Do takeover defenses deter takeovers?*

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Abstract: The G-index and E-index are used extensively in financial research to measure firms' takeover defenses. Using plausibly exogenous instruments for a firm's use of takeover defenses based on a firm's geographic location and IPO cohort, we report the first direct evidence that the G-index and E-index are negatively related to acquisition likelihood. The evidence is robust to a variety of specifications and methodologies. The relation between takeover likelihood and the G-index is driven by a subset of 12 provisions, many of which are not in the E-index and three of which have positive impacts on takeover likelihood.

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1. Introduction

The G-index and E-index are workhorses of empirical corporate finance research. Each counts the number of takeover defenses a firm has and is often used as a summary measure of the firm's protection from unsolicited takeovers (see Gompers, Ishii, and Metrick, 2003; and Bebchuk, Cohen, and Ferrell, 2009). But do these indices actually measure takeover deterrence?

This is an important question because a substantial number of empirical findings and their interpretations are based on the assumption that takeover defense indices measure takeover deterrence. For example, researchers have used the G-index and E-index to examine whether takeover defenses are associated with low stock returns (e.g., Gompers, Ishii, and Metrick, 2003; Cremers, Nair, and John, 2009; Cremers and Ferrell, 2013), firm value (Bebchuk, Cohen, and Ferrell, 2009; Cremers and Ferrell, 2014), acquisition returns (Masulis, Wang, and Xie, 2007), takeover premiums (Sokolyk, 2011; Kadyrzhanova and Rhodes-Kropf, 2011), increased risk taking (John, Litov and Yeung, 2008), internal capital markets (Duchin and Sosyura, 2013), credit risk and pricing (Cremers, Nair, and Wei, 2007; Klock, Mansi and Maxwell, 2005), operating performance (Core, Guay, and Rusticus, 2006; Giroud and Mueller, 2011), the value and use of cash holdings (Dittmar and Mahrt-Smith, 2007; Harford, Mansi and Maxwell, 2008), and corporate innovation (Atanassov, 2013). Researchers also have used takeover indices to examine whether takeover defenses serve primarily to entrench managers at shareholders' expense (Masulis, Wang, and Xie, 2007), or to increase firm value through bargaining or contractual bonding (Cen, Dasgupta, and Sen, 2011; Johnson, Karpoff, and Yi, 2015). The common basis in all of these tests is the foundational assumption that the G-index and/or E-index measure takeover deterrence. Even conclusions that takeover defenses increase firm value are based on the assumption that they deter unsolicited acquisitions (e.g., Chemmanur and Jiao, 2012; Humphery-Jenner, 2014).[1]

[1] Gompers, Ishii, and Metrick (2003) formulate the G-index to measure shareholder rights and not takeover deterrence per se. However, many researchers, including those cited in this paragraph, use the G-index to measure takeover deterrence or governance quality. Bebchuk, Cohen, and Ferrell explicitly formulate the E-index to measure

For such a foundational assumption, the notion that takeover defenses deter takeovers has surprisingly little empirical support. If anything, the available evidence indicates that there is no meaningful relation between takeover frequencies and the G-index (see Core, Guay, and Rusticus, 2006; Bates, Becher, and Lemmon, 2008; Kadyrzhanova and Rhodes-Kropf, 2011; Sokolyk, 2011). There is some evidence that isolated provisions in these indices, e.g., classified boards, are associated with lower takeover likelihood (e.g., see Bates, Becher, and Lemmon, 2008; Kadyrzhanova and Rhodes-Kropf, 2011; Sokolyk, 2011), but this evidence also is mixed (e.g., see Comment and Schwert, 1995). Some researchers focus on small subsets of takeover defenses (e.g., Cremers, Nair, and John, 2009; Kadyrzhanova and Rhodes-Kropf, 2011; Harford, Humphery-Jenner, and Powell, 2012), but such individualized choices only underscore the absence of systematic evidence on whether certain takeover defenses do, in fact, deter takeovers, and if so, which ones.

The issue is, of course, endogeneity. Firms that deploy takeover defenses may do so precisely because they are likely to receive unsolicited takeover bids. The absence of an empirical correlation between takeover defenses and firm independence cannot rule out the hypothesis that takeover defenses do in fact deter takeovers, but tend to be deployed by firms with high takeover likelihoods. Stated differently, the lack of an empirical correlation between defenses and takeover frequencies might indicate that the defenses are endogenous, not ineffective.

The purpose of this paper is to examine whether takeover defenses, and particularly the G-index and E-index, do in fact measure takeover deterrence. Using standard acquisition likelihood models without accounting for endogeneity, we find that acquisition likelihood is significantly related to firm characteristics and performance, but not to a firm's G-index or E-index. This result for the overall G-index is consistent with previous findings (e.g., see Core, Guay, and Rusticus, 2006; Bates, Becher, and Lemmon, 2008; Kadyrzhanova and Rhodes-Kropf, 2011).

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managerial entrenchment via takeover deterrence. Their E-index has been widely used as a measure of deterrence; a listing of more than 300 papers using the E-index is available at http://www.law.harvard.edu/faculty/bebchuk/studies.shtml.

To account for the endogenous adoption of defenses, we use three related but distinct empirical approaches and supplement them with multiple robustness tests. The three main approaches are (1) two-stage least squares (2SLS) models, (2) limited information maximum likelihood (LIML) models, and (3) recursive bivariate probit (RBPM) models. In these tests, we deploy two types of instrumental variables that capture arbitrary variation in firms' use of defenses. The first set of instruments is based on the defenses deployed by firms with headquarters in the same geographical area as the focus firm, but not in the same industry. The rationale for this instrument is threefold: First, managers and directors of firms in geographical proximity are likely to interact and influence each other's decisions on a broad range of corporate matters, including takeover defenses.[2] Second, firms from the same area are more likely to share law firms who do business in their area. Law firms are known to influence their client firms' use of takeover defenses (see Coates, 2001), so this geographical overlap also indicates that firms from the same area tend to use takeover defenses in similar ways for reasons that are not directly related to their specific takeover likelihoods. Third, firms are slow to change their takeover defenses during our sample period. Consistent with these arguments, we find a strong correlation between a firm's takeover provisions and those of its geographically proximate non-industry peers, a correlation that persists for years. This last point is important because it allows us to instrument for a given firm's defenses using the defenses at non-industry peer firms that were in place several years before the year of analysis and, hence, are predetermined with respect to the takeover likelihood of the focus firm in the year of analysis.

Our second type of instrument is based on the takeover defenses adopted by firms that went public within one year of the focus firm but that are not in the same industry. Daines and Klausner (2001) and Field and Karpoff (2002) document a strong time component to the adoption of takeover defenses by IPO firms, and Hannes (2006) documents that a firm's use of takeover defenses is sticky over time. These results imply that a firm's use of takeover defenses is strongly influenced by the year it went public.

[2] Similar arguments for the importance of geographical network effects are made by Davis and Greve (1997) regarding golden parachutes, Kedia and Rajgopal (2009) regarding the adoption of stock option plans, and Parsons, Sulaeman, and Titman (2014) regarding financial misconduct. Hochberg and Lindsey (2010) and Chang, Fu, Low, and Zhang (2015) also use geographical cohorts of firms from other industries to construct instrumental variables.

Accordingly, we use the provisions adopted by unrelated firms in a focus firm's IPO cohort to identify arbitrary variation in a firm's takeover defenses that is not directly related to the firm's specific takeover likelihood. As with the geography-based instrument, we use predetermined non-industry IPO cohort information from years before the year of analysis to instrument for each firm's defenses during our sample period.

Following guidelines discussed in the literature, we test and confirm that both our instruments meet the necessary conditions for strong instruments. Using these instruments to account for endogeneity has an important effect on our empirical results, as we find that takeover likelihood is negatively and significantly related to both the G-index and E-index. A one-standard deviation increase in the instrumented value of a firm's G-index corresponds to a 14.0% reduction in the probability that the firm will be acquired within five years, and a one-standard deviation increase in the instrumented value of a firm's E-index corresponds to a 25.5% reduction in the probability that the firm will be acquired within five years. These results are robust across the 2SLS, LIML, and RBPM methods, as well as other methods and specifications that support our argument that the instruments satisfy the exclusion criterion. These results provide the first direct empirical support for the widespread assumption that takeover defenses do in fact deter takeovers.

To unpack how the G-index and E-index are related to takeover deterrence, we conduct several additional tests. First, we document that an index constructed from the provisions that are included in the G-index but excluded from the E-index – which Straska and Waller (2014) label the Other Index or O-index – is significantly and negatively related to takeover likelihood. The O-index provisions are also economically significant, as a one-standard deviation increase in the instrumented value of a firm's O-index is associated with a 10.1% reduction in the probability that the firm will be acquired within five years.

Next, we investigate the effects of each individual provision on takeover likelihood. For each provision, we use a firm's non-industry geographic peer firms' three-year lagged incidence of that provision as one instrument and the firm's non-industry IPO-year cohorts' three-year lagged incidence of that provision as a second instrument. These instruments identify variation in the use of these provisions that is strongly correlated with the incidence of the provision at the focus firm in the year of analysis but that is

predetermined and not directly related to the takeover likelihood for that specific firm. Using this approach, we then test for the relation between each provision and takeover likelihood while controlling for the rest of the provisions. We find that 12 of the original 24 provisions in the G-index are individually related to takeover deterrence. Of these, nine have the expected sign, indicating they deter takeovers, while three have the opposite sign, indicating that they positively affect takeover likelihood.

The nine provisions that deter takeovers after accounting for endogeneity are anti-greenmail provisions, classified boards, director indemnification, limitations on director liability, directors' duties provisions, director contracts, fair price restrictions, supermajority requirements, and unequal voting rights.[3] The provisions that are positively related to takeover likelihood are compensation plans with change-in-control provisions, golden parachutes, and straight (i.e., not cumulative) voting. The fact that these three provisions are positively related to takeover likelihood runs counter to the assumptions about these provisions that underlie the G-index and E-index. Nonetheless, the results for the two compensation-related provisions have intuitively appealing interpretations: if offered generous payouts once their firm is acquired, managers are more likely to seek acquirers or agree to be acquired.[4]

Finally, we compare several subsets of provisions to examine which best explain takeover likelihood. We find that an index of the 12 individual provisions that are significantly related to takeover likelihood is strongly related to takeover deterrence with or without accounting for endogeneity. We construct this new index – called the Deterrence index or D-index – by adding 1 to the index total for each of the nine provisions that have a negative relation to takeover incidence. Unlike the G-index and E-index, however, we add 1 to the D-index for each of the three provisions that are positively related to takeover incidence if the provision is absent. All of the predictive power in the G-index and E-index (as well as two

[3] This list notably excludes poison pills, a finding that is consistent with arguments that virtually all firms have latent, or shadow, poison pills (e.g., Coates, 2000). If all firms effectively have poison pills during our sample period, the official presence or absence of a poison pill should not affect takeover likelihood. The Appendix presents additional evidence about poison pills' empirical relation to takeover likelihood.

[4] Mansi, Nguyen, and Wald (2013) and Goktan, Kieschnick, and Moussawi (2014) also find that takeover likelihood is positively related to the use of golden parachutes.

other indices used in other papers) for takeover deterrence is attributable to the provisions that overlap with the D-index.

Our investigation is related to several papers that use various identification strategies to examine the relation between takeover defenses and outcome variables such as Tobin's q and takeover premiums. Kadyrzhanova and Rhodes-Kropf (2011) use age-at-IPO as an instrument in a two-step estimation approach aimed at estimating the relation between governance provisions and takeover premiums. Goktan and Kieschnick (2012) use a Heckman probit model approach with a selection equation to address selection issues. Straska and Waller (2010), Bebchuk and Cohen (2005), and Bebchuk, Cohen, and Ferrell (2009) use antitakeover provisions from several years before the year of analysis in an attempt to address simultaneity concerns. Cremers and Ferrell (2014) use the 1985 *Moran v. Household International, Inc.* decision to identify the relation between firm value and takeover defenses. Cuñat, Gine, and Guadalupe (2015) use a regression discontinuity design to examine the effect of shareholder governance-related proposals on takeover probabilities and premiums. Our paper, in contrast, examines all 24 of the G-index provisions and their specific relation to takeover likelihood, as opposed to their relations with other outcome variables.

Our investigation also is related to previous papers that conclude that the G-index and E-index are not empirically related to takeover likelihood (Core, Guay, and Rusticus, 2006; Bates, Becher, and Lemmon, 2008; Kadyrzhanova and Rhodes-Kropf, 2011; Sokolyk, 2011). Bates, Becher, and Lemmon (2008) argue that these findings have wide-ranging implications, as they "…challenge the common perception that these factors, independently or as indexed, provide a reliable proxy for managerial entrenchment or a firm's exposure to the market for corporate control." Our findings, in contrast, provide empirical support for the widespread use of the G-index and E-index to measure takeover deterrence.

This paper makes four contributions to the literature. First, we argue that the absence of an empirical correlation between takeover likelihood and the G-index or E-index reflects the endogenous adoption of takeover defenses. We propose two types of instruments that allow for a direct empirical investigation of the relation between each of the 24 provisions used in the G-index (and the six provisions

in the E-index) and takeover likelihood. Our main results are largely similar and robust to using either type of instrument, even though the instruments are created using two fundamentally different types of peer effects. Second, we show that both the G-index and E-index are negatively and significantly related to takeover likelihood. These results support the widespread assumption that these indices measure takeover deterrence, as well as the large body of empirical inferences that are based on this assumption. To our knowledge, our paper is the first to document a causal effect between these indices' counts of takeover defenses and lower takeover likelihoods. In robustness tests we show that a higher number of takeover defenses also results in a lower likelihood of receiving a takeover bid, indicating that at least part of the effect on takeover likelihood comes from bid deterrence. Third, our provision-level results show that the G-index and E-index are particularly noisy measures of takeover deterrence, as their predictive power comes from a subset of provisions, many of which are outside the E-index. And fourth, we identify the subset of provisions in the G-index – the D-index – that empirically are most strongly related to takeover likelihood. In constructing the D-index we intentionally eschew theoretical arguments about which takeover defenses should or should not be strong takeover deterrents (e.g., see Coates, 2000; Bates, Becher, and Lemmon, 2008), and include individual defenses only if they are empirically related to acquisition likelihood. The resulting D-index contains the 12 provisions that most significantly relate to takeover likelihood, and incorporates our finding that three of the provisions increase takeover likelihood. We demonstrate that the G-index and E-index are negatively related to takeover likelihood because some of their provisions overlap with the provisions in the D-index.

The paper proceeds as follows. In Section 2 we describe the data, discuss endogeneity issues in our empirical approach, and motivate and discuss the validity of our specific instruments. In Section 3 we report the relation between takeover likelihood and both the G-index and E-index. We report these results first without accounting for endogeneity and then after accounting for endogeneity. In Section 4 we investigate how each individual takeover defense relates to takeover likelihood, and again account for endogeneity. In Section 5 we report on robustness tests. In Section 6 we use the Section 4 results to create

the D-index and show that the G-index and E-index "work" to explain takeover incidence only because they include some of the D-index provisions. Section 7 concludes.

2. Descriptive information, endogeneity concerns, and instruments

2.1. Data and sample descriptive information

To address the question of whether the antitakeover provisions from the G-index and E-index relate to takeover deterrence we require information on firm acquisitions, firm- and industry-level control variables known from prior research to relate to takeover likelihood, and information on which provisions exist at each firm each year. Our acquisition data come from the Thomson's Securities Data Company (SDC) database, the firm- and industry-level information is from Compustat and CRSP, and the provision-level data are from the Investor Responsibility Research Center (IRRC) database.[5]

Institutional Shareholder Services (ISS) acquired IRRC in 2005. Riskmetrics then acquired ISS and starting in 2007 made significant changes to the format and scope of the governance data collected each year. As a result, only about half of the original 24 components of the G-index are available in some form via Riskmetrics after 2006. Riskmetrics not only changed the exact information collected but also the manner of collecting and reporting the information such that even for the subset of variables collected by both IRRC and Riskmetrics there is a large structural change in 2006, despite the focus that both data sets have on S&P 1500 firms. For example, both the IRRC and Riskmetrics data sets include a binary variable named "labylw," which indicates restrictions on shareholders' ability to amend bylaws. The IRRC file reports that 22.4% of firms have such restrictions in 2006, while Riskmetrics reports that 85.0% of firms have such restrictions in 2007. Given such changes and the lack of many provisions' data after 2006, we focus only on the IRRC data through 2006 and assume that the provisions constituting the G-index in 2006

[5] The following SDC Filters were used in identifying IRRC targets: US Targets with deal form M, AM, or AA and a completed status. The IRRC data have been acquired and alternatively controlled by ISS, Riskmetrics, and MSCI, and have been listed on the WRDS platform alternatively under the Riskmetrics and ISS names. To avoid confusion, in this paper we refer to the 1990-2006 data collected by IRRC as IRRC.

carry forward for two more years. This approach ensures that our analysis directly relates to the large body of existing research, which relies extensively on the IRRC data.[6]

Projecting the data forward in time is consistent with the standard approach used in the literature for previous years in which IRRC did not report firm-level data. From 1990-2006, IRRC published governance data for 1990, 1993, 1995, 1998, 2000, 2002, 2004, and 2006, with each volume including corporate governance information for between 1,400 and 2,000 firms. Like previous studies, we fill in data from missing years by projecting forward from the most recent IRRC data. For example, the IRRC governance data from 1993 are used in 1994 and the 1995 data are used for 1996 and 1997.

