operincome	Operating income before depreciation scaled by total assets.
Size	The log of total assets.
Mkt value	The log of total market capitalization.
Mb	Market-to-book ratio.
Salesgrow	The log of the ratio of current year's sales and past year's sales.
Capexp	Net capital expenditure scaled by total assets, with missing values coded as zeros.
Rd	R&D expenses scaled by total assets, with missing values coded as zeros.
Leverage	Debt in current liabilities plus long-term debt scaled by total assets.
Segments	The number of business segments.
Firm age	The number of years since the firm went public.
Target	Dummy variable that equals one if the firm is a takeover target in a given year.
Stock return	Annual dividend-reinvested total stock return.
Industry target	Dummy variable that equals one if the firm's industry as classified by four-digit SIC code has at least one firm that is a takeover target in a given year, and zero otherwise.
PPE	Net PPE scaled by total assets.

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Table 1. Summary of Hypotheses

This table provides the basis, predictions, and intuition behind the two hypotheses on GPs and risk-taking, as well as on the interaction of GPs and delta and risk-taking: the insurance hypothesis and the takeover incentive hypothesis.

	Insurance Hypothesis	Takeover Incentive Hypothesis
Interpretation of GP	Downside compensation for a CEO for the expected loss due to job terminations following a change-in-control	Incentive of a CEO to accept a takeover, which results in a substantially higher probability of the firm being acquired.
Prediction for GP	Positive	No prediction
Intuition for the prediction	Downside compensation motivates the CEO to take more risks.	A takeover affects the wealth of a CEO primarily through two channels: GP payment and equity portfolio. The incentive to maximize the expected GP payment should motivate the CEO to take more risks, because the GP payment is relatively fixed, and the downside of risk-taking increases the probability of a takeover. The incentive to maximize the expected takeover-associated equity portfolio wealth may motivate the CEO to take fewer risks. The reason is that the substantial increase of takeover probability in the presence of GPs would decrease the importance of takeover probability and increase the relevance of a higher takeover offer in maximizing the expected equity wealth, which would decrease the risk-taking incentive of a risk-averse CEO, because the unfavorable outcome of the risk-taking is likely to decrease the takeover offer.
As delta increases	Changes in firm stock price have a greater impact on the CEO's wealth.	The CEO's concern for portfolio wealth increases.
Prediction for GP*Delta	No prediction	Negative
Intuition for the prediction	Because delta is the sensitivity of CEO equity wealth to firm stock price, whether a CEO is more or less concerned about her equity wealth associated with a change-in-control depends on whether risk-taking makes the final takeover offer lower or higher than the current stock price. Because a target firm often receives a significant premium over their stock price at the time of bidding, whether the final takeover offer is lower or higher than the current stock price is uncertain. Therefore, the degree to which a CEO needs downside compensation is uncertain.	When the CEO's concern for portfolio wealth increases relative to her desire to receive the GP payment, the risk-reducing effect of maximizing the expected takeover-associated equity portfolio wealth increases relative to the risk-inducing effect of maximizing the expected GP payment. The CEO is therefore increasingly likely to reduce risk-taking.

Table 2. Summary Statistics and Correlations

This table reports the summary statistics (Panel A) and correlations (Panel B) for the major variables used in the empirical analysis. Definitions of all variables are in the Appendix. The summary statistics for Volat_stk, Idio_stk, Volat_roa, CEO tenure, CEO age, CEO cash, Size, and Lagged mkt value are reported without taking logs. The summary statistics for Delta and Vega are reported both in their raw format and in logs. CEO cash, Operincome, Mb, Capexp, Rd, Leverage, and Lagged stock return have been winsorized at the 1st and 99th percentiles.