Following the procedure in Gompers et al. (2003), we distill the 45 IRRC data elements into 24 corporate governance provisions, and report the G-index as a sum of the constituent provisions. The E-index described in Bebchuk et al. (2009) is calculated in the same manner as the G-index, by adding one for each provision in effect. The E-index is comprised of six governance provisions: poison pills, golden parachutes, classified boards, limits to shareholder amendments of the bylaws, supermajority requirements for mergers, and supermajority requirements for charter amendments.[7] Table A.1 in the Appendix reports on the annual frequencies of each provision in our sample.

Firm-specific financial and operating control variables are from Compustat and CRSP and are motivated by prior work on takeover likelihood.[8] These variables include firm size (AT), leverage (DLTT/AT), the market-to-book ratio ((CSHO*PRC + DLTT)/AT), return on assets (OIADP/AT), the property ratio (PPEGT/AT), the liquidity ratio ((ACT-LCT)/AT), average sales growth over three years (average(($SALE_t$ - $SALE_{t-1}$)/$SALE_{t-1}$)), the prior one-year market-adjusted return, and industry

[6] The Appendix reports on tests in which the 2006 data are extended through 2010. The results (Table A.19) are similar to those reported in the paper for Table 4. The Appendix is available on SSRN at http://ssrn.com/abstract=2608759.
[7] Gompers, Ishii, and Metrick (2003) include a detailed discussion of the 24 provisions in the G-index.
[8] For examples, see Palepu (1986), Ambrose and Megginson (1992), Song and Walkling (1993), Comment and Schwert (1995), and Field and Karpoff (2002).

concentration as measured year-by-year using the Herfindahl-Hirschman index based on sales.[9] Industry controls are made using the Fama-French 49 industries.

Our initial sample consists of 29,374 firm-years from the intersection of firms in the IRRC and Compustat databases from 1990-2008. Missing control variables cause 5,729 firm-years to be eliminated from the sample. In addition to these data requirements, each firm each year is required to have at least one non-industry geographic peer firm within its state and at least one non-industry IPO-year peer for the calculation of the instrumental variables described in more detail in Section 2.3. Additionally, we construct our instruments using lagged takeover provision data for each firm's non-industry geographic and IPO-year peers using data from three years before the year of analysis. The three-year lag requirement eliminates all observations from 1990-1992 because the IRRC data starts in 1990. Finally, because we track takeovers of sample firms for five years after each focus year, we require Thomson's SDC acquisition data from 1993-2013. These data requirements result in 15,989 firm-year observations that serve as our basic sample for all tests.

[Insert Table 1]

Using this sample, Table 1 reports the number of firms and takeovers and the mean G-index and E-index values by year. The mean G-index ranges from 9.1 to 9.6 during our sample period of 1993-2008 with a standard deviation of 2.6 provisions.[10] Gompers et al. (2003) report similar G-index values during the 1990-1998 period. The E-index ranges from 2.5 to 2.8 during our sample period with a standard deviation of 1.2, again largely comparable to the figures reported for the 1990-2002 sample in Bebchuk et al. (2009). The trends in takeover frequency shown in Table 1, with peaks in the late 1990s and mid-2000s, are similar to those documented by Masulis, Wang and Xie (2007). Table 2 provides additional descriptive

[9] If PPEGT is missing but PPENT is not, we use PPENT to calculate the property ratio. ACT and LCT are not reported in Compustat for banks, so requiring these variables eliminates banks from our sample.

[10] The slight variation in the mean G-index and E-index values across proximate years is due to firms dropping from the sample. For example, consider the 1993 and 1994 values. The 1993 G-index values are used to populate 1994, but the table above reports a slightly different annual mean in 1993 and 1994. The difference arises because not all of the firms that were included in 1993 still exist in 1994.

information for the firms in the final sample of 15,989 firm-year observations. Most of the sample characteristics are standard for research in this area, and the summary statistics are similar to those of other samples based on IRRC data (e.g., see Core, Guay, and Rusticus, 2006; Sokolyk, 2011).

[Insert Table 2]

2.2. Endogeneity concerns

Our research question is whether the takeover provisions as constituted within the G-index or E-index affect takeover likelihood. A naïve approach to this question would involve estimating a simple regression of a binary variable for being acquired (y_1) on the takeover index variable (y_2) and control variables (x_1-x_k), as in equation (1).

$$y_1 = \partial y_2 + \beta_1 x_1 + \cdots \beta_k x_k + u \qquad (1)$$

Given the potentially endogenous nature of y_2, this approach would result in biased and inconsistent estimates of ∂ because $E(u \,|y_2, x_1 \ldots x_k) \neq 0$. Intuitively, endogeneity arises if managers' use of takeover defenses is affected by their assessment of the likelihood the firm will receive a takeover bid or if the adoption of the defenses is correlated with managers' underlying openness to being acquired. In this paper, we address this endogeneity concern in three main ways: (1) two-stage least squares (2SLS) models, (2) limited information maximum likelihood (LIML) models, and (3) recursive bivariate probit (RBPM) models. In addition to these three main approaches we employ a series of robustness tests reported in the paper but tabulated in the Appendix. We describe the rationale for these empirical approaches below.

Our first and main approach for identification is to estimate 2SLS models using instrumental variables for the takeover defense variable y_2. Identification is achieved by directly modeling the endogenous variable as a function of two sets of instrumental variables (z) as shown in equation (2) and then using the fitted values from equation (2), which capture exogenous variation in firms' index values, in the structural equation (equation 1).

$$y_2 = \gamma_1 z + \gamma_2 x_1 + \cdots + \gamma_k x_k + e \qquad (2)$$

Our second identification approach is to estimate the same models using a limited information maximum likelihood (LIML) approach. As noted by Stock and Yogo (2005) and Hayashi (2000, page 542), 2SLS and LIML estimators have the same asymptotic distributions but LIML is more robust to both finite sample bias and to weak instruments. Angrist and Pischke (2009, pages 209-213) suggest using a LIML model to corroborate inference from overidentified 2SLS models – as in our main application – specifically because the LIML estimates tend to be less biased than the 2SLS estimates. We obtain similar qualitative results using either methodology.

Both 2SLS and LIML approaches rely on variation in the instrument to identify exogenous variation in y_2. For identification, an instrument must meet both relevance and exclusion conditions (see Roberts and Whited, 2012). The relevance condition is testable, and we report the first-stage F-statistic and the R-squared value for each of our tests. Staiger and Stock (1997) suggest a rule-of-thumb that the F-statistic be at least 10 for a strong instrument in a 2SLS setting. Stock and Yogo (2005) tabulate various guidelines for identifying weak instruments depending on (1) the estimation bias and test statistic size distortion that the researcher is willing to accept relative to OLS estimation, (2) the number of endogenous variables involved, and (3) the number of instruments. Since we have one endogenous variable and up to two instruments for each index or provision, only the size distortion guidelines apply (the tabulated bias guidelines require three or more instruments). The Stock and Yogo (2005) size distortion guidelines for our application using a LIML model, assuming less than 10% size distortion (10% is the smallest category they consider), are that the first-stage F-statistics should be at least 8.7 for a strong instrument.

The exclusion condition requires $\text{cov}(z, u) = 0$ and can be thought of as the requirement that the instrument only affect whether a firm is acquired (y_1) via its relation with the endogenous index (y_2) and not via some other pathway captured in the error term. Because the exclusion condition is not directly testable we discuss the creation of our instruments in detail in Section 2.3 and argue that the exclusion condition is plausibly met. However, it is impossible to rule out all conceivable channels through which our instruments might be correlated with the error term in equation (1). Here is where the strength of our instruments plays an important role. Previous research shows that, even with small violations of the

exclusion condition, the 2SLS approach often yields estimates that are close to the true parameter values if the instruments are sufficiently strong, (e.g., see the discussion in Conley, Hansen, and Rossi, 2012; Kiviet and Niemczyk, 2013; and Murray, 2006). As we report in detail in the following sections, our instruments are very strong relative to the established guidelines in the literature.

Most of our instrumental variable tests focus on systems of equations like those described in equations (1) and (2) above. In Tables 4 and 6 the endogenous variable is an index of provisions (i.e., G-index, E-index) that is treated as a pseudo-continuous variable. In Table 5, the endogenous variable is a single binary provision. When the dependent variable in equation (2) is binary we have the option either to impose a cumulative distribution function on the outcome or to estimate a linear probability model (LPM). Given that 2SLS in a LPM context allows for either binary or continuous endogenous regressors (both of which we use) we choose to use 2SLS with a LPM as our main approach. This approach is similar to that discussed in econometrics texts such as Angrist and Pischke (2009, page 198) and Cameron and Trivedi (2010, page 485). Cameron and Trivedi specifically note that using a 2SLS approach with a LPM results in consistent estimates but that heteroskedasticity-robust standard errors must be used for inference.

Both 2SLS and LIML approaches rely on the relevance and exclusion conditions for identification although, as noted above, the LIML results tend to be less sensitive to both finite sample problems as well as to bias. Given the corroboration of our main conclusions across these two methodologies and the strength of our instruments – particularly in the models focused on the overall G-index – we argue that our main empirical conclusions are reasonably identified even in the possible presence of slight violations of the exclusion condition. However, as a further robustness test, we check our inferences using a RBPM.

RBPMs are specific to settings in which both the endogenous variable and the final outcome variable are binary. Hence, the RBPM approach is a natural robustness check for the tests that focus on individual provisions. For our main tests that focus on indices of variables we map the index variables to binary outcomes. This mapping is consistent with the general intuition in a RBPM where the two left-hand side variables in equations (1) and (2) are considered latent variables (y_1^*, y_2^*). By assumption, y_1 and y_2 are observed to equal 1 when their underlying respective latent variables are above a certain threshold. For

our application of the RBPM, we assume that firms with G-index values above the mean each year are firms whose latent measures of defenses are above the cutoff threshold. We use the same approach to map E-index and O-index values to binary measures.

The RBPM approach offers three advantages as a robustness test for the 2SLS and LIML results. The first advantage is that, unlike in the other approaches, the RBPM allows for, and models, the correlation in errors across equations. This means that correlation between the omitted variables in both equations can exist without creating potential bias in the RBPM estimates. The second advantage is that the RBPM's joint bivariate normal distributional assumption is different from the 2SLS and LIML models. As a robustness test, this more restrictive distributional assumption is valuable because it allows us to corroborate our main results across different methodologies using different assumptions. The third advantage of the RBPM approach as a robustness test is that the exclusion condition is not necessarily required for identification in RBPMs (Wilde, 2000; Greene, 2003, pp. 714-717).[11] Greene specifically notes that "the endogenous nature of one of the variables on the right-hand side of the first equation can be ignored in formulating the log-likelihood…." for the RBPM, and that we "can ignore the simultaneity in this model and we cannot in the linear regression model…" (Greene pp. 715-716). Thus the RBPM represents a way to probe our results from the 2SLS and LIML models using an empirical approach that is less dependent on the (nontestable) exclusion condition.

The RBPM results also address a potential concern specific to measurement error in a 2SLS setting focused on endogenous index values. As described in more detail in the heading of Table A.24 in the Appendix, even if our instruments for each individual provision satisfy the exclusion restriction, the instrument for the overall G-index (or E-index) might still be correlated with the error term in the structural

[11] Wilde (2000) notes that in RBPMs no exclusion condition is needed for identification as long as there is sufficient variation in the variables. Mourifie and Meango (2010) note that partial identification is possible without the exclusion condition but that point identification in some cases requires more information. Han and Vytlacil (2013) show that although the exclusion restriction is sufficient, it is not necessary for identification in these types of models as long as there are common exogenous variables included as controls across the two equations.

model because the index is measured with error.[12] The RBPM results are not as sensitive to potential violations of the exclusion condition and hence address this issue. In the Appendix Table A.24 we discuss additional robustness tests that also address this concern using reduced form models. Angrist and Krueger (2001), Murray (2006), and Chernozhukov and Hansen (2008) suggest that reduced form models of the dependent variable of interest (y_1) regressed directly on the instrument can offer corroborating evidence for inference taken from 2SLS models particularly in settings with potential 2SLS bias. We apply the same approach here to partially mitigate bias-related concerns associated with measurement error when instrumenting an index in a 2SLS setting. Our main results are qualitatively similar using 2SLS, LIML, RBPM, or reduced form approaches.

2.3. Instrumental variables and exogenous proxies for takeover defenses

Given the relevance and exclusion requirements described above, our instruments for the 2SLS and LIML tests should (1) strongly correlate with the index values or individual provisions for the firm, and (2) not relate to the likelihood of takeover of that firm in other ways. We use two sets of instruments in this paper. The first set of instruments is based on the incidence of provisions at geographically-proximate firms that are not in the same industry as the focus firm. The second set of instruments is based on the incidence of provisions at firms that went public within one year of the firm in question but that are not in the same industry.

To create the first set of instruments, we first use zip codes to identify all firms within a 100-mile radius of the focus firm's headquarters. We then eliminate firms within this group if they (1) have the same

[12] We thank Daniel Ferreira for bringing this point to our attention. Intuitively, the measurement error arises when different components of the index have different effects on takeover likelihood. An implicit assumption behind the use of G-index and E-index as measures of takeover defenses in the literature is that every component of the index has equal and interchangeable effects on takeover likelihood. For example, using an equally weighted index of provisions, as is done in the literature, implies that classified boards, supermajority vote requirements, and golden parachutes all have the same effect on takeover likelihood, and that a G-index measure of 3 at one firm that includes a classified board has the same effect as a G-index measure of 3 at another firm that does not include a classified board. If this assumption is true, the measurement error disappears. Even if this assumption is not true (as we show in Section 4), the discussion in the Appendix associated with Table A.24 provides reasons why the measurement-error-induced violation of the exclusion condition is likely to be small.

Fama-French 49 industry classification as the focus firm or (2) are located in a different state. If no peer firms are found using this approach then a statewide net is used instead of a 100-mile radius. In robustness tests, we repeat our main analysis using the 24 broader industry groups associated with GICs instead of the Fama-French industries and obtain qualitatively similar results. Requiring that the matching firms come from the same state ensures that all of the comparison firms share unobservable state-specific characteristics. Nevertheless, in robustness tests reported in the Appendix (Tables A.14 and A.15), we relax the requirement that comparison firms be located in the same state as the focus firm and find results similar to those in Tables 4 and 5.

Geographic proximity could explain takeover defenses if there are shared legal or consulting services by region or a spillover of management ideas at the local level (e.g., via university-sponsored CEO forums or local chapters of the National Association of Corporate Directors). Importantly, the geographic proximity instrument is based on headquarter locations and not state of incorporation, so the instrument does not pick up the tendency for firms to select Delaware, Nevada, or other specific states due to their laws, as examined by Bebchuk and Cohen (2003) and Dyreng, Lindsey, and Thornock (2014). Figure 1 plots the headquarters locations for firms in our sample and shows that these headquarters are distributed widely across the US.

[Insert Figure 1]

To illustrate the construction of the geography-based instrument assume that the antitakeover index has two provisions (provisions A and B). Assume the firm in question has four geographically-proximate non-industry peer firms; the presence of provision A using binary variables at these four firms is (0,0,1,1) and the presence of provision B at these four firms is (1,1,0,1). Using these numbers, 50% of the geographically-proximate firms have provision A and 75% have provision B. Thus the instrument at the index level for this firm would be 0.50 + 0.75 = 1.25. At the provision level, the instrument for provision A would be 0.50 and the instrument for provision B would be 0.75. (Note that the instrument is not the

same for the index and the provisions. Rather, a unique geography-based instrument exists for each index and each provision.)