Panel A: Summary Statistics

Variable	Observations	P25	Mean	Median	P75	Std
GP	8199	0	0.67	1	1	0.47
Net G-index	8199	7	8.70	9	10	2.48
Volat_stk	8199	0.02	0.03	0.02	0.03	0.01
Idio_stk	8199	0.02	0.03	0.02	0.03	0.01
Volat_roa	8183	0.01	0.02	0.01	0.02	0.04
Delta ($\$10^3$)	8199	94.70	1370.08	242.97	668.27	13153.40
Delta (log)	8199	4.56	5.55	5.50	6.51	1.52
Vega ($\$10^3$)	8199	20.14	149.20	55.44	145.57	317.41
Vega (log)	8199	3.05	3.91	4.03	4.99	1.64
CEO tenure (years)	8199	2.61	7.76	5.26	10.67	7.32
CEO age (years)	8199	51.00	55.43	56.00	60.00	7.30
CEO cash ($\$10^6$)	8199	0.60	1.33	0.98	1.64	1.14
Operincome	8199	0.10	0.14	0.14	0.20	0.10
Size ($\$10^6$)	8199	504.03	5449.02	1229.1	3745.9	22803.28
Mb	8199	1.26	2.1	1.66	2.38	1.37
Salesgrow	8199	0.01	0.09	0.08	0.17	0.23
Capexp	8199	0	0.04	0.03	0.06	0.05
Rd	8199	0	0.04	0	0.05	0.06
Leverage	8199	0.07	0.22	0.21	0.33	0.17
Segments	8199	3	5.23	5	7	3.05
Firm age (years)	8199	10.42	25.55	20.52	33.52	19.4
Target	10771	0	0.03	0	0	0.16
Lagged stock return (%)	10771	-13.05	17.06	10.57	36.65	51.22
Lagged mkt value ($\$10^6$)	10771	528.06	7104.34	1372.25	4198.37	24184.44
Lagged PPE	10771	0.14	0.31	0.25	0.43	0.22
Lagged industry target	10771	0	0.23	0	0	0.42

Panel B: Correlations

	GP	Net G-index	Volat_stk	Idio_stk	Volat_roa	Delta	Vega	Capexp	Rd	Leverage	Segments
GP	1										
Net G-index	0.18	1									
Volat_stk	-0.05	-0.25	1								
Idio_stk	-0.05	-0.25	0.98	1							
Volat_roa	0.05	-0.19	0.50	0.50	1						
Delta	-0.19	-0.04	-0.16	-0.21	-0.12	1					
Vega	0.17	0.13	-0.16	-0.21	-0.04	0.42	1				
Capexp	-0.12	-0.11	0.06	0.07	-0.02	0.05	-0.10	1			
Rd	-0.05	-0.16	0.36	0.34	0.45	0.02	0.06	-0.04	1		
Leverage	0.11	0.15	-0.08	-0.06	-0.10	-0.10	0.06	-0.07	-0.23	1	
Segments	0.09	0.12	-0.07	-0.11	-0.03	0.09	0.24	-0.18	0.04	0.08	1

Table 3. Golden Parachutes and Managerial Risk-Taking

These models present the results of pooled OLS regressions for the effect of golden parachutes on managerial risk-taking. The sample consists of S&P 1,500 firms that do not have dual-class stocks and are not in the finance or utility industries from 1992 to 2006. See the Appendix for the definitions of all variables. All models include two-digit SIC industry and year dummies, and a constant term, which are not reported to save space. Standard errors are adjusted for heteroskedasticity and clustered at the firm level. *t*-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
Dependent variable	Volat_stk	Idio_stk	Volat_roa
GP	-0.001	-0.000	0.006
	(-0.155)	(-0.080)	(0.562)
Net G-index	-0.003***	-0.004***	-0.005***
	(-3.139)	(-3.554)	(-2.606)
Delta	-0.014***	-0.015***	-0.012**
	(-4.845)	(-5.236)	(-2.545)
Vega	-0.007***	-0.007***	-0.006
	(-3.121)	(-3.115)	(-1.556)
CEO tenure	0.013***	0.013***	-0.004
	(4.177)	(4.133)	(-0.735)
CEO age	-0.059***	-0.054**	-0.113***
	(-2.856)	(-2.495)	(-3.022)
CEO cash	-0.006**	-0.006**	-0.003
	(-2.370)	(-2.092)	(-0.476)
Operincome	-0.463***	-0.481***	-0.501***
	(-12.043)	(-12.559)	(-7.349)
Size	-0.008**	-0.014***	-0.006
	(-2.503)	(-3.961)	(-1.072)
Mb	0.011***	0.007***	0.015***
	(4.422)	(2.851)	(3.105)
Salesgrow	0.030**	0.021*	-0.084***
	(2.577)	(1.750)	(-3.909)
Capexp	0.149***	0.141***	-0.022
	(3.102)	(2.822)	(-0.186)
Rd	0.421***	0.467***	0.875***
	(6.804)	(7.236)	(6.178)
Leverage	0.054***	0.071***	0.111***
	(2.726)	(3.413)	(3.159)
Segments	0.001	0.001	0.004*
	(1.081)	(0.512)	(1.908)
Firm age	-0.001***	-0.001***	-0.000
	(-5.118)	(-5.095)	(-0.911)
Lagged Volat_stk	0.668***		
	(60.138)		
Lagged Idio_stk		0.660***	
		(58.592)	
Lagged Volat_roa			0.850***
			(72.110)
Observations	8199	8199	8203
Adjusted R^2	0.80	0.80	0.85