We construct the instrument in this manner to address two potential concerns about the exclusion condition for a geography-based instrumental variable. The first potential concern arises because merger waves (and hence takeover likelihoods) are a function of industry-level shocks and trends through time (e.g., see Harford, 2005; and Mitchell and Mulherin, 1996). To the extent that firms from the same industry locate in the same region there could be correlations in takeover defenses and takeover likelihoods in a given year between the focus firm and its geographically-proximate peer firms. We address this concern by excluding from the peer group firms from the same industry as the focus firm. This allows us to isolate geographic peer effects in takeover provisions that are not related to the firm's industry. As noted above, our results are not sensitive to using narrowly defined (Fama-French 49 industries) versus more broadly defined industry groups (24 industries based on GICs).

The second potential concern is that unobservable geographic factors might explain not only takeover defenses at the focus firm and its cohort firms, but also takeover likelihoods in any given year. To address this concern we examine (1) the timing of firms' location decisions, (2) the size and geographic scope of these firms' operations relative to their headquarters, and (3) the fact that the firms' takeover provision decisions, once made, rarely change during our sample period (e.g. see Hannes, 2006; and Johnson, Karpoff, and Yi, 2016). Consider first that most firms' headquarter location decisions are made many years before the year of analysis, and most firms in a given location during our sample period chose their headquarters and their takeover provisions in different years through time. Indeed, the headquarter locations for most firms in our sample were likely chosen by their respective founders for personal reasons when their firms were considerably smaller and private, and hence not subject at that time to the same takeover environment as public peer firms in our sample period. Hence, we argue that because these location decisions are made in different years for different firms for diverse reasons that may or may not apply to public firms, and because economic and takeover conditions vary widely over time for different locations, it is unlikely that the focus firm and its non-industry peers would all have chosen the same

headquarter location for common reasons (in different prior years) that then in later years still explains both their takeover defense choices and their takeover likelihoods. This is especially true given that the cohort set excludes firms from the same industry as the focus firm and that firms' takeover provision decisions tend to be sticky through time where past decisions are rarely overturned during our sample period.

Next, consider that our sample consists of large (primarily S&P 1500) firms. As large firms, their operations and sales are widespread and thus affected by economic trends beyond the narrow locale of their headquarters. Indeed, it is unlikely that any geographic characteristic that is specific to the narrow locale of such a large firm's headquarters would materially affect its takeover likelihood. Thus, because our sample consists of national and multi-national firms, we argue that the firms' takeover likelihoods are primarily a function of their overall fundamentals, and not the narrow locales where their headquarters are located. Whatever the reasons that led both the focus firm and its geographic non-industry peers to locate their headquarters in the same area, these reasons are not driven by a common industry trend (due to our construction of the non-industry cohort set), and are not driven by common timing in the location decision. Rather, we contend that large firms with proximal headquarters, but from different industries, exhibit similar takeover defenses during our sample period because of local information spillovers that occurred years, if not decades in the past, when the takeover provisions were being selected. We conclude that the past takeover defense decisions of non-industry, physically proximal peer firms are not directly related to the specific takeover likelihood of the focus firm years (or decades) later in our sample.

To further strengthen our argument that the exclusion condition is met, not only is the peer set limited to non-industry peer firms, but all measures of the peer firms' takeover defenses in our analysis are lagged by at least three years with robustness tests showing qualitatively similar results using a five-year lag (see Tables A.7-A.8 and Section 5 for more discussion). These robustness tests support the argument that the cohort's use of takeover defenses is not directly related to the focus firm's current takeover environment.

To create the second set of instruments we employ a similar approach, but instead of using geography we identify peer firms from all firms in the sample that went public within one year of the focus

firm but that are not in the same industry. This instrument is based on evidence that a firm's use of takeover defenses is strongly influenced by the year it went public. Daines and Klausner (2001) and Field and Karpoff (2002) show that IPO firms' use of takeover defenses varies systematically over time, and Hannes (2006) reports that a firm's use of takeover defenses does not change much after the IPO. Similarly, Johnson, Karpoff, and Yi (2016) find that 83% of firms that went public between 1997 and 2011 never changed their takeover defenses through the end of 2013.

Given the size of firms covered in IRRC, many of the firms in our sample went public years before our sample period (1993-2008). To capture variation in takeover defenses over time we define IPO-year cohorts starting in 1950 and move forward year-by-year through 2008. All firms that went public before 1950 are included as part of the 1950 cohort. Using this approach results in most years having 10 or more peer firms, with some years having more than 100 peer firms per year. Following the logic introduced with the geography-based instrument, the provision-level instrument for a given firm is the percent of non-industry IPO-year cohort firms that have the same provision. The index-level instrument is the sum of the provision-level instruments. Table A.2 in the Appendix provides the number of IPOs in each year for our sample.

Similar to the geography-based instrument, we argue that whatever sets of provisions a firm's non-industry IPO-year cohort of firms chose to have years in the past should have no direct relation with the specific takeover likelihood of the firm in question years later and, hence, that the exclusion requirement is met. As with the geography-based instrument, to strengthen the argument that the exclusion condition is met, we lag all measures of IPO-year-non-industry peer firms' takeover provisions by at least three years in all tests when constructing the instruments. Again, we emphasize that there is not only one IPO-cohort instrument for all indices and provisions. Rather, this procedure yields a unique instrument for each index and each provision.

The two sets of instruments are calculated using two different peer effects – one geographic in nature, and the other year-based in nature. The differences in approaches are reflected in the relatively low correlation the instruments have with each other (e.g., the geography-based instrument for the G-index has

a correlation of 0.16 with the IPO-year-based instrument for the G-index). Although the two instruments are based on fundamentally different peer effects, our main qualitative conclusions are not sensitive to whether we use only the geography-based, only the IPO-year-based, or both instruments together (see Tables A.3 and A.4 in the Appendix for the results based on each instrument separately). These results suggest that each instrument does, in fact, identify exogenous and independent variation in the endogenous variables of interest.[13]

3. Governance indices and takeover deterrence

3.1. Tests without accounting for endogeneity

We begin our investigation of the relation between the indices and takeover deterrence in a traditional setting without regard to endogeneity. Columns 1-4 of Table 3 report coefficients from probit models, and columns 5-8 report results from linear probability models (for comparison purposes with subsequent tables). In all cases, the G-index and E-index are not significantly related to takeover likelihood within one year or within five years. The G-index results are consistent with earlier findings (Core, Guay, and Rusticus, 2006; Bates, Becher, and Lemmon, 2008; Kadyrzhanova and Rhodes-Kropf, 2011; Sokolyk, 2011), and the E-index results consistent with a result reported but not tabulated in Bates, Becher, and Lemmon (2008). Again, these results are difficult to interpret because these tests do not attempt to account for endogeneity.

[Insert Table 3]

[13] Gormley and Matsa (2014) identify problems with using group averages of an independent variable as an instrument. For example, if the instrument for a firm's takeover defenses is calculated as the average number of defenses among firms in the same industry, unobserved heterogeneity at the industry level that is correlated with the use of takeover defenses leads to inconsistent estimates and the inability to use industry fixed effects in the 2SLS equations. Our instruments do not suffer from this problem because we use the firm's non-industry peers – not the firm's industry group – to create the instruments, and all of our instruments are constructed using lagged information. We also note that our group assignments are based on decisions about where to locate and when to go public that typically were made some years before the year of analysis. Thus, unlike the example discussed in Gormley and Matsa (2014) where the group assignment mechanism itself (i.e., industry) implies ongoing correlation between the firm and potentially unobservable group characteristics, our group assignment mechanism is based on decisions made years in the past by firms in different industries and hence does not imply ongoing correlation between the firm and its group. In Appendix Table A.20 we estimate the Table 4 specification without industry fixed effects and obtain qualitatively similar results.

3.2. Instrumental variable tests

If firms with greater ex-ante exposure to unsolicited takeover bids deploy and maintain defenses, or if takeover defenses are related to managers' underlying willingness to accept takeover overtures, the models in Table 3 yield biased estimates. To address the bias that arises from firms' endogenous use of takeover defenses and takeover likelihood, we employ the estimation techniques and instrumental variables discussed in Sections 2.2 and 2.3. Panels A, B, and C of Table 4 report the 2SLS, LIML, and RBPM results from takeover likelihood tests after accounting for endogeneity using both the geography-based and IPO-year-based instruments.[14,15] In addition to the G-index and E-index, we examine what Straska and Waller (2014) call the "O-index," which is the set of provisions outside the E-index but in the G-index. In Table 4, columns 1-3 (4-6) the dependent variable is set to 1 if the focus firm was acquired in year t+1 (years t+1 through t+5). The last two columns in Panel A report the standardized coefficients for the G-index, E-index, and O-index from columns 1–6. The 2SLS standardized results imply that a one standard deviation increase in the G-index results in a 14.0% reduction in the likelihood of being acquired within the next five years. A one standard deviation increase in the E-index results in a 25.5% reduction in the likelihood of being acquired within the next five years. The instrumented O-index also is negatively and significantly related to takeover likelihood.

[Insert Table 4]

The bottom of Panel A of Table 4 reports F-statistics from the first-stage regressions associated with the second-stage results reported in the first six columns (again, the first-stage regressions are reported in the Appendix Tables A.10 and A.11). The same F-statistics apply to the Panel B LIML results. The F-statistics are large and exceed the guidelines outlined in Staiger and Stock (1997) and Stock and Yogo

[14] The first-stage regressions for Tables 4 and 5 are tabulated in the Appendix. See Tables A.10 and A.11. The results in Table 4 are from over-identified models. The just-identified results are qualitatively similar for all models using the geography-based instrument. The just-identified results are qualitatively similar for the five-year horizon models, but weaker for the one-year-horizon models, when using just the IPO-year-based instrument. The just-identified results are tabulated in Tables A.3 and A.4 in the Appendix.

[15] All models in Table 4 include the same control variables as in Panel A. In Panels B and C we tabulate only the LIML coefficients and the RBPM average marginal effect for the G-index, E-index, and O-index variables.

(2005) to identify "strong" instruments, as discussed in Section 2.1.[16,17] Based on our argument that these instruments are not directly related to takeover likelihood, we interpret the results in Panel A of Table 4 as providing evidence that the G-index and E-index are indeed negatively related to takeover likelihood after accounting for endogeneity. This conclusion is corroborated by both the LIML results, which are very close to the 2SLS results, as well as the RBPM results. This evidence supports the literature's widespread use of the G-index and E-index as proxies for a firm's takeover vulnerability. Furthermore, the O-index results indicate that some provisions in the G-index but excluded from the E-index also work to deter takeovers.

As discussed in Section 2.2, the RBPM approach is used as a robustness test. Given the non-linear nature of these models the marginal effects are not equal to the estimated coefficients. Thus we calculate and report the average marginal effect of above-average G-index, E-index, and O-index values. The RBPM marginal effects are estimated as the difference in the predicted probability of observing a takeover conditional on being above or below the index average value while holding all other characteristics at the firm constant (following Greene, 2003, page 716). The Table 4 Panel C results confirm that firms with higher numbers of takeover defenses are significantly less likely to be acquired. Specifically, firms with above-average G-index are 3.8% less likely to be acquired within one year and 22.8% less likely to be acquired within five years. These results strongly corroborate our 2SLS and LIML results from Table 4 Panels A and B. The reduced form tests, tabulated in Table A.24 in the Appendix, also corroborate these qualitative conclusions. A potential concern with the E-index and O-index tests is that they exclude the

[16] Roberts and Whited (2012) discuss common problems with tests regarding overidentification and the exclusion criterion. Following this discussion, we rely more on our arguments in Section 2 for instrument validity than on specification tests. Nonetheless, we take advantage of having two instruments by using the robust version of the Hausman overidentification test to test for instrument validity. The null hypothesis in this test is a joint null of both (1) correct model specification, and (2) instrument validity. The robust version of the Hausman test is appropriate because our models correct for heteroskedastic errors and cluster by firm (see Wooldridge 2002, page 123). Using this test, we fail to reject the joint null for any of the models in Table 4. The p-values from these tests range from 0.241 to 0.986. We interpret the test results as providing corroborating evidence that our instruments are valid.

[17] The Stock and Yogo (2005) test statistics were derived in a setting with homoskedastic errors. Consistent with the discussion in Cameron and Trivedi (2010, page 199) and the lack of published guidelines on how to relate the test statistics to F-statistics in the context of heteroskedastic-robust errors, we follow Cameron and Trivedi and note that our F-statistics using robust standard errors greatly exceed the published guidelines and hence likely satisfy the test, and thus reject the null of weak instruments.

other provisions in the G-index, which our results indicate have an effect on takeover likelihood. Thus, even though our intent is to examine whether each index is a reliable predictor of takeover likelihood, the results regarding the E-index and O-index could be affected by an omitted variable bias. In Table A.21 in the Appendix we report results in which these tests are repeated with the other G-index provisions included as additional controls and obtain qualitatively similar results.

4. Individual antitakeover provisions as measures of takeover deterrence

In this section we move our attention from the index level to the individual provisions from which the indices are constituted. Our empirical strategy is the same as before: we rely on two equations in which one equation (the structural or takeover equation) models takeover likelihood as a function of the provision and other firm- and industry-level control variables while the other equation (the first stage in a 2SLS context) models the potentially endogenous presence of the provision as a function of the instruments and other control variables. We focus first on the 2SLS results, followed by the LIML and RBPM results.

Columns 1, 2, 7, 8 and 9 of Table 5 report on the marginal effect each provision has on takeover likelihood. A challenge that arises in these tests is how best to control for the other 23 provisions when examining the specific effect any one provision might have on takeover likelihood. Columns 1 and 2 of Table 5 present two approaches to this challenge. In column 1, the results come from a single takeover equation that includes 24 separate binary variables for each of the 24 provisions included together at the same time. In column 2, the results come from 24 separate takeover equations, estimated one at a time, in which a single provision is included as the binary variable of interest. In the column 2 models, we include as a control variable an index that sums up the remaining 23 provisions (i.e., an index that could range in value from 0 to 23) in each of the 24 regressions. All specifications in Table 5 also include the 73 year-, firm-, and industry-level control variables that are included in Table 4.

Neither of the approaches in columns 1 or 2 account for endogeneity, but the results are presented in this way to show that the signs, sizes, and significance of the coefficients in columns 1 and 2 are generally similar using either approach. This result suggests that we can control for the net effect of the remaining

23 provisions collectively while parsimoniously looking at the specific effect that each provision has on takeover likelihood, considered in isolation.[18] The marginal effects reported in columns 7, 8, and 9 start with the general approach in column 2 by including an index of the 23 provisions, but use 2SLS, RBPM, and LIML methodologies, respectively, to account for endogeneity in each provision. In each case the results are estimated using both the takeover and provision equations together with exogenous variation in each provision's incidence being identified using the lagged provision-level instruments.

[Insert Table 5]

Column 7 of Table 5 reports the marginal effects of each of the 24 provisions as estimated using 2SLS with a linear probability model (LPM) with 24 separate regressions in which each provision is treated, in turn, as the endogenous binary variable of interest. Columns 3-6 report diagnostic information related to these same 24 2SLS regressions. Column 3 reports the first-stage R-squared value. Column 4 reports the F-statistic from the first-stage of each specification to provide information about the strength of the provision-level instrument. Column 5 summarizes this information by highlighting the provisions that have strong instruments using the rule-of-thumb from Staiger and Stock (1997) that requires an F-statistic greater than 10. Column 6 reports a "Yes" if the *p*-value from a regression-based test of exogeneity is smaller than 10% and hence provides supporting evidence that the variable in question is actually endogeneous.[19] To be conservative, we purposely use a 10% cutoff for this test rather than a 5% cutoff.

For robustness, columns 8 and 9 report the marginal effects of the 24 provisions on takeover likelihood using our two alternative estimation approaches that are based on the same two underlying equations but that use different modeling assumptions and hence are not subject to the same weaknesses as

[18] In additional robustness tests we re-estimate all specifications in Table 5 using the same two equations that appear in the Table 5 heading but without the index of the other 23 provisions (i.e., the $Index_{23}$ variable). We find that most of the same coefficients that are significant in Table 5 are significant and that they have the same signs. See Table A.6 in the Appendix.

[19] The errors for a LPM are known to be heteroskedastic. In our specifications the errors are also clustered by firm. Hence, the test for endogeneity is not done using the traditional Hausman or Durbin-Wu-Hausman approaches but instead uses a variation of the Durbin-Wu-Hausman test that is robust to heteroskedastic and clustered errors. See Wooldridge (2002, pages 118-121) for a discussion of the traditional approach. Cameron and Trivedi (2010) discuss the robust test (page 190) as the "robustified" Durbin-Wu-Hausman test. The test was implemented in Stata and is referred to in the Stata documentation for the ivregress/estat endogeneous command as the "regression-based test."

2SLS. The column 8 results are estimated using a RBPM. Under this approach, as discussed in Section 2.2, the two equations are estimated as simultaneous equations using maximum likelihood techniques that allow for correlation between the errors in the two equations. As discussed in Greene (2003, pages 715-716), this type of approach can be used to consistently estimate the marginal effects of an endogeneous binary regressor in a system of equations like the system we are using in which both equations in the system have binary outcomes. Given that the correlation in errors is allowed and modeled, and that the exclusion condition is not necessarily needed for identification (Wilde 2000), this approach is not as sensitive to some of the assumptions needed to motivate the 2SLS or LIML approaches. Following Greene (2003, page 716) we estimate the marginal effects in column 8 as the average difference in the predicted probability of observing a takeover conditional on having or not having the provision in place while holding all other characteristics at the firm constant. A comparison of the results in columns 7 and 8 reveals that the signs and significance of the RBPM marginal effects are for the most part similar to the 2SLS results. A comparison of the marginal effects using the 2SLS, RBPM, and LIML approaches show a few differences, but all of the significant results from the 2SLS approach are confirmed significant by the alternative robustness approaches.[20]

Column 10 summarizes how we use the results in Table 5 to identify the provisions that are most significantly related to acquisition likelihood, and which constitute the basis for our empirically-driven Deterrence index, or D-index. We first focus on the signs and significance of the 2SLS results for provisions that have a strong instrument. This is because 2SLS coefficients with strong instruments are consistent. By this criterion, the following provisions are negatively related to acquisition likelihood: anti-greenmail provisions, director indemnification, directors' duties provisions, fair price restrictions, and supermajority requirements. By this criterion, straight (not cumulative) voting is positively related to acquisition

[20] The Table 5 2SLS LPM results are based on an overidentified model using both the geography-based and IPO-year-based instruments together. The just-identified version of the 2SLS LPM results for Table 5 are tabulated in Appendix Table A.5.

likelihood. For each of these provisions, the RBPM or LIML results, or both, provide corroborating evidence.

For several other provisions, the F-statistics in column 4 indicate the absence of strong instruments, and the regression-based test for exogeneity (see footnote 19) fails to indicate evidence of endogeneity. For these provisions, we rely on the signs and significance of the LPM results in columns 1 and 2. This is because, in the absence of endogeneity, OLS estimation (columns 1 and 2) is more efficient than 2SLS estimation (column 7). By this criterion, classified boards and unequal voting rights are negatively related to acquisition likelihood, while compensation plans and golden parachutes are positively related to acquisition likelihood. We also add limitations on director liability and director contracts to this list because the LPM results are significant and column 6 indicates a lack of evidence for endogeneity. Moreover, the signs on the LPM, 2SLS, RBPM, and LIML coefficients are consistently negative across methodologies, and the limitations on director liability and director contracts results are significant in some of the 2SLS, RBPM, and LIML results tabulated in robustness tests in the Appendix Table A.5.

Using this logic, a total of 12 of the 24 provisions in the G-index are individually and significantly related to takeover likelihood. Column 10 indicates the direction of effect for each of these 12 provisions.

Three additional provisions have mixed or weaker evidence. First, limitations on making amendments to the charter appear weakly significant in columns 1 and 2 and hence are a candidate for inclusion in column 10. We do not include it because (1) the signs of the 2SLS, RBPM, and LIML marginal effects are opposite the signs in columns 1 and 2 and appear in some cases to be significant and (2) there is evidence of endogeneity. Second, the coefficient for limitations on written consent is significant in columns 1 and 2, but not included in column 10 due to inconsistent signs in columns 7-9 coupled with evidence of a strong instrument.

The third provision with mixed evidence is poison pills. Pills are not included in column 10 based on the absence of a strong instrument and the conflict in signs between columns 2 and 8 as well as evidence from the robustness tests. In Tables A.5 and A.6 in the Appendix we explore the robustness of our results using slightly different models and a five-year versus a one-year horizon for takeovers. The overall results

in these tables are similar to those in Table 5 and, specifically for poison pills the evidence is not clear. Our mixed evidence regarding poison pills mirrors an ongoing theoretical debate about the importance of a firm's explicit adoption of a poison pill. Pills are widely regarded as having a strong deterrence effect on unsolicited takeovers, an argument that Bebchuk et al. (2009) use to include poison pills in the E-index. Coates (2000) and others, however, point out that nearly all firms have the legal right to adopt poison pills at any time, even after receiving an unsolicited takeover bid, a right affirmed by several Delaware Supreme Court decisions.[21] By this argument, the nearly universal availability of latent poison pills eliminates the incremental deterrence of observed poison pills in our sample. In our main tests, we rely on the Table 5 results and exclude poison pills from the D-index, a decision that is consistent with the argument that all firms have latent pills. In a sensitivity test reported in Table 6, however, we include poison pills already in place in the analysis along with the other provisions that appear significant in Table 5.

Three provisions have the opposite effect on takeover likelihood than assumed in the construction of the G-index: compensation plans with change-in-control provisions, golden parachutes, and the lack of cumulative voting. The positive effects of the two compensation-related variables have a simple interpretation: if offered a generous payout conditional on their firm being acquired, managers will be more likely to seek acquirers or to agree to be acquired if an unsolicited bid arises.

The positive effects of the lack of cumulative voting do not have an easy interpretation. It is conceivable that such limitations decrease outside activists' ability to force specific changes in corporate policy, thereby increasing the marginal value of a takeover attempt. Similarly, most prior researchers argue that straight voting discourages takeover attempts because dissidents are unable to cumulate their votes to elect one or two dissident-backed directors to the corporate board. It is possible, however, that precluding such dissident activity encourages outside activists to substitute away from activist efforts and toward

[21] These decisions include *Moran v. Household International, Inc.*, 500 A.2d 1346 (Del. 1985); *Paramount Communications, Inc. v. Time, Inc.*, 571 A.2d 1140, Del. Supr. 1989; and *Unitrin, Inc. v. American General Corp.*, 651 A.2d 1361 (Del. 1995).

takeover of the whole firm. Such interpretations are consistent with our findings that limitations on straight voting are positively related to acquisition likelihood, but these interpretations are highly speculative.

5. Instrument validity and robustness tests

The results in Tables 4 and 5 plus the supporting tests reported in the Appendix imply that, after accounting for endogeneity, the G-index, E-index, and O-index all are negatively related to takeover likelihood. The results also identify nine provisions in the G-index that are negatively related to takeover likelihood and three provisions that are positively related to takeover likelihood. While the RBPM tests do not rely on the exclusion condition for identification, our inferences from the 2SLS and LIML tests do rely on the validity of our instrumental variables. In this section we discuss tests that examine potential concerns about instrument validity and the robustness of our test results.

5.1. Peer influence on bid receptivity

Both of our main instruments are based on the notion that peer effects – via either geographic proximity or IPO cohort – induce arbitrary variation in firms' use of takeover defenses that does not directly correlate with each firm's specific takeover likelihood. One concern is that peer effects simultaneously affect both takeover defenses and takeover likelihood. For example, it is possible that a manager's willingness to accept a takeover bid is affected by other nearby firms, just as her willingness to adopt takeover defenses was.

Our main tests seek to address this concern by examining the relation between takeover likelihood and instruments that are lagged by three years. The three-year lagged instruments capture the influence on the focus firm's defenses of non-industry peer firms' use of takeover defenses three years before the period in which takeover likelihood is measured for the focus firm. So, even if the peer firms simultaneously affect the focus firm's takeover defenses and takeover likelihood (despite being from different industries), it is much less likely that the peer firms' use of defenses from three years previously will directly affect the

focus firm's current takeover likelihood. This implies that any direct relation between the lagged instrument and any current peer influence on a manager's receptivity to a takeover bid is likely to be negligible.

To further probe this concern, however, we conduct two additional tests. In the first test, we construct instrumental variables using cohort information that is lagged by five years. Such lags decrease our sample size, but further strengthen the argument that the instruments satisfy the exclusion restriction. This is because the peers' influence on the focus firm's use of takeover defenses comes from their use of takeover defenses many years previously and is unlikely to be correlated with any current peer influence on the focus firm's attitude toward acquisition bids. The results are reported in Appendix Tables A.7 and A.8 and are similar to the results from our main tests.

In a second test to probe the concern about instrument validity, we examine the influence of a firm's takeover defenses on the likelihood of receiving a takeover bid rather than on the likelihood of being acquired. We realize that the focus firm's receptiveness to being acquired could affect its likelihood of receiving a bid. Even so, any direct effect of the peer firms on the focus firm's receptiveness to being acquired plausibly will be weaker than any effect on the likelihood that the focus firm receives a bid in the first place. The results, which are reported in Appendix Tables A.12 and A.13, are consistent with our main results. They indicate that not only are the G-index and E-index negatively related to acquisition likelihood, they also are negatively related to the likelihood of receiving a takeover bid. The results from both of these robustness tests support the argument that our instruments meet the exclusion restriction.

5.2. Persistent IPO cohort influence on takeover likelihood

A second concern focuses on the validity of the IPO year cohort-based instrument. It is possible that time-variation in takeover likelihood induces a simultaneous correlation between peers' takeover defenses and both the focus firm's takeover defenses and takeover likelihood. For example, firms going public in 1990 may have takeover defenses that are influenced by the defenses used by other firms going public at the same time, but all of these defenses may reflect these firms' acquisition likelihood at the time. Such an effect would violate our exclusion restriction for the IPO cohort-based instrument.

Our main tests address this concern by basing the instruments on the takeover defenses of firms that are not in the focus firm's industry. Merger activity clusters by industry, but time clustering across industry groupings is less pronounced (e.g., Harford 2005). Another aspect of our tests that address this concern is that firms' takeover likelihood is affected by firm characteristics – including size, age, profitability, and leverage – that differ substantially across firms in the same IPO cohort. This implies that takeover likelihood is not strongly affected by a firm's IPO cohort. As argued above, however, there is a strong time-dimension to IPO firms' uses of takeover defenses that drives a strong IPO cohort influence on a firm's use of takeover defenses. Together, these effects imply that the IPO cohort-based instruments meet both the relevance and exclusion restrictions for good instruments.

Nevertheless, we further probe this concern by repeating our main tests and limiting the sample to firms that have been public at least ten years. The rationale for this robustness test is that any peer-related correlation between takeover defenses and takeover likelihood induced at the time of the IPO would weaken over time. This is because the firm-specific circumstances that affect takeover likelihood at the time of the IPO are unlikely to remain constant for 10 or more years. Stated differently, we observe that IPO-cohort peer effects have a persistent effect on the focus firm's use of takeover defenses. But any common correlation with takeover likelihood is much less likely to persist over time, especially because our cohort firms exclude any firms from the focus firm's same industry. The results of this test are reported in Appendix Table A.16, and are similar to those in our main tests. These tests further support the inference that our instrumental variables meet the exclusion restriction.

5.3. Endogeneity of state of incorporation

A third potential concern arises from the fact that firms choose the state in which to incorporate, and states offer different levels of takeover defense via state antitakeover laws. This raises the possibility that firms cluster in states according to their takeover likelihood and desire for takeover protection, thus creating a direct link between a firm's takeover likelihood and its peer firms' takeover defenses. Such a direct link could invalidate our geography-based instrumental variable.

Fortunately, this concern does not apply to our tests because state takeover laws apply to firms incorporated in the state. Our peer-based instruments, in contrast, are based on the location of the firm's headquarters. As documented by Cremers and Sepe (2015), a majority of large, publicly-traded firms are incorporated and headquartered in different states, largely because a majority of firms incorporate in Delaware.[22] Furthermore, most firms' headquarters are the result of decisions made long before the firm became publicly traded and long before managers would be considering takeover defenses. While there is some movement in firms' states of incorporation, it is unlikely that firms' headquarters decisions have much to do with the antitakeover laws of the headquarters state.

Nonetheless, we conduct several tests to examine whether our results are sensitive to additional controls for either the state of incorporation or headquarters state. Appendix Table A.23 reports results from the second stage regressions for takeover likelihood using the G-index, E-index, and O-index (similar to Table 4), but including an indicator for firms that are headquartered in the same state in which they incorporate. Appendix Table A.22 includes a control for Delaware incorporation. The results from these tests are similar to the main results in the paper.

5.4. Additional robustness tests

In addition to the tests reported above, we examine whether our results are sensitive to other decisions we made in implementing our main tests. Our test results are robust to the following changes: (1) different approaches to creating the instruments (see Tables 4, A.14, and A.17); (2) using a takeover horizon of one or five years (Tables 4, A3, A4, A.12, A.14, A.16, A.17); (3) using the 49 Fama-French industries or the 24 GIC industry classifications (Tables 4, A.17, and A.18); (4) calculating the geography-based instrument using geographically-proximate firms either with or without the requirement that they be in the same state (Tables 4 and A.14).

[22] Cremers and Sepe (2015) report a total of 470 firms reincorporated from one state to another during the 16 year period from 1996-2011. Most (331) are reincorporations into Delaware from other states.

There are two exceptions to our overall finding that the results are robust to a wide range of test specifications. First, in one robustness test the G-index and E-index are not statistically significant in explaining takeover likelihood when using the IPO-year-based instrument alone and a one-year takeover horizon. Both indices remain negative and statistically significant in explaining takeovers when using a five-year horizon or when using the geography-based instrument. Second, our tests regarding each individual provision have some variability in outcomes across methodologies. Our overall conclusion is that 12 of the original 24 provisions in the G-index are individually related to takeover likelihood – nine with negative effects and three with positive effects. This overall conclusion is supported in takeover likelihood tests using various methodologies and modeling assumptions, as reported in Tables 5, A.5, A.6, A.8, A.13, A.15, and A.18. But the exact list of specific provisions that are considered to relate to takeover likelihood varies slightly depending on which assumptions and approaches are emphasized. For example, in some of the specifications, limitations on shareholder amendments to bylaws appears negative and significant (e.g., Appendix Table A.13) but in other specifications it does not.

In the following section we compare several subsets of provisions to examine which best explain takeover likelihood. We include the 12 provisions that are identified as individually important in Table 5 – and which constitute the D-index – as one of the subsets in these tests. But we emphasize that our main results – that (1) higher G-index and E-index levels are associated with lower takeover likelihoods after accounting for endogeneity, and (2) that this effect is driven by a subset of the provisions in the G-index – do not depend on whether we focus on these specific 12 provisions in the D-index, or consider a different set of provisions as most strongly related to takeover deterrence.

6. Alternate measures of takeover defense

To better understand how subsets of provisions might explain takeover likelihood, in this section of the paper we isolate sets of provisions and then empirically test their ability to explain takeover likelihood. In identifying these subsets we focus on (1) known indices from the literature, (2) the set of provisions highlighted in Table 5 (i.e., the "D-index"), and (3) the subsets of the provisions that are common

to more than one index. Our approach in this section is purely empirical and atheoretic in nature. That is, we make no effort to explain why these specific provisions should relate to takeover likelihood and instead allow the data to indicate which provisions are empirically related to takeover likelihood. The G-index and E-index are calculated as discussed in the literature. The D-index is calculated using a similar approach by adding 1 for each of the nine provisions that have significantly negative marginal effects on takeover likelihood as reported in Table 5, column 10. We add 1 to the D-index for the absence of each of the three provisions that have significantly positive effects. The D-index therefore can range in value from 0 to 12. In our sample it has a mean value of 3.4 and a standard deviation of 1.8 provisions.

Figure 2 illustrates the relationships between the D-index, G-index, and E-index and highlights the subsets of provisions common to more than one index. The figure also includes two lesser-used indices, the FK-index used by Field and Karpoff (2002), Chemmanur et al. (2011), and Johnson et al. (2014), and the Alternative Takeover Index (ATI) described by Cremers and Nair (2005). The D-index consists of a subset of the provisions in the G-index that partially overlaps with the provisions in the E-index, FK-index, and ATI.