Table 4. Interactions of Golden Parachutes and CEO Pay-Performance Sensitivity on Risk-Taking

These models present the results of pooled OLS regressions for the interactive effects of golden parachutes and CEO compensation delta on risk-taking. The sample consists of S&P 1,500 firms that do not have dual-class stocks and are not in the finance or utility industries from 1992 to 2006. See the Appendix for the definitions of all variables. All models include two-digit SIC industry and year dummies, and a constant term, which are not reported to save space. Standard errors are adjusted for heteroskedasticity and clustered at the firm level. *t*-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
Dependent variable	Volat_stk	Idio_stk	Volat_roa
GP	0.073***	0.074***	0.086**
	(3.714)	(3.601)	(2.360)
Net G-index	-0.003***	-0.004***	-0.005***
	(-3.325)	(-3.726)	(-2.710)
GP * Delta	-0.013***	-0.013***	-0.014**
	(-4.054)	(-3.921)	(-2.334)
Delta	-0.007**	-0.009***	-0.005
	(-2.200)	(-2.615)	(-0.852)
Vega	-0.005**	-0.005**	-0.004
	(-2.252)	(-2.279)	(-0.993)
CEO tenure	0.013***	0.014***	-0.004
	(4.263)	(4.212)	(-0.683)
CEO age	-0.058***	-0.053**	-0.112***
	(-2.809)	(-2.448)	(-2.999)
CEO cash	-0.006**	-0.005*	-0.002
	(-2.121)	(-1.848)	(-0.351)
Operincome	-0.461***	-0.479***	-0.497***
	(-12.009)	(-12.532)	(-7.287)
Size	-0.009***	-0.014***	-0.007
	(-2.646)	(-4.090)	(-1.159)
Mb	0.010***	0.007***	0.014***
	(4.180)	(2.601)	(2.948)
Salesgrow	0.031***	0.021*	-0.083***
	(2.620)	(1.795)	(-3.879)
Capexp	0.152***	0.144***	-0.020
	(3.143)	(2.859)	(-0.165)
Rd	0.430***	0.475***	0.883***
	(6.910)	(7.340)	(6.219)
Leverage	0.052***	0.069***	0.108***
	(2.610)	(3.308)	(3.088)
Segments	0.001	0.000	0.003*
	(0.987)	(0.417)	(1.850)
Firm age	-0.001***	-0.001***	-0.000
	(-5.078)	(-5.047)	(-0.863)
Lagged Volat_stk	0.666***		
	(59.997)		
Lagged Idio_stk		0.659***	
		(58.481)	
Lagged Volat_roa			0.849***
			(71.977)
Observations	8199	8199	8203
Adjusted R^2	0.80	0.80	0.85

Table 5. Golden Parachutes and Takeover Probability

These models present the results of probit regressions of golden parachutes on the incidence of takeovers. The sample consists of S&P 1,500 firms that do not have dual-class stocks and are not in the finance or utility industries from 1992 to 2006. See the Appendix for the definitions of all variables. All models include year dummies and a constant term. Model 1 also includes two-digit SIC industry dummies. These coefficients are not reported to save space. Industry adj. X refers to the industry-adjusted variable X, defined as a firm's value of X minus the two-digit SIC industry median value of X. Standard errors are adjusted for heteroskedasticity and clustered at the firm level. *t*-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)
Dependent variable	Target	Target	Target	Target
GP	0.127**	0.146**	0.142**	-0.216
	(2.101)	(2.498)	(2.433)	(-0.975)
GP * Delta				0.067*
				(1.752)
Delta				-0.038
				(-1.050)
Net G-index	-0.010	-0.013	-0.011	-0.026**
	(-0.897)	(-1.191)	(-1.000)	(-2.095)
CEO tenure	-0.080***	-0.080***	-0.081***	-0.085**
	(-2.867)	(-3.002)	(-3.034)	(-2.443)
CEO age	0.171	0.163	0.180	0.192
	(0.800)	(0.759)	(0.843)	(0.792)
Lagged stock return	-0.002***			
	(-2.828)			
Lagged industry adj. stock return		-0.002***	-0.002***	-0.002**
		(-2.852)	(-2.788)	(-2.111)
Lagged Operincome	-0.519*			
	(-1.816)			
Lagged industry adj. operincome		-0.419	-0.295	-0.221
		(-1.467)	(-1.024)	(-0.689)
Lagged mkt value	0.009	0.031		
	(0.447)	(1.555)		
Lagged industry adj. mkt value			0.006	-0.006
			(0.274)	(-0.217)
Lagged Mb	-0.019	-0.027		
	(-0.688)	(-1.009)		
Lagged industry adj. mb			-0.021	-0.024
			(-0.771)	(-0.738)
Lagged leverage	0.270*			
	(1.713)			
Lagged industry adj. leverage		0.249	0.247	0.284
		(1.548)	(1.551)	(1.556)
Lagged PPE	0.091	0.131		
	(0.452)	(1.096)		
Lagged industry adj. PPE			0.042	0.282
			(0.210)	(1.196)
Firm age	-0.006***	-0.007***	-0.006***	-0.006***
	(-3.434)	(-3.968)	(-3.507)	(-2.986)
Lagged industry target		0.072	0.081	0.124*
		(1.164)	(1.317)	(1.751)
Industry dummies	Yes	No	No	No
Observations	10206	10771	10771	8191
Pseudo R^2	0.07	0.05	0.04	0.05

Table 6. Test of the Takeover Incentive Hypothesis

These models present the results of pooled OLS regressions to test the takeover incentive hypothesis, which predicts that similar to the negative interactive effects of golden parachutes and delta on risk-taking, the interactive effects of the takeover-related component of golden parachutes and delta on risk-taking are also negative and significant. Mp_gp (Rs_gp) is defined as the predicted (residual) component of the regression: $GP=\alpha+\beta*Mp+\varepsilon$, where Mp is the marginal probability of takeovers associated with golden parachutes based on Model 3 of Table 5 (therefore, Mp_gp+Rs_gp=GP). The sample consists of S&P 1,500 firms that do not have dual-class stocks and are not in the finance or utility industries from 1992 to 2006. See the Appendix for the definitions of all other variables. All models include two-digit SIC industry and year dummies, and a constant term, which are not reported to save space. Standard errors are adjusted for heteroskedasticity and clustered at the firm level. *t*-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
Dependent variable	Volat_stk	Idio_stk	Volat_roa
Mp_gp	0.149***	0.148***	0.148***
	(4.647)	(4.475)	(3.011)
Rs_gp	0.040	0.036	-0.010
	(1.200)	(1.032)	(-0.198)
Mp_gp * Delta	-0.033***	-0.032***	-0.023**
	(-5.426)	(-5.096)	(-2.431)
Rs_gp * Delta	-0.001	-0.001	-0.000
	(-0.183)	(-0.188)	(-0.048)
Net G-index	-0.003***	-0.004***	-0.005**
	(-3.557)	(-3.911)	(-2.486)
Delta	0.006	0.003	0.001
	(1.254)	(0.698)	(0.199)
Vega	-0.005**	-0.005**	-0.004
	(-2.094)	(-2.166)	(-0.991)
CEO tenure	0.010***	0.011***	-0.002
	(2.982)	(3.165)	(-0.365)
CEO age	-0.045**	-0.041*	-0.116***
	(-2.173)	(-1.877)	(-3.076)
CEO cash	-0.007***	-0.006**	-0.003
	(-2.618)	(-2.324)	(-0.592)
Operincome	-0.470***	-0.486***	-0.497***
	(-12.252)	(-12.779)	(-7.081)
Size	-0.008**	-0.013***	-0.007
	(-2.420)	(-3.838)	(-1.192)
Mb	0.009***	0.005**	0.015***
	(3.614)	(2.139)	(3.037)
Salesgrow	0.031***	0.021*	-0.082***
	(2.582)	(1.768)	(-3.788)
Capexp	0.150***	0.142***	0.004
	(3.110)	(2.839)	(0.029)
Rd	0.440***	0.487***	0.887***
	(7.092)	(7.559)	(6.221)
Leverage	0.061***	0.078***	0.100***
	(3.054)	(3.722)	(2.808)
Segments	0.001	0.000	0.003*
	(0.835)	(0.270)	(1.806)
Firm age	-0.001***	-0.001***	-0.000
	(-5.971)	(-5.715)	(-0.159)
Lagged Volat_stk	0.667***		
	(60.134)		
Lagged Idio_stk		0.659***	