[Insert Figure 2]

Table 6 reports on tests that compare each index's empirical relation to takeover likelihood. Column 1 reports the marginal effect of each set of provisions on takeover likelihood using a linear probability model without accounting for endogeneity. As noted previously, neither the G-index nor the E-index correlates with takeover likelihoods in tests that do not account for endogeneity. The ATI and FK-index are also not significantly related to takeover likelihood when not accounting for endogeneity.

[Insert Table 6]

Column 2 reports the marginal effect of each set of provisions as estimated from the takeover equation after accounting for endogeneity using a 2SLS approach. For each set of provisions, we calculate set-specific three-year-lagged geography-based and IPO-year-based instruments by summing the provision-level instruments for the specific set of provisions. In these tests, after correcting for endogeneity,

the G-index, E-index, O-index, and FK-index all are negatively related to takeover likelihood.[23] Columns 3 and 4 report results from the first-stage regressions indicating the presence of strong instruments for almost all subsets of provisions.

Rows 6-8 report results for the D-index. Rows 6 and 7 calculate the D-index using the corrected signs for the three provisions that empirically are positively related to takeover likelihood, and row 8 calculates the D-index using the original signs as used by previous researchers. The results in row 6 show that the D-index is significantly and negatively related to takeover likelihood with or without accounting for endogeneity. This provides evidence that, collectively, the provisions in the D-index are strongly negatively related to takeover likelihood. Given the strength and validity of our instruments, the estimated relation is causal. Row 7 displays similar results for an augmented D-index that includes poison pills. As shown by row 8, D-index provisions entered without corrected signs remain negatively related to takeover likelihood only after accounting for endogeneity, similar to the results for G-index and E-index in rows 1 and 2, respectively. Collectively, these results imply that effective measures of takeover deterrence should correct for individual provisions' directional effects on takeover likelihood and account for endogeneity.

The results in rows 9-11 serve as sensitivity analysis; we examine subsets of the D-index to understand if particular provisions are driving the observed deterrence relation. Rows 9 and 10 focus on the set of D-index provisions with negative and positive marginal effects, respectively. Row 11 considers a subset of D-index provisions after eliminating provisions related to state-level laws (control share, anti-greenmail, directors' duties, and fair price). The results indicate that the significant deterrence relation of the D-index holds even when excluding state-level defenses.

[23] In the original ATI some of the provisions were considered jointly. For example, a value of 1 was added to the index if the firm had either limitations on calling special meetings or limitations on acting by written consent. Similarly a value of 1 was added to the index if the firm had either a blank check provision or a poison pill. Because some indices treat the provisions jointly whereas others treat them separately, and to ensure we can compare the various indices and subsets of provisions in Table 6, we code the indices in Table 6 as though each provision is considered separately. Hence a value of 2 (rather than 1) is added to the ATI index in Table 6 if the firm in question has both a blank check and a poison pill.

The results in rows 12-14 illustrate which subsets of the various provisions actually reflect takeover deterrence and which constitute noise. Each row reports the effect on takeover likelihood of the subset of provisions in a given index that are not also in the D-index. In each case, the non-D-index provisions—even when aggregated—are not significantly related to takeover likelihood with or without accounting for endogeneity. We note that the F-statistics from the first-stage regressions associated with rows 12-14 all easily exceed the guidelines from the literature for the identification of strong instruments. Hence the lack of significance in these rows is not due to weak instruments.

These results are corroborated by the results in rows 15-20. Each row reports the relation to takeover likelihood for the subset of an index's provisions that are also in the D-index. We report two sets of results for each index. The first enters the D-index provisions with the corrected signs for the three provisions with positive marginal effects on takeover likelihood, and the second enters these three D-index provisions with the original signs as used by previous researchers. (The FK-index does not include any of the provisions with positive marginal effects on takeover likelihood. Hence, its "corrected signs" results in row 19 are identical to its uncorrected results in row 20.)

In row 15, the E-index provisions that also are in the D-index are negatively related to takeover likelihood with or without treatments for endogeneity if we count the absence of a golden parachute (instead of its presence) as increasing the index. Similarly, the subsets of each of the other indices that are also in the D-index are negatively related to takeover likelihood, but the relation becomes smaller or insignificant in tests that do not account for endogeneity if the provisions are not entered taking into account the positive marginal effects of the three positively related provisions. We conclude from these results that, although the G-index, E-index, O-index, and FK-index are negatively related to takeover likelihood after accounting for endogeneity, these relations are wholly attributable to the set of provisions that constitute the D-index.

The results in Table 6 indicate that, within-sample, the D-index is a less noisy measure of takeover deterrence than the G-index, E-index, FK-index, or the ATI.[24] Furthermore, while we explicitly avoid

[24] One potential limitation for the analysis in Table 6 is due to possible pre-testing bias given that the D-index's 12 provisions are identified by their statistical significance in the tests reported in Table 5. Thus it may not be surprising

theoretical arguments about which provisions provide the most takeover deterrence, most of the provisions in the D-index have intuitively appealing interpretations. For example, the D-index includes classified boards, unequal voting rights, and directors' duties provisions, three provisions that are widely regarded as offering strong takeover deterrence.[25] It also includes provisions that the law literature and trade outlets regard as offering significant takeover deterrence, including supermajority vote requirements and straight (non-cumulative) voting (e.g., see Hannes, 2006), and it treats golden parachutes and compensation plans as increasing a firm's takeover likelihood, consistent with evidence reported by Bebchuk, Cohen and Wang (2014) and Fich, Tran, and Walkling (2013).

7. Conclusion

The G-index and E-index are used extensively in the literature as proxies for takeover vulnerability. Yet, because of endogeneity, almost no empirical evidence exists that quantifies whether, or how much, various takeover defenses, or combination of defenses, actually affect a firm's likelihood of being acquired. Indeed, we find that, in simple tests that do not account for endogeneity, there is no empirical relation between a firm's G-index or E-index and its takeover likelihood.

In this paper we use two types of instruments to achieve identification in 2SLS tests of the relation between takeover defenses (and indices of defenses) and takeover likelihood. The first set of instruments is based on the lagged use of takeover defenses by geographically proximate firms that are not in the same industry as the focus firm, and the second set of instruments is based on the lagged use of takeover defenses by firms in the same IPO cohort as the focus firm but not in the same industry. Previous findings indicate that a firm's headquarter locations and IPO year have strong effects on its use of takeover defenses that are related to networking and law firm influence rather than a direct concern about takeover vulnerability.

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that the D-index displays statistical significance in Table 6. However, it is not clear how pre-testing at the provision level should interact with aggregated measures of provisions and the comparisons between subsets of provisions not highlighted in Table 5 seem informative on their own.

[25] For classified boards, see Bates et al. (2008) and Kadyrzhanova and Rhodes-Kropf (2011); regarding directors' duties provisions, see, e.g., Valihura and Stark (1998); regarding unequal voting rights, see, e.g., Karmel (1988).

Given that firms are also slow to update their defenses over time, the on-going correlation observed in defenses between the focus firm and its non-industry cohorts during our sample period are for reasons that occurred years, if not decades, in the past and hence the instruments are predetermined with respect to the focus firm's takeover likelihood in a given year. These instruments thus help to simulate arbitrary variation in a firm's use of takeover defenses to test for the relation between the use of such defenses and takeover likelihood.

Using these instruments to account for endogeneity, we find that a one-standard deviation increase in the instrumented value of a firm's G-index (E-index) results in a 14.0% (25.5%) reduction in the probability that the firm will be acquired within the next five years. At the provision level we find strong evidence that nine provisions negatively affect takeover likelihood: anti-greenmail provisions, classified boards, director indemnification, limitations on director liability, director contracts, directors' duties provisions, fair price provisions, supermajority vote requirements, and unequal voting rights. We find mixed evidence that poison pills relate to takeover likelihood. Our evidence regarding poison pills does not contradict arguments that poison pills are effective and strong takeover deterrents. Rather, this evidence is consistent with the view that all firms have latent poison pills and that the actual presence of a pill is immaterial. Three provisions counted as takeover deterrents in the G-index are positively and significantly related to takeover likelihood: change-in-control compensation plans, golden parachutes, and the absence of cumulative voting.

To probe possible concerns about our 2SLS results, we conduct several robustness tests and also examine the direct relation between takeover likelihood and our instruments. Limited information maximum likelihood, recursive bivariate probit, and reduced form tests help mitigate possible concerns about potential 2SLS bias. The results from these tests, along with a battery of robustness tests reported in the Appendix, work together to corroborate our main findings using 2SLS.

Concerns about the endogenous nature of the G-index and E-index have prompted many researchers to use coverage by state antitakeover laws to identify plausibly exogenous variation in firms' takeover vulnerability (e.g., see Bertrand and Mullainathan, 2003; Cain, McKeon, and Solomon, 2015).

Such identification strategies, however, are subject to their own weaknesses (see Catan and Kahan, 2015; Karpoff and Wittry, 2015). Our results, in contrast, provide direct empirical support for the use of takeover indices such as the G-index and E-index to measure takeover deterrence because – after taking endogeneity into account – higher values of both indices have a negative causal effect on takeover likelihood.

However, we also show that the relation between takeover likelihood and the G-index is driven by a subset of provisions that we call the D-index. The D-index is a purely empirically-based collection of 12 provisions that, historically, is directly and strongly related to a firm's takeover likelihood. Many of these provisions are excluded from the E-index and three of them are counted with the opposite sign from how they are included in the G-index. While the D-index provisions individually and jointly are significantly related to takeover likelihood, the G-index and E-index provisions that are not in the D-index are not significantly related to takeover deterrence.

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Figure 1: Firm headquarters in our sample

The figure below shows the headquarters of firms in our sample, used to create geography-based instruments for the use of individual takeover defenses and indices of takeover defenses. Our sample was created as the intersection of firms in both the IRRC and Compustat databases from 1993-2008. Although not depicted in the figure, firms from both Hawaii and Alaska are included in the sample.

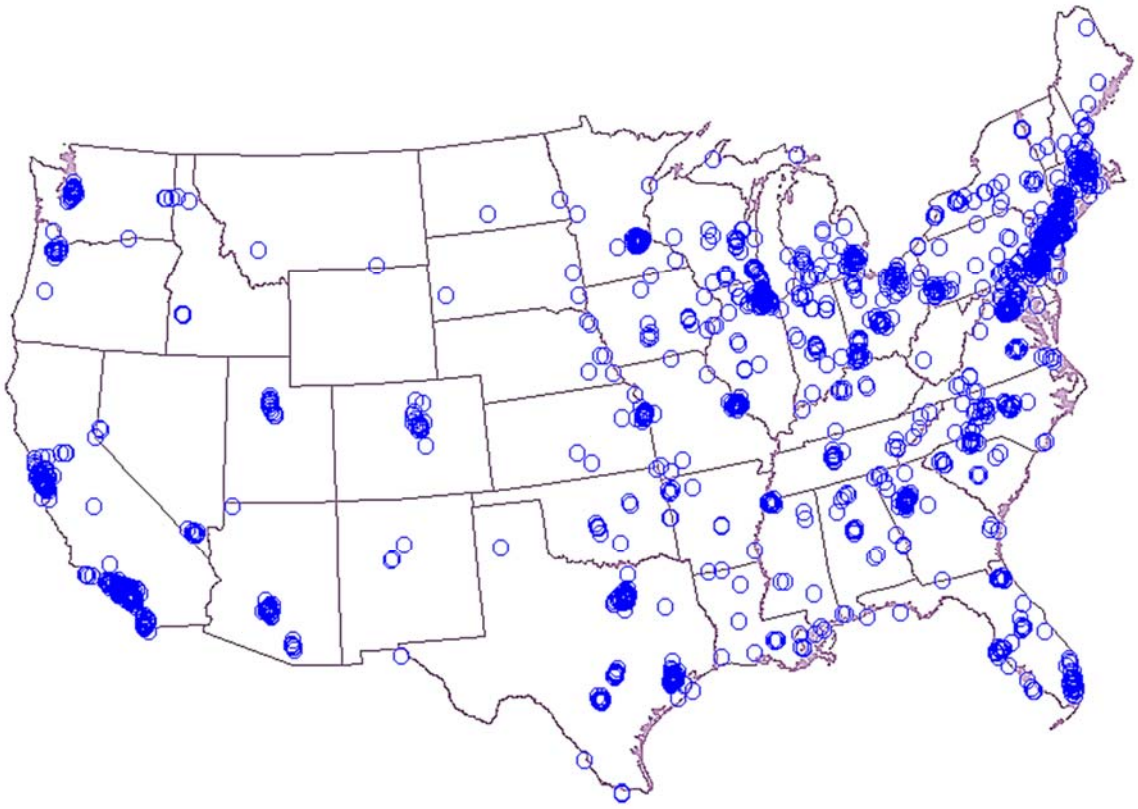

Figure 2: Visual portrayal of the relations between different takeover indices

In the figure below the 24 provisions covered in the G-index are represented visually by the largest circle. Each of the shapes within the circle represents other takeover indices used in the literature to proxy for takeover deterrence. The shaded regions identify provisions that are shared between indices. The figure visually highlights the differences in opinions that exist in the finance literature about which provisions most relate to takeover likelihood, and helps to motivate the empirical measures used in Table 6. The G-index, E-index, FK-index, and ATI are described in Gompers, Ishii, and Metrick (2003), Bebchuk, Cohen, and Ferrell (2009), Field and Karpoff (2002), and Cremers, Nair, and John (2009), respectively. The O-index includes the G-index provisions minus the E-index provisions. The three provisions shown with negative signs indicate that, based on evidence presented in Table 5, the presence of these provisions is linked to lower, not higher, takeover deterrence.

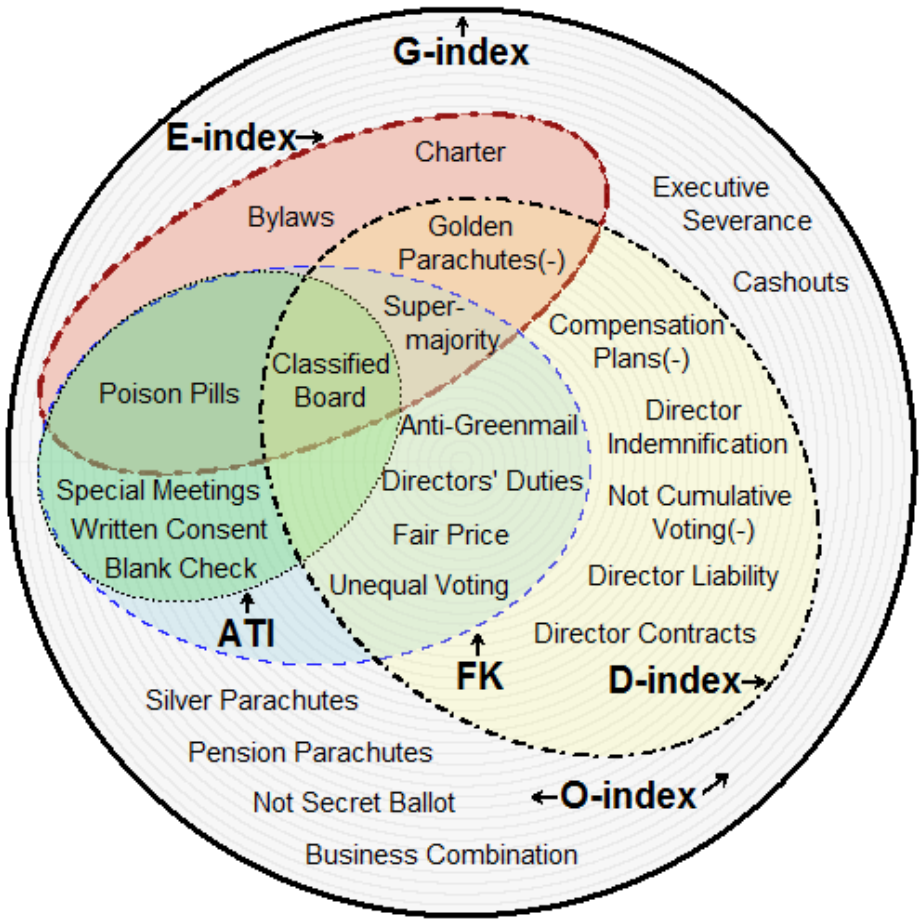

Table 1: Sample information across years

The table reports the number of firms (year t) and the number of takeovers (year t+1) in each year of our sample. The last two columns report the mean G-index and E-index values for the firms in the sample. The sample is based on the intersection of the IRRC and Compustat databases each year from 1993 through 2008. As described in Section 2, our instruments require three years of lagged IRRC data, so the sample that starts in 1993 uses IRRC data from 1990 onward.