		(58.610)	
Lagged Volat_roa			0.848***
			(71.318)
Observations	8090	8090	8115
Adjusted R^2	0.80	0.80	0.85

Table 7. Test of the Entrenchment Hypothesis

These models present the results of pooled OLS regressions conditional on subsamples characterized by different degree of CEO entrenchment to test the entrenchment hypothesis, which states that the negative interaction of golden parachutes and delta on risk-taking are attributable to entrenched CEOs (as indicated by the presence of GPs) reducing risk-taking when faced with greater compensation incentives. The sample consists of S&P 1,500 firms that do not have dual-class stocks and are not in the finance or utility industries from 1992 to 2006. High CEO tenure is a dummy variable that equals one if the tenure of the CEO is above the sample median, and zero otherwise. No majority indep directors is a dummy variable that equals one if the proportion of independent directors is less than one-half, and zero otherwise. No indep block is a dummy variable that equals one if the board has no independent director with at least 5% ownership of the firm, and zero otherwise. No inst block is a dummy variable that equals one if the firm has no institutional blockholder with at least 5% ownership, and zero otherwise. High net G-index is a dummy variable that equals one if the Net G-index of the firm is above the sample median, and zero otherwise. High CEO power is a dummy variable that equals one if the following conditions are met simultaneously: the firm's proportion of independent directors is below the sample median, the CEO shareholding is above the sample median, the CEO is also the chairman, and the CEO's tenure is at least five years, and zero otherwise. See the Appendix for the definitions of other variables. All models include two-digit SIC industry and year dummies, and a constant term, which are not reported to save space. Standard errors are adjusted for heteroskedasticity and clustered at the firm level. *t*-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	Volat_stk	Volat_stk	Volat_stk	Volat_stk	Volat_stk	Volat_stk
Sample	High CEO tenure=1	High CEO tenure=0	No majority indep directors=1	No majority indep directors=0	No indep block=1	No indep block=0
p-value for Chow test on statistical difference for GP * Delta	1.000		0.613		0.678	
GP * Delta	-0.011**	-0.011**	-0.016	-0.010**	-0.012***	-0.005
	(-2.257)	(-2.206)	(-1.280)	(-2.487)	(-2.941)	(-0.302)
Delta	-0.013***	-0.007	-0.006	-0.011***	-0.008**	-0.009
	(-2.816)	(-1.289)	(-0.572)	(-2.708)	(-2.064)	(-0.526)
GP	0.049	0.072***	0.118	0.050**	0.069***	0.020
	(1.564)	(2.632)	(1.584)	(2.071)	(2.617)	(0.194)
Net G-index	-0.003**	-0.004***	-0.002	-0.004***	-0.003**	-0.004
	(-2.205)	(-2.610)	(-0.648)	(-3.509)	(-2.259)	(-0.699)
Vega	-0.004	-0.008**	0.004	-0.008***	-0.005*	-0.028**
	(-1.324)	(-2.221)	(0.737)	(-3.203)	(-1.865)	(-2.505)
CEO tenure	0.016**	0.009	0.015	0.015***	0.014***	-0.004
	(2.075)	(1.631)	(1.404)	(4.635)	(4.120)	(-0.181)
CEO age	-0.079***	-0.049*	-0.150**	-0.051**	-0.061**	-0.001
	(-2.655)	(-1.793)	(-2.337)	(-2.112)	(-2.530)	(-0.011)
CEO cash	-0.005	-0.009*	-0.023***	-0.008***	-0.011***	0.028
	(-1.441)	(-1.853)	(-2.923)	(-2.610)	(-3.572)	(1.616)
Operincome	-0.399***	-0.511***	-0.554***	-0.457***	-0.508***	-0.525***
	(-7.973)	(-8.740)	(-4.550)	(-11.788)	(-11.164)	(-2.948)
Size	-0.005	-0.009**	-0.017	-0.003	-0.008**	-0.014

	(-1.088)	(-2.057)	(-1.481)	(-0.730)	(-2.002)	(-0.885)
Mb	0.014***	0.008*	0.020***	0.010***	0.012***	-0.001
	(4.097)	(1.944)	(2.603)	(3.607)	(3.933)	(-0.105)
Salesgrow	0.046**	0.015	0.056*	0.036***	0.040***	-0.005
	(2.543)	(0.966)	(1.873)	(2.700)	(2.818)	(-0.117)
Capexp	0.182***	0.122	0.250	0.127**	0.124**	-0.033
	(2.950)	(1.555)	(1.573)	(2.168)	(2.060)	(-0.110)
Rd	0.378***	0.500***	0.404*	0.464***	0.365***	0.515*
	(4.561)	(5.581)	(1.862)	(6.970)	(5.066)	(1.741)
Leverage	0.074**	0.034	0.200***	0.012	0.044**	0.128
	(2.421)	(1.327)	(3.457)	(0.574)	(1.987)	(1.075)
Segments	-0.000	0.002	0.009**	0.000	0.002	0.002
	(-0.146)	(1.150)	(2.445)	(0.118)	(1.624)	(0.358)
Firm age	-0.001***	-0.001***	-0.002***	-0.001***	-0.001***	-0.004***
	(-3.924)	(-3.759)	(-2.750)	(-4.608)	(-3.681)	(-3.622)
Lagged Volat_stk	0.673***	0.648***	0.581***	0.649***	0.649***	0.560***
	(42.492)	(47.598)	(37.686)	(42.139)	(50.936)	(9.833)
Observations	4099	4100	724	5983	5265	368
Adjusted R^2	0.79	0.81	0.75	0.80	0.79	0.73

(Table 7 continued)

	(7)	(8)	(9)	(10)	(11)	(12)
Dependent variable	Volat_stk	Volat_stk	Volat_stk	Volat_stk	Volat_stk	Volat_stk
Sample	No inst block =1	No inst block =0	High net G-index =1	High net G-index =0	High CEO power =1	High CEO power =0
p-value for Chow test on statistical difference for GP * Delta	0.856		0.921		0.374	
GP * Delta	-0.010	-0.012***	-0.014**	-0.015***	-0.020*	-0.009*
	(-0.906)	(-2.962)	(-2.234)	(-3.832)	(-1.699)	(-1.773)
Delta	-0.017**	-0.010**	-0.005	-0.007*	-0.005	-0.010*
	(-2.167)	(-2.545)	(-0.835)	(-1.916)	(-0.443)	(-1.760)
GP	0.072	0.059**	0.085**	0.080***	0.122	0.046
	(1.070)	(2.551)	(2.204)	(3.403)	(1.591)	(1.544)
Net G-index	-0.004	-0.003***	-0.008***	-0.003	-0.007**	-0.002*
	(-1.213)	(-2.850)	(-2.729)	(-1.532)	(-1.985)	(-1.689)
Vega	-0.004	-0.004*	-0.008**	-0.002	0.003	-0.012***
	(-0.842)	(-1.714)	(-2.136)	(-0.935)	(0.460)	(-3.625)
CEO tenure	0.031***	0.011***	0.017***	0.012***	0.001	0.018***
	(3.357)	(3.287)	(3.168)	(3.191)	(0.027)	(3.976)

CEO age	-0.086	-0.046**	-0.088**	-0.044*	-0.097	-0.052*
	(-1.277)	(-2.039)	(-2.431)	(-1.726)	(-1.588)	(-1.798)
CEO cash	-0.005	-0.008**	-0.005	-0.007*	-0.017*	-0.010***
	(-0.895)	(-2.378)	(-1.237)	(-1.889)	(-1.966)	(-2.662)
Operincome	-0.552***	-0.459***	-0.632***	-0.435***	-0.333***	-0.483***
	(-4.817)	(-10.858)	(-8.408)	(-9.822)	(-3.382)	(-9.308)
Size	0.001	-0.009**	-0.011**	-0.007*	0.001	-0.004
	(0.140)	(-2.568)	(-2.043)	(-1.753)	(0.062)	(-0.867)
Mb	0.012*	0.012***	0.021***	0.008***	0.017**	0.013***
	(1.654)	(4.174)	(4.054)	(2.618)	(2.314)	(3.613)
Salesgrow	-0.026	0.062***	0.014	0.043***	0.006	0.031**
	(-1.045)	(4.530)	(0.604)	(3.092)	(0.178)	(2.157)
Capexp	0.313**	0.147***	0.143	0.161***	0.066	0.033
	(2.057)	(2.692)	(1.592)	(2.701)	(0.413)	(0.421)
Rd	0.358*	0.418***	0.519***	0.401***	0.629***	0.441***
	(1.716)	(6.096)	(3.251)	(5.964)	(3.508)	(5.142)
Leverage	-0.036	0.071***	0.051	0.059**	0.073	0.006
	(-0.680)	(3.158)	(1.478)	(2.490)	(1.148)	(0.231)
Segments	0.003	0.001	-0.001	0.002	0.001	-0.000
	(0.969)	(1.094)	(-0.414)	(1.218)	(0.282)	(-0.382)
Firm age	-0.002***	-0.001***	-0.001***	-0.001***	-0.002***	-0.001***
	(-4.202)	(-3.866)	(-2.934)	(-3.831)	(-3.478)	(-3.340)
Lagged Volat_stk	0.643***	0.663***	0.625***	0.675***	0.609***	0.641***
	(17.160)	(59.581)	(34.212)	(49.514)	(17.743)	(46.806)
Observations	1116	6537	3073	5126	828	3957
Adjusted R^2	0.82	0.79	0.76	0.81	0.76	0.80