Year	Number of Firms	Number of Takeovers	G-index	E-index
1993	922	19	9.41	2.51
1994	892	28	9.43	2.52
1995	854	23	9.60	2.58
1996	942	45	9.42	2.55
1997	884	49	9.42	2.55
1998	913	71	9.37	2.59
1999	837	67	9.39	2.60
2000	772	34	9.64	2.71
2001	1,061	25	9.13	2.66
2002	1,095	28	9.43	2.78
2003	1,143	30	9.36	2.78
2004	1,065	43	9.42	2.79
2005	1,251	64	9.27	2.79
2006	1,135	78	9.25	2.79
2007	1,148	55	9.15	2.78
2008	1,075	25	9.17	2.79

Table 2: Descriptive statistics

The mean and median values of the variables described below are shown for all firms in the sample from 1993–2008. The sample is based on the intersection of IRRC and Compustat firms. Firm size is measured as the book value of assets. Leverage is measured as long-term debt divided by book value of assets. Market to book is the sum of the book value of debt and the market value of equity all divided by the book value of assets. ROA is calculated as operating income after depreciation divided by the book value of assets. The property ratio is calculated as the gross property, plant, and equipment divided by the book value of assets. The liquidity ratio is the difference between current assets and liabilities divided by the book value of assets. Sales growth is the average annual sales growth calculated over years t, t-1, and t-2. Market-adjusted returns are the buy-and-hold returns at the firm over the prior calendar year minus the buy-and-hold return on the CRSP value-weighted index over the same time period. Industry concentration is measured as the Herfindahl-Hirshman index using Compustat sales information for Fama-French 49 industries.

Variable	Mean	Median	Observations
G-index	9.35	9	15,989
E-index	2.68	3	15,989
Firm size ($ millions)	5,648.70	1,609.61	15,989
Market value of equity ($ millions)	6,883.96	1,536.00	15,989
Leverage	0.21	0.2	15,989
Market to book	1.52	1.15	15,989
ROA	0.09	0.09	15,989
Property ratio	0.63	0.57	15,989
Liquidity ratio	0.18	0.16	15,989
Sales growth	0.09	0.07	15,989
3-year sales growth	0.03	0.02	15,989
Market-adjusted return	0.03	-0.02	15,989
Industry concentration	6.20	4.97	15,989

Table 3: Takeover likelihood and takeover indices without accounting for endogeneity

Coefficients from probit and linear probability models are shown in columns 1–4 and 5–8, respectively. In columns 1–2 and 5–6 (3–4 and 7–8) the dependent variable is set to one if the firm was acquired over the next year (five years). The control variables are described in Table 2. The sample is constructed from the intersection of the IRRC and Compustat databases from 1993–2008. The number of observations drops slightly in models 1 and 2 because some industry-year cells do not contain observations with variation in the dependent variable (i.e., both 1 and 0). *p*-values are shown in parentheses below the coefficients with significance at the 10%, 5%, and 1% levels noted using *, **, ***, respectively. The errors are robust to heteroskedasticity and clustered at the firm level.

	Probit Models				Linear Probability Models			
	(1) (t+1)	(2) (t+1)	(3) (t+1,t+5)	(4) (t+1,t+5)	(5) (t+1)	(6) (t+1)	(7) (t+1,t+5)	(8) (t+1,t+5)
G-index	0.003		0.006		0.000		0.001	
	(0.645)		(0.531)		(0.856)		(0.653)	
E-index		0.021		0.025		0.001		0.006
		(0.221)		(0.226)		(0.320)		(0.282)
Firm size	-0.120***	-0.120***	-0.145***	-0.144***	-0.011***	-0.011***	-0.040***	-0.039***
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
Leverage	0.067	0.063	0.479***	0.475***	0.003	0.003	0.138***	0.137***
	(0.564)	(0.586)	(<.001)	(<.001)	(0.817)	(0.832)	(<.001)	(<.001)
Market to book	-0.061***	-0.060***	-0.112***	-0.111***	-0.003**	-0.003**	-0.022***	-0.021***
	(0.005)	(0.006)	(<.001)	(<.001)	(0.038)	(0.044)	(<.001)	(<.001)
Property ratio	-0.103	-0.105	-0.020	-0.020	-0.011	-0.011	-0.007	-0.008
	(0.141)	(0.131)	(0.816)	(0.807)	(0.125)	(0.120)	(0.763)	(0.755)
Liquidity ratio	-0.389***	-0.387***	-0.345***	-0.342**	-0.047***	-0.047***	-0.109***	-0.107***
	(0.001)	(0.001)	(0.010)	(0.011)	(0.002)	(0.002)	(0.005)	(0.006)
Sales growth	-0.181**	-0.180**	-0.113*	-0.114*	-0.019**	-0.019**	-0.037**	-0.037**
	(0.044)	(0.045)	(0.061)	(0.060)	(0.026)	(0.026)	(0.032)	(0.032)
ROA	-0.664***	-0.671***	-0.439*	-0.444*	-0.078***	-0.078***	-0.151**	-0.152**
	(0.002)	(0.002)	(0.077)	(0.073)	(0.002)	(0.002)	(0.043)	(0.042)
Market-adjusted return	0.045	0.044	0.017	0.016	0.004	0.004	0.004	0.004
	(0.325)	(0.335)	(0.514)	(0.542)	(0.317)	(0.327)	(0.577)	(0.605)
Industry concentration	0.000	0.001	-0.013	-0.013	-0.000	-0.000	-0.003	-0.003
	(0.962)	(0.946)	(0.127)	(0.137)	(0.862)	(0.890)	(0.149)	(0.160)
Constant	-0.998***	-1.020***	0.481	0.463	0.128***	0.125***	0.566***	0.559***
	(0.006)	(0.005)	(0.168)	(0.181)	(<.001)	(<.001)	(<.001)	(<.001)
Year controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15,879	15,879	15,989	15,989	15,989	15,989	15,989	15,989
Pseudo R-square	0.069	0.070	0.060	0.060				
Chi-square	394.996	395.697	342.924	344.125				
R-square					0.026	0.026	0.060	0.060

Table 4: Takeover likelihood and takeover indices accounting for endogeneity

Panel A reports the second stage coefficients from a linear probability model after instrumenting the G-index, E-index, and O-index variables using both the geography-based and IPO-year-based instruments described in Section 2.3. (The first stage results are reported as Table A.10 in the Appendix.) In columns 1–3 (4–6) the dependent variable is set to one if the firm was acquired in the next year (five years). The control variables are described in Table 2. The last two columns report the second stage coefficients from six regressions that mirror those in columns 1–3, and 4–6, respectively, but using standardized versions of the G-index, E-index, and O-index variables where a one-unit increase in the standardized variable represents a standard deviation increase in the underlying index. To save space only the main variables of interest are reported (and stacked) in the last two columns from six separate regressions that in each case include the same control variables as shown in columns 1–6. Panel A reports the 2SLS coefficients. Panel B reports the LIML coefficients. Panel C reports the RBPM average marginal effects. The same control variables used in the 2SLS models are used but not tabulated for the LIML and RBPM results in Panels B and C. The number of observations reported at the bottom of Panel A applies to all panels. *p*-values are shown in parenthesis below the marginal effects with significance at the 10%, 5%, and 1% levels noted using *, **, ***, respectively. Errors are robust to heteroskedasticity and clustered at the firm level.

Panel A: 2SLS	(1)	(2)	(3)	(4)	(5)	(6)	Columns 1-3, standardized	Columns 4-6, standardized
	Acquired within 1 year			Acquired within 5 years			coefficients	coefficients
	(t+1)	(t+1)	(t+1)	(t+1,t+5)	(t+1,t+5)	(t+1,t+5)		
G-index	-0.009**			-0.053***			-0.024**	-0.140***
	(0.013)			(<.001)			(0.013)	(<.001)
E-index		-0.042**			-0.218***		-0.049**	-0.255***
		(0.027)			(0.004)		(0.027)	(0.004)
O-index			-0.009**			-0.051***	-0.017**	-0.101***
			(0.015)			(<.001)	(0.015)	(<.001)
Firm size	-0.009***	-0.012***	-0.009***	-0.029***	-0.044***	-0.028***		
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)		
Leverage	0.005	0.011	0.003	0.150***	0.180***	0.140***		
	(0.710)	(0.457)	(0.806)	(<.001)	(<.001)	(<.001)		
Market to book	-0.005***	-0.007***	-0.004**	-0.030***	-0.039***	-0.025***		
	(0.005)	(0.003)	(0.014)	(<.001)	(<.001)	(<.001)		
Property ratio	-0.006	-0.005	-0.007	0.021	0.024	0.012		
	(0.429)	(0.575)	(0.308)	(0.453)	(0.486)	(0.632)		
Liquidity ratio	-0.057***	-0.067***	-0.053***	-0.166***	-0.213***	-0.139***		
	(<.001)	(<.001)	(0.001)	(<.001)	(0.001)	(0.001)		
Sales growth	-0.021**	-0.020**	-0.020**	-0.050***	-0.043**	-0.048***		
	(0.015)	(0.022)	(0.016)	(0.007)	(0.030)	(0.008)		
ROA	-0.068***	-0.062**	-0.072***	-0.097	-0.071	-0.117		
	(0.007)	(0.021)	(0.005)	(0.220)	(0.431)	(0.126)		

Table 4, continued:

Market-adjusted return	0.006	0.007	0.005	0.011	0.019*	0.007
	(0.211)	(0.119)	(0.266)	(0.164)	(0.057)	(0.346)
Industry concentration	-0.000	-0.001	-0.000	-0.004*	-0.007**	-0.004
	(0.620)	(0.268)	(0.799)	(0.065)	(0.020)	(0.130)
Constant	0.199***	0.241***	0.172***	0.980***	1.157***	0.826***
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
Year controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15,989	15,989	15,989	15,989	15,989	15,989
Chi-square (2nd stage)	334.0	282.9	388.8	352.7	261.3	378.4
Prob < Chi-square (2nd stage)	<.001	<.001	<.001	<.001	<.001	<.001
F-statistic (1st stage)	54.1	10.1	94.2	54.1	10.1	94.2
R-square (1st stage)	0.139	0.110	0.158	0.139	0.110	0.158

Panel B: LIML	Acquired within 1 year			Acquired within 5 years		
G-index	-0.009**			-0.053***		
	(0.013)			(<.001)		
E-index		-0.042**			-0.228***	
		(0.027)			(0.005)	
O-index			-0.009**			-0.051***
			(0.015)			(<.001)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes

Panel C: RBPM	Acquired within 1 year			Acquired within 5 years		
G-index	-0.038**			-0.228***		
	(0.012)			(<.001)		
E-index		-0.033*			-0.215***	
		(0.081)			(0.001)	
O-index			-0.033**			-0.219***
			(0.020)			(<.001)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes

Table 5: Takeover likelihood as a function of individual provisions after accounting for endogeneity

Columns 1, 2, 7, 8, and 9 report the marginal effects related to the ∂_i's shown in the takeover equation below where p_i is an indicator variable for each of the 24 takeover provisions considered in the paper. In all specifications the dependent variable (y_1) is set to 1 in year t if the firm in question is acquired in t+1. In all specifications the same 73 control variables used in Table 4 are also included (but not tabulated) controlling for various firm, industry and year effects.

$$y_1 = \propto_0 + p_i\partial_i + Index_{23}\vartheta_{23} + \sum_{j=1}^{73} x_j\beta_j + e \qquad \text{(takeover equation, columns 2-9)}$$

$$p_i = \alpha_0 + z\_p_{geo,i}\pi_i + z\_p_{ipo,i}\theta_i + Index_{23}\alpha_{23} + \sum_{j=1}^{73} x_j\gamma_j + u \qquad \text{(first stage equation, columns 3-9)}$$

The results in columns 1 and 2 are estimated using only the takeover equation whereas the results in the other columns are estimated using both equations. In column 1 the marginal effects are all from a single linear probability regression model (LPM) that includes all 24 provisions together each as separate indicator variables in addition to the control variables. Hence for column 1, unlike the other columns, the takeover equation does not include an $Index_{23}$ variable and instead includes 24 p_i's. In contrast, the marginal effects in column 2 (and in each of the other columns) are from 24 separate regressions where for each regression one provision at a time is included as an indicator variable (p_i) while simultaneously controlling collectively for the other 23 provisions using an index ($index_{23}$). The results in columns 3-7 all come from 2SLS LPMs that include both the geography- and IPO-year-based instruments (z_p_{geo} and z_p_{ipo}) in the first stage. The instruments are described in Section 2.3. Columns 3 and 4 report the R-square and F-statistic from the first-stage equations and provide a sense as to the strength of the instruments. Column 5 indicates whether there is evidence of a strong instrument using the F-statistic rule-of-thumb cutoff of 10 as advocated in Staiger and Stock (1997). Column 6 indicates whether the p-value from the test for exogeneity is less than 10%. For this test the null hypothesis is that the variables are exogenous, so a p-value < 10% provides evidence that the provision in question needs to be treated as endogenous. Column 7 reports the marginal effect of each provision on being acquired as estimated in the second stage (takeover) equation. For robustness, columns 8 and 9 are based on alternative modeling approaches and report the marginal effects from a recursive bivariate probit model (RBPM) and a limited-information maximum likelihood (LIML) model, respectively. The underlying equations (shown above) are similar for the 2SLS LPM, RBPM, and LIML models but different key assumptions are made in each approach. For the RBPM, the two left-hand side variables in the equations above are considered latent variables (y_1^*, p_i^*). By assumption, y_1 and p_i are observed to equal 1 when their underlying respective latent variables are above a certain threshold. In the RBPM the errors are assumed to have a bivariate normal distribution with a modeled correlation of ρ: $\binom{u}{e} \sim N\left\{\binom{0}{0}, \binom{1\ \rho}{\rho\ 1}\right\}$. RBPM marginal effects are estimated as the difference in the predicted probability of observing a takeover conditional on having or not having the provision while holding all other characteristics at the firm constant following Greene (5 ed., page 716). For both the RBPM and LIML approaches, maximum likelihood estimation techniques are used to estimate both equations. Column 10 summarizes the sign of each provision's marginal effect on the likelihood of being acquired using a 10% p-value cutoff. Column 10 uses the signs and significance of the 2SLS LPM results if there is evidence of a strong instrument. If the instrument is weak and there is no evidence of endogeneity then the LPM results from columns 1 and 2 are used. Significance of the 2SLS, RBPM, and LIML marginal effects is shown using asterisks with significance at the 10%, 5% and 1% shown using *, **, and ***, respectively. Errors are corrected for heteroskedasticity and clustered by firm. As in previous tests, there are 15,989 firm-year observations used in these tests.

Table 5, continued

Provision	(1) LPM marginal effects (all together)	(2) LPM marginal effects (one at a time)	(3) 2SLS first-stage R-square	(4) 2SLS first-stage F-statistic	(5) Evidence of a strong instrument?	(6) Evidence of endogeneity?	(7) 2SLS marginal effects	(8) Recursive bivariate probit marginal effects	(9) LIML marginal effects	(10) Include in D-index
Anti-greenmail	<0.001	-0.003	0.268	133.928	yes	yes	-0.025***	-0.021***	-0.025***	-
Blank check	-0.004	-0.001	0.094	17.562	yes		0.007	0.022	0.007	
Classified board	-0.007*	-0.004	0.167	1.749			-0.115	-0.006	-0.115	-
Compensation plans	0.005	0.008**	0.098	7.812			-0.044	-0.008	-0.044	+
Not cumulative voting	0.003	0.006	0.129	26.092	yes	yes	0.046**	0.032***	0.046**	+
Director indemnification	0.001	-0.006*	0.197	100.013	yes		-0.021*	-0.019**	-0.021*	-
Director contracts	-0.011**	-0.012**	0.065	13.046	yes		-0.014	-0.017	-0.014	-
Director liability	-0.007*	-0.008**	0.416	359.364	yes		-0.008	-0.009	-0.008	-
Directors' duties	-0.005	-0.008	0.151	33.814	yes	yes	-0.035**	-0.026***	-0.035**	-
Fair price	-0.001	-0.004	0.262	87.499	yes	yes	-0.031**	-0.024**	-0.031**	-
Golden parachutes	0.018***	0.019***	0.143	1.194			0.244	0.052*	0.245	+
Bylaws	-0.001	0.003	0.078	13.797	yes		-0.058	-0.045**	-0.058	
Charter	0.024*	0.025*	0.062	1.988		yes	-0.248	-0.053***	-0.250	
Cashouts	<0.001	-0.007	0.328	28.808	yes		-0.021	-0.019**	-0.021	
Special meeting	-0.004	0.002	0.148	17.753	yes		-0.041	-0.031	-0.041	
Written consent	0.013***	0.012***	0.148	33.396	yes		-0.006	-0.021	-0.006	
Pension parachutes	0.005	0.010	0.061	3.644			-0.150	-0.047***	-0.151	
Business combination	-0.003	-0.001	0.163	57.290	yes		-0.005	0.004	-0.005	
Poison pill	0.001	0.006*	0.135	0.386			-0.093	-0.012	-0.094	
Not secret ballot	-0.007	-0.007	0.194	19.994	yes		-0.006	0.004	-0.006	
Executive severance	0.002	-0.007	0.043	0.134			0.409	-0.025	0.479	
Silver parachutes	0.001	0.001	0.067	1.367		yes	-0.442	-0.032***	-0.443	
Supermajority	-0.007*	-0.010***	0.208	113.795	yes	yes	0.030***	-0.030***	-0.030***	-
Unequal voting	-0.020*	-0.026**	0.039	4.883			0.274	0.123	0.274	-

Table 6: Which sets of provisions explain takeover likelihood?