Table 8. Test of the Takeover Incentive Hypothesis Using CEO-Firm Fixed Effects Models

These models employ CEO-firm fixed effects regressions to examine the robustness of the results with respect to the takeover incentive hypothesis. Mp_gp (Rs_gp) is defined as the predicted (residual) component of the regression: GP=$\alpha+\beta$*Mp+ε, where Mp is the marginal probability of takeovers associated with golden parachutes based on Model 3 of Table 5. Lagged dependent variables are lagged with respect to firm, rather than CEO-firm pair. The sample consists of S&P 1,500 firms that do not have dual-class stocks and are not in the finance or utility industries from 1992 to 2006. See the Appendix for the definitions of all other variables. All models include year dummies and a constant term, which are not reported to save space. Standard errors are adjusted for heteroskedasticity and clustered at the firm level. *t*-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
Dependent variable	Volat_stk	Idio_stk	Volat_roa
Mp_gp	0.142**	0.117*	0.218**
	(2.090)	(1.684)	(2.329)
Rs_gp	0.060	0.078	0.087
	(1.048)	(1.340)	(0.966)
Mp_gp * Delta	-0.032**	-0.025**	-0.032*
	(-2.553)	(-2.002)	(-1.852)
Rs_gp * Delta	-0.006	-0.009	-0.018
	(-0.667)	(-0.935)	(-1.188)
Net G-index	-0.004	-0.003	0.004
	(-0.677)	(-0.572)	(0.421)
Delta	0.005	-0.007	-0.007
	(0.389)	(-0.537)	(-0.361)
Vega	-0.029***	-0.027***	-0.014
	(-5.039)	(-4.637)	(-1.460)
CEO tenure	0.021**	0.018*	-0.022
	(2.166)	(1.861)	(-1.266)
CEO age	-0.326	-0.228	0.038
	(-0.847)	(-0.546)	(0.057)
CEO cash	-0.014***	-0.014***	-0.004
	(-2.879)	(-2.804)	(-0.351)
Operincome	-0.324***	-0.306***	-0.652***
	(-4.386)	(-4.104)	(-4.485)
Size	-0.020	-0.037***	-0.025
	(-1.459)	(-2.603)	(-0.851)
Mb	0.010**	0.002	0.013
	(2.019)	(0.377)	(1.228)
Salesgrow	0.021	0.022	-0.000
	(1.519)	(1.542)	(-0.017)
Capexp	0.095	0.052	-0.294*
	(1.033)	(0.541)	(-1.871)
Rd	0.063	0.118	1.684***
	(0.429)	(0.786)	(3.856)
Leverage	0.086**	0.097**	0.023
	(2.303)	(2.500)	(0.298)
Segments	0.006***	0.005**	0.004
	(2.801)	(2.538)	(0.866)
Firm age	-0.034*	-0.041**	0.006
	(-1.800)	(-2.185)	(0.226)
Lagged Volat_stk	0.218***		
	(11.293)		
Lagged Idio_stk		0.200***	

		(10.057)	
Lagged Volat_roa			0.559***
			(20.089)
Observations	8090	8090	8115
Number of CEO-firms	2375	2375	2385
Adjusted R^2	0.58	0.58	0.39