The table below reports the regression coefficients in columns 1 and 2 from limited probability models (LPM) where in each row a different set of provisions is included as the key variable of interest. As shown in the equations, in all cases the remaining set of provisions from the G-index that are not part of the focus set are included as a control variable in addition to the same 73 control variables shown in Table 4 for various firm, industry and year effects. Only the coefficient on the focus set is tabulated from each regression. The dependent variable (y_1) is set to 1 in year t if the firm was acquired in year t+1. The ∂'s in column 1 were estimated without accounting for endogeneity using just the takeover model shown below.

$$y_1 = \propto_0 + set_i\partial_i + remaining\ Gindex\ provisions_i\gamma_i + \sum_{j=1}^{73} x_j\beta_j + e \qquad \text{(takeover equation)}$$

$$set_i = \delta_0 + set_i geo\_IV_i\pi_i + set_i ipo\_IV_i\vartheta_i + remaining\ Gindex\ provisions_i\psi_i + \sum_{j=1}^{73} x_j\omega_j + \mu \text{ (first stage equation)}$$

In the equations, set_i refers to each of the 20 sets of provisions listed in Table 6. These particular sets of provisions correspond with either (1) the antitakeover indices used in the literature, or (2) subsets of these indices that either do or do not overlap with the provisions found to be significant in explaining takeover likelihood in Table 5. For example, row 1 corresponds with the G-index as discussed in Gompers, Ishii, and Metrick (2003) and row 12 corresponds with the subset of provisions in the G-index that are not also in D-index. The D-index refers to the sets of provisions identified in column 10 of Table 5. The ∂'s in column 2 were estimated after accounting for endogeneity using a 2SLS approach with the geography- and IPO-year-based instruments ($set_i geo\_IV_i, set_i ipo\_IV_i$) described in Section 2.3. The last two columns report the F-statistic and R-square values from the 1st stage equations used when estimating the ∂'s in column 2. The significance of the ∂'s is shown at the 10%, 5%, and 1% levels using *, **, ***, respectively. The errors are robust to heteroskedasticity and clustered at the firm-level. The sets of provisions noted as having corrected signs indicate that those sets of provisions were aggregated using the signs from Table 5 meaning that the absence of golden parachutes and compensation plans and the presence of cumulative voting were added to these sets. As in previous tests, observations number 15,989. The FK-index does not include any of the provisions with positive marginal effects on takeover likelihood. Hence, its "corrected signs" results in row 19 are identical to its "uncorrected" results in row 20.

	Sets of Provisions	(1) LPM ∂'s	(2) 2SLS ∂'s	(3) 1st Stage F-statistic	(4) 1st Stage R-square
Antitakeover indices used in the literature (original signs)					
(1)	All provisions in G-index	<0.001	-0.009**	54.473	0.139
(2)	All provisions in E-index	0.001	-0.042**	10.258	0.110
(3)	All provisions in O-index	<0.001	-0.009**	94.600	0.158
(4)	All provisions in FK-index	<0.001	-0.014***	32.980	0.125
(5)	All provisions in ATI	0.002	-0.011	12.652	0.092
Variations on new takeover deterrence-index based on Table 5 results column 10					
(6)	All provisions in D-index (corrected signs)	-0.005***	-0.006***	219.967	0.357
(7)	D-index provisions plus poison pills(corrected signs)	-0.004***	-0.006***	218.002	0.347
(8)	All provisions in D-index (original signs)	-0.001	-0.004*	183.965	0.285
(9)	Subset of D-index provisions with negative marginal effects	-0.004***	-0.005**	242.563	0.367
(10)	Subset of D-index provisions with positive marginal effects	0.010***	0.046	2.710	0.106
(11)	Firm-level D-index provisions (- control share, anti-greenmail, directors' duties, fair price)	-0.007***	-0.008*	126.775	0.268
Subsets of provisions from takeover indices that are NOT also in the D-index (original signs)					
(12)	G-index provisions not in D-index	0.002*	-0.012	20.385	0.084
(13)	E-index provisions not in D-index	0.003	-0.025	13.930	0.058
(14)	O-index provisions not in D-index	0.002	-0.012	25.175	0.089
Subsets of provisions from takeover indices that ARE also in the D-index					
(15)	E-index provisions also in D-index (corrected signs)	-0.010***	-0.032***	34.487	0.121
(16)	E-index provisions also in D-index	0.001	-0.018*	41.113	0.152
(17)	O-index provisions also in D-index (corrected signs)	-0.004***	-0.006**	274.504	0.375
(18)	O-index provisions also in D-index	-0.002**	-0.005*	257.137	0.321
(19)	FK-index provisions also in D-index (corrected signs)	-0.003***	-0.012***	116.138	0.258
(20)	FK-index provisions also in D-index	-0.003***	-0.012***	116.138	0.258

Appendix for "Do takeover defenses deter takeovers?"

by Jonathan M. Karpoff, Robert Schonlau, and Eric Wehrly

February 10, 2016

This appendix contains descriptive information about the sample as well as multiple tests that probe the robustness of the results reported in Tables 4 and 5 of the main paper. Table A.9 summarizes the criteria used to identify the provisions included in the D-index.

List of Appendix Tables:

- **A.1:** Percent of sample firms with each provision during the sample period.
- **A.2:** Number of firms in the sample going public each year.
- **A.3:** Takeover likelihood as a function of index values after accounting for endogeneity using only the geography-based instrument.
- **A.4**: Takeover likelihood as a function of index values after accounting for endogeneity using only the IPO-year-based instrument.
- **A.5**: This table corresponds to Table 5 in the main body of the paper. Table 5 presents the 2SLS LPM results for the over-identified models using both the geography-based and IPO-year-based instruments. Table A.5 presents the just-identified results using the two instruments separately.
- **A.6**: Table 5 specifications without the $Index_{23}$ variable. This table also relates to Table 5 in the main paper. The results in Table 5 are estimated controlling for the remaining 23 provisions using the $Index_{23}$ variable. Table A.6 shows the key results from Table 5-like specifications without including the other 23 provisions.
- **A.7**: Takeover likelihood as a function of index values after accounting for endogeneity using instruments calculated with a five-year lag. This table corresponds to Table 4 in the main body of the paper. However, in Table A.7 we measure each firm's cohorts' incidence of the provisions five years before the year of analysis, to instrument the focus firm's provisions in year t. In this robustness test not only is the cohort assignment based on decisions (headquarter location and IPO-year) made years or even decades in the past, and not only is the cohort made up of firms from other industries than the focus firm, but also the instrument calculations themselves now rely on data from five years before the year of analysis.
- **A.8**: Takeover likelihood as a function of individual provisions after accounting for endogeneity using instruments calculated with a five-year lag. This table repeats the analysis from Table 5 in the main paper using instruments lagged by five years. In the main paper the geography and IPO-year-based cohorts' incidence of provisions from year t-3 are used to instrument the focus firm's provisions in year t. In this table the cohorts' incidence of the provisions from five years before the year of analysis are used to instrument the focus firm's provisions in year t.
- **A.9:** This table draws on the information from Table 5 in the paper as well as from Tables A.5 and A.6 and summarizes the statistical evidence used to decide which provisions to include in the D-index.
- **A.10**: First-stage coefficients for Table 4 in the main body of the paper. Table 4 reports only the second-stage coefficients.
- **A.11**: First-stage coefficients for column 7 of Table 5 in the main body of the paper. Table 5 reports only the second-stage coefficients.

- **A.12**: This table models the receipt of a takeover bid as a function of antitakeover indices. This table is similar to Table 4 from the main body of the paper but uses a different dependent variable (receipt of bid vs being acquired).
- **A.13**: This table models the receipt of a takeover bid as a function of individual antitakeover provisions. This table is similar to Table 5 from the main body of the paper but uses a different dependent variable (receipt of bid vs being acquired).
- **A.14**: This table repeats the analysis from Table 4 in the main body of the paper using a different version of the geography-based instrument where the geographically-proximate peer group is identified strictly on distance (but not in the same industry) without consideration of state boundaries. Like Table 4 this table reports the overidentified results.
- **A.15**: This table repeats the analysis from Table 5 in the main body of the paper using a different version of the geography-based instrument where the geographically proximate peer group is identified strictly on distance (but not in the same industry) without consideration of state boundaries. Like Table 5 this table reports the overidentified results.
- **A.16**: This table repeats the analysis from Table 4 in the main body of the paper but uses only firm-years where the year of the IPO was at least 10 years in the past. This test ensures that the correlation in takeover provisions based on IPO-year-cohort and geographic proximity is driven by choices that are more than 10 years in the past.
- **A.17**: This table repeats the analysis from Table 4 in the main body of the paper but uses the 24 industry groups based on GICs instead of Fama-French industry classifications when identifying geographically-proximate and IPO-year-proximate firms when calculating the instruments.
- **A.18**: This table repeats the analysis from Table 5 in the main body of the paper but uses the 24 industry groups based on GICs instead of Fama-French industry classifications when identifying geographically-proximate and IPO-year-proximate firms when calculating the instruments.
- **A.19**: This table repeats the analysis from Table 4 in the main body of the paper but extends the 2006 IRRC data through 2010 instead of 2008.
- **A.20**: This table repeats the analysis from Table 4 in the main body of the paper but without including industry fixed effects.
- **A.21**: This table repeats the analysis from columns 2, 3, 5, and 6 from Table 4 in the main body of the paper but includes a control variable for the set of provisions not being instrumented.
- **A.22**: This table repeats the analysis from Table 4 in the main body of the paper, but includes an indicator variable for Delaware incorporation.
- **A.23**: This table repeats the analysis from Table 4 in the main body of the paper, but includes an indicator variable if the state of incorporation is the same as the state where the headquarters are located.
- **A.24**: This table repeats the analysis from Table 4 in the main body of the paper, but rather than reporting 2SLS estimates, reports OLS coefficients from a linear probability reduced form model.

Table A.1: Percent of firms with each provision during the sample period. Each year's data is used in the subsequent year(s) until the next IRRC volume becomes available. In the G-index, 1 was added to the index if the firm did not allow cumulative voting or did not allow secret ballots. In this table Cumulative vote is set equal to 1 if the firm had a cumulative vote, and secret ballot is set equal to 1 if the firm allowed secret ballots.

Provision	1993	1995	1998	2000	2002	2004	2006
Blank check	80.4	84.3	86.1	86.9	89.6	88.8	90.7
Classified board	59.2	60.0	59.1	59.6	59.3	57.6	54.6
Special meeting	29.2	32.0	33.5	38.3	48.4	47.9	50.8
Written consent	28.6	30.9	33.1	36.1	41.6	42.2	46.3
Compensation plans	65.5	73.8	74.0	80.8	78.9	81.2	79.5
Director contracts	16.6	14.8	15.1	13.7	11.2	10.6	8.7
Golden parachutes	52.0	54.6	57.0	66.3	71.9	74.8	78.8
Director indemnification	41.6	43.1	31.7	34.1	24.0	23.4	21.1
Director liability	73.9	75.4	62.0	62.2	43.7	42.0	35.8
Executive severance	5.2	8.5	12.0	9.5	6.1	6.2	3.4
Bylaws	15.8	16.0	17.3	18.4	21.0	21.2	19.9
Charter	2.6	2.6	2.4	2.6	2.1	1.9	2.0
Cumulative vote	18.1	17.7	15.8	14.5	10.5	10.4	10.0
Secret ballot	9.8	13.8	11.9	14.6	12.2	13.2	14.0
Supermajority	40.7	40.5	37.5	37.0	34.6	34.8	33.1
Unequal voting	2.0	2.0	2.0	1.4	1.3	0.9	0.8
Antigreenmail	7.2	7.1	6.1	6.0	4.2	4.4	4.1
Directors' duties	6.5	7.0	7.0	7.5	7.8	8.0	7.6
Fair Price	37.3	37.2	34.1	35.1	25.5	24.4	22.0
Pension parachutes	5.9	4.7	3.1	1.9	1.3	1.1	0.8
Poison pill	56.5	57.6	58.2	61.5	60.8	60.6	56.4
Silver parachutes	5.3	4.3	3.6	3.0	2.0	1.5	1.2
Recapture of profits law	18.4	18.3	15.8	16.2	15.1	15.3	14.6
Business combination law	88.9	89.2	90.5	92.1	92.6	92.6	92.8
Cash out law	4.9	4.6	3.7	3.9	3.3	3.0	3.1
Director's duties law	6.1	6.1	4.8	4.8	4.4	4.3	4.4
Fair price law	38.4	38.5	33.5	33.8	31.7	32.6	30.6
Control share acquisition law	30.5	31.0	29.2	29.0	27.2	27.3	25.8

Table A.2: Number of firms in the sample going public each year. All IPO years before 1950 are assigned a 1950 IPO date for compiling the firm's IPO year cohort.

IPO year	Firms	IPO year	Firms	IPO year	Firms	IPO year	Firms
1950	223	1964	21	1978	9	1992	83
1951	6	1965	19	1979	14	1993	112
1952	6	1966	15	1980	17	1994	67
1953	6	1967	25	1981	36	1995	85
1954	7	1968	34	1982	24	1996	98
1955	4	1969	42	1983	69	1997	58
1956	5	1970	29	1984	38	1998	48
1957	8	1971	26	1985	36	1999	85
1958	6	1972	211	1986	71	2000	45
1959	7	1973	16	1987	89	2001	27
1960	10	1974	6	1988	49	2002	13
1961	10	1975	12	1989	34	2003	6
1962	71	1976	12	1990	43	2004	1
1963	12	1977	10	1991	84		

Table A.3: Takeover likelihood as a function of index values after accounting for endogeneity – using only the geography-based instrument.

This table corresponds to Table 4 Panel A in the main body of the paper. Table 4 in the main body of the paper presents the overidentified results using both instruments. This table shows the second stage coefficients from a linear probability model after instrumenting the G-index, E-index, and O-index variables using only the geography-based instrument described in Section 2.3 of the paper. In columns 1–3 (4–6) the dependent variable is set to 1 if the firm was acquired in the next year (five years). The control variables are described in Table 2 in the paper. *p*-values are shown in parentheses below the coefficients with significance at the 10%, 5%, and 1% levels noted using *, **, ***, respectively. Errors are robust to heteroskedasticity and are clustered at the firm level.

	(1)	(2)	(3)	(4)	(5)	(6)
	Acquired within 1 year			Acquired within 5 years		
	(t+1)	(t+1)	(t+1)	(t+1,t+5)	(t+1,t+5)	(t+1,t+5)
G-index	-0.015**			-0.063**		
	(0.016)			(0.013)		
E-index		-0.041*			-0.167**	
		(0.052)			(0.036)	
O-index			-0.012**			-0.051**
			(0.032)			(0.030)
Firm size	-0.008***	-0.012***	-0.008***	-0.027***	-0.043***	-0.028***
	(<.001)	(<.001)	(<.001)	(0.001)	(<.001)	(<.001)
Leverage	0.006	0.011	0.003	0.152***	0.170***	0.140***
	(0.654)	(0.466)	(0.804)	(<.001)	(<.001)	(<.001)
Market to book	-0.006***	-0.007***	-0.004**	-0.031***	-0.035***	-0.025***
	(0.003)	(0.005)	(0.012)	(<.001)	(<.001)	(<.001)
Property ratio	-0.003	-0.005	-0.006	0.026	0.017	0.013
	(0.741)	(0.568)	(0.426)	(0.394)	(0.595)	(0.640)
Liquidity ratio	-0.063***	-0.067***	-0.055***	-0.176***	-0.189***	-0.140***
	(<.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
Sales growth	-0.022**	-0.020**	-0.021**	-0.052***	-0.042**	-0.048***
	(0.011)	(0.022)	(0.013)	(0.008)	(0.027)	(0.010)
ROA	-0.062**	-0.063**	-0.070***	-0.088	-0.089	-0.117
	(0.019)	(0.022)	(0.007)	(0.294)	(0.302)	(0.132)
Market-adjusted return	0.006	0.007	0.005	0.012	0.016	0.007
	(0.163)	(0.123)	(0.249)	(0.155)	(0.111)	(0.351)
Industry concentration	-0.000	-0.001	-0.000	-0.005*	-0.006**	-0.004
	(0.502)	(0.290)	(0.777)	(0.062)	(0.033)	(0.130)
Constant	0.244***	0.239***	0.190***	1.050***	1.022***	0.828***
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
Year controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15,989	15,989	15,989	15,989	15,989	15,989
Chi-square (2nd stage)	307.1	283.5	359.7	323.4	292.1	360.6
Prob < Chi-square (2nd stage)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
F-statistic (1st stage)	21.2	11.9	38.4	21.2	11.9	38.4
R-square (1st stage)	0.114	0.108	0.116	0.114	0.108	0.116

Table A.4: Takeover likelihood as a function of index values after accounting for endogeneity – using only the IPO-year-based instrument.

This table corresponds to Table 4 Panel A in the main body of the paper. Table 4 in the main body of the paper presents the overidentified results using both instruments. This table shows the second stage coefficients from a linear probability model after instrumenting the G-index, E-index, and O-index variables using only the IPO-year-based instrument described in Section 2.3 of the paper. In columns 1–3 (4–6) the dependent variable is set to 1 if the firm was acquired in the next year (five years). The control variables are described in Table 2 in the paper. *p*-values are shown in parentheses below the coefficients with significance at the 10%, 5%, and 1% levels noted using *, **, ***, respectively. Errors are robust to heteroskedasticity and are clustered at the firm level.

	(1)	(2)	(3)	(4)	(5)	(6)
	Acquired within 1 year			Acquired within 5 years		
	(t+1)	(t+1)	(t+1)	(t+1,t+5)	(t+1,t+5)	(t+1,t+5)
G-index	-0.007			-0.050***		
	(0.113)			(0.001)		
E-index		-0.044			-0.357**	
		(0.252)			(0.030)	
O-index			-0.007*			-0.051***
			(0.091)			(<.001)
Firm size	-0.010***	-0.012***	-0.009***	-0.029***	-0.046***	-0.028***
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
Leverage	0.004	0.011	0.003	0.149***	0.206***	0.140***
	(0.734)	(0.479)	(0.807)	(<.001)	(0.002)	(<.001)
Market to book	-0.004**	-0.007**	-0.004**	-0.029***	-0.050***	-0.025***
	(0.010)	(0.045)	(0.017)	(<.001)	(0.001)	(<.001)
Property ratio	-0.007	-0.004	-0.008	0.019	0.043	0.012
	(0.344)	(0.654)	(0.276)	(0.495)	(0.374)	(0.636)
Liquidity ratio	-0.055***	-0.069***	-0.052***	-0.162***	-0.279***	-0.139***
	(0.001)	(0.006)	(0.001)	(<.001)	(0.006)	(0.001)
Sales growth	-0.020**	-0.020**	-0.020**	-0.049***	-0.047**	-0.048***
	(0.018)	(0.024)	(0.018)	(0.008)	(0.049)	(0.008)
ROA	-0.071***	-0.061**	-0.073***	-0.100	-0.021	-0.117
	(0.006)	(0.035)	(0.004)	(0.202)	(0.859)	(0.126)
Market-adjusted return	0.005	0.008	0.005	0.010	0.029*	0.007
	(0.235)	(0.160)	(0.274)	(0.180)	(0.062)	(0.346)
Industry concentration	-0.000	-0.001	-0.000	-0.004*	-0.010**	-0.004
	(0.675)	(0.352)	(0.808)	(0.069)	(0.034)	(0.130)
Constant	0.182***	0.248**	0.165***	0.953***	1.528***	0.826***
	(<.001)	(0.020)	(<.001)	(<.001)	(0.001)	(<.001)
Year controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15,989	15,989	15,989	15,989	15,989	15,989
Chi-square (2nd stage)	343.0	276.0	396.5	352.9	251.1	375.4
Prob < Chi-square (2nd stage)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
F-statistic (1st stage)	96.7	9.4	162.9	96.7	9.4	162.9
R-square (1st stage)	0.130	0.105	0.142	0.130	0.105	0.142

Table A.5: Takeover likelihood as a function of individual provisions after accounting for endogeneity using just the geography-based or IPO-year based instruments

This table corresponds to Table 5 in the main body of the paper. See the Table 5 heading for a detailed explanation of the two equations and variables used in the 2SLS equations. The 2SLS LPM results presented in Table 5 are for the over-identified models using both the geography-based and IPO-year-based instruments. In this table the just-identified results are presented for comparison. *, **, and *** indicate statistical significance at the 10%, 5% and 1% level, respectively. Errors are corrected for heteroskedasticity and are clustered by firm.

	Just-identified (Geography IV) acquired in next year		Just-identified (IPO-year IV) acquired in next year		Overidentified models (Geography and IPO-year IVs) acquired over next 1 or 5 years				
Provision	2SLS 1st-Stage F-statistic (Geo. IV)	2SLS Marg. Eff. (Geo. IV) (t+1)	2SLS 1st-Stage F-statistic (IPO IV)	2SLS Marg. Eff. (IPO IV) (t+1)	2SLS 1st-Stage F-statistic	2SLS Marg. Eff. (t+1)	2SLS Marg. Eff. (t+1, t+5)	Recursive Bivariate Probit Marg. Eff. (t+1, t+5)	LIML Marg. Eff. (t+1, t+5)
Anti-greenmail	244.275	-0.025***	25.406	-0.041	133.928	-0.025***	-0.141***	-0.124***	-0.141***
Blank check	1.597	-0.060	33.430	0.009	17.562	0.007	0.129	0.153**	0.130
Classified board	1.179	-0.116	2.355	-0.112	1.749	-0.115	-0.455	-0.029	-0.457
Compensation plans	1.971	-0.074	12.373	-0.033	7.812	-0.044	-0.585**	-0.154	-0.595**
Not cumulative voting	48.161	0.038	5.775	0.062	26.092	0.046**	0.168*	0.109**	0.168*
Director indemnification	63.639	-0.022	140.012	-0.020	100.013	-0.021*	-0.144***	-0.119***	-0.144***
Director contracts	6.074	-0.007	23.448	-0.015	13.046	-0.014	-0.210	-0.156**	-0.212
Director liability	80.540	-0.009	558.346	-0.008	359.364	-0.008	-0.070**	-0.067**	-0.070**
Directors' duties	67.139	-0.037**	0.200	-0.292	33.814	-0.035**	-0.148**	-0.109**	-0.149**
Fair price	96.193	-0.039**	68.586	-0.018	87.499	-0.031**	-0.209***	-0.148***	-0.209***
Golden parachutes	0.034	0.046	2.224	0.253	1.194	0.244	-0.485	-0.029	-0.575
Bylaws	3.318	-0.089	24.349	-0.046	13.797	-0.058	-0.114	-0.048	-0.115
Charter	4.117	-0.266	0.519	0.154	1.988	-0.248	-0.327	-0.221***	-0.358
Cashouts	57.771	-0.023	3.104	-0.022	28.808	-0.021	-0.013	-0.010	-0.013
Special meeting	14.755	-0.011	21.531	-0.056	17.753	-0.041	-0.003	-0.004	-0.003
Written consent	14.796	0.064	51.883	-0.029	33.396	-0.006	0.181**	0.144	0.186**
Pension parachutes	2.967	-0.315	5.878	-0.071	3.644	-0.150	-0.495	-0.197***	-0.506
Business combination	112.191	-0.009	6.325	0.029	57.290	-0.005	-0.029	0.040	-0.029
Poison pill	0.774	-0.095	0.036	-0.264	0.386	-0.093	0.124	-0.321*	10.880
Not secret ballot	<0.001	187.961	39.739	-0.005	19.994	-0.006	-0.013	0.040	-0.013
Executive severance	0.024	1.816	0.238	0.289	0.134	0.409	4.953	-0.102	9.523
Silver parachutes	0.386	-0.609	2.300	-0.427	1.367	-0.442	0.573	0.019	1.741
Supermajority	176.016	-0.031***	51.644	-0.026	113.795	-0.030***	-0.148***	-0.134***	-0.148***
Unequal voting	2.119	0.299	8.880	0.281	4.883	0.274	0.933	0.242	1.008

Table A.6: Table 5 specifications without the *Index*$_{23}$ variable

This table relates to Table 5 in the main paper. As described in the heading to Table 5, most of the results in Table 5 were estimated controlling for the remaining 23 provisions using the *Index*$_{23}$ variable. This table shows the key results from Table 5-like specifications that were estimated without including the other 23 provisions. The dependent variable in columns 1–7 equals one if the firm is acquired within one year (t+1), and the dependent variable in columns 8–10 equals one if the firm is acquired within five years (t+1, t+5).

Provision	(1) LPM marginal effects (one at a time) (t+1)	(2) 2SLS first-stage R-square	(3) 2SLS first-stage F-statistic	(4) Evidence of strong instrument	(5) 2SLS marginal effects (t+1)	(6) RBPM marginal effects (t+1)	(7) LIML marginal effects (t+1)	(8) 2SLS marginal effects (t+1,t+5)	(9) RBPM marginal effects (t+1,t+5)	(10) LIML marginal effects (t+1,t+5)
Anti-greenmail	-0.003	0.262	137.767	yes	-0.025***	-0.020***	-0.025***	-0.140***	-0.123***	-0.140***
Blank check	-0.001	0.069	14.718	yes	0.008	0.022	0.008	0.141	0.153**	0.142
Classified board	-0.003	0.064	3.800		-0.070	-0.004	-0.070	-0.280	-0.023	-0.280
Compensation plans	0.007*	0.059	14.201	yes	-0.029	-0.009	-0.029	-0.399**	-0.154	-0.410**
Not Cumulative voting	0.006	0.129	25.695	yes	0.045**	0.031***	0.045**	0.160*	0.106**	0.161*
Director indemnification	-0.005	0.187	119.625	yes	-0.018	-0.017*	-0.018	-0.125***	-0.109***	-0.125***
Director contracts	-0.011**	0.057	16.188	yes	-0.010	-0.015	-0.010	-0.179	-0.148**	-0.180
Director liability	-0.008**	0.414	392.147	yes	-0.007	-0.007	-0.007	-0.064**	-0.061**	-0.064**
Directors duties	-0.008	0.116	34.328	yes	-0.034**	-0.026***	-0.034**	-0.150**	-0.107**	-0.150**
Fair price	-0.004	0.23	114.397	yes	-0.026**	-0.022**	-0.026**	-0.175***	-0.136***	-0.175***
Golden parachutes	0.018***	0.115	4.303		0.117	0.047*	0.117	-0.297	-0.051	-0.307
Bylaws	0.003	0.04	13.241	yes	-0.059	-0.045**	-0.059	-0.118	-0.048	-0.119
Charter	0.024*	0.05	1.866		-0.260	-0.053***	-0.261	-0.392	-0.221***	-0.426
Cashouts	-0.007	0.311	28.079	yes	-0.021	-0.019**	-0.021	-0.015	-0.007	-0.015
Special meeting	0.002	0.096	18.986	yes	-0.041	-0.031	-0.042	-0.018	-0.004	-0.019
Written consent	0.011***	0.088	19.798	yes	-0.012	-0.019	-0.012	0.199*	0.153	0.211*
Pension parachutes	0.010	0.052	4.400		-0.127	-0.047***	-0.128	-0.407	-0.195***	-0.417
Business combination	-0.001	0.159	58.290	yes	-0.005	0.004	-0.005	-0.029	0.039	-0.029
Poison pill	0.006*	0.067	2.249		-0.004	-0.013	-0.004	-0.465	-0.329*	-0.508
Not secret ballot	-0.007	0.193	21.207	yes	-0.007	0.003	-0.007	-0.019	0.037	-0.019
Executive severance	-0.007	0.037	0.612		0.153	-0.025	0.162	2.511	-0.097	3.686
Silver parachutes	0.002	0.062	1.863		-0.380	-0.031**	-0.380	0.594	0.017	1.239
Supermajority	-0.009***	0.200	125.195	yes	-0.028***	-0.028***	-0.028***	-0.138***	-0.127***	-0.139***
Unequal voting	-0.026**	0.036	4.745		0.278	0.127	0.278	0.974	0.252	1.053

Table A.7: Takeover likelihood as a function of index values after accounting for endogeneity – using instruments calculated with a five-year lag.

This table corresponds to Table 4 Panel A in the main body of the paper. In the main paper the geography- and IPO-year-based cohorts incidence of provisions from year t-3 are used to instrument the focus firms provisions in year t. In this table the cohorts incidence of the provisions from five years prior to the year of analysis are used to instrument the focus firms provisions in year t. Thus, in this robustness test not only is the cohort assignment based on decisions (headquarter location and IPO-year) made years or even decades in the past, and not only is the cohort made up of firms from other industries than the focus firm, but also the instrument calculations themselves now rely on data from five years before the year of analysis. Requiring lagged data causes a significant drop in the number of observations. This table shows the second stage coefficients from a linear probability model after instrumenting the G-index, E-index, and O-index variables using only the IPO-year-based instrument described in Section 2.3 of the paper. In columns 1–3 (4–6) the dependent variable is set to 1 if the firm was acquired in the next year (five years). The control variables are described in Table 2 in the paper. *p*-values are shown in parentheses below the coefficients with significance at the 10%, 5%, and 1% levels noted using *, **, ***, respectively. Errors are robust to heteroskedasticity and are clustered at the firm level.

	(1)	(2)	(3)	(4)	(5)	(6)
	Acquired within 1 year			Acquired within 5 years		
	(t+1)	(t+1)	(t+1)	(t+1,t+5)	(t+1,t+5)	(t+1,t+5)
G-index	-0.008**			-0.038***		
	(0.019)			(0.002)		
E-index		-0.035**			-0.171***	
		(0.025)			(0.005)	
O-index			-0.008**			-0.039***
			(0.028)			(0.004)
Firm size	-0.009***	-0.011***	-0.009***	-0.032***	-0.043***	-0.030***
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
Leverage	0.030*	0.035**	0.028*	0.213***	0.236***	0.204***
	(0.068)	(0.048)	(0.084)	(<.001)	(<.001)	(<.001)
Market to book	-0.004*	-0.005**	-0.003*	-0.024***	-0.031***	-0.021***
	(0.053)	(0.019)	(0.090)	(<.001)	(<.001)	(<.001)
Property ratio	0.001	0.002	0.001	0.020	0.021	0.017
	(0.882)	(0.863)	(0.942)	(0.500)	(0.533)	(0.554)
Liquidity ratio	-0.041**	-0.053***	-0.037**	-0.143***	-0.199***	-0.121**
	(0.017)	(0.009)	(0.028)	(0.006)	(0.004)	(0.013)
Sales growth	-0.014	-0.013	-0.014	-0.047**	-0.045**	-0.047**
	(0.188)	(0.210)	(0.188)	(0.024)	(0.042)	(0.024)
ROA	-0.089***	-0.085***	-0.092***	-0.215**	-0.196*	-0.227**
	(0.006)	(0.010)	(0.004)	(0.024)	(0.057)	(0.016)
Market-adjusted return	0.002	0.003	0.002	0.017*	0.023**	0.015*
	(0.724)	(0.573)	(0.783)	(0.058)	(0.025)	(0.091)
Industry concentration	-0.000	-0.001	-0.000	-0.007**	-0.008**	-0.006*
	(0.673)	(0.482)	(0.751)	(0.047)	(0.030)	(0.062)
Constant	0.175***	0.222***	0.152***	0.854***	1.084***	0.746***
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
Year controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,560	11,560	11,560	11,560	11,560	11,560
Chi-square (2nd stage)	519.3	456.0	530.1	33165.9	20125.3	40744.1
Prob < Chi-square (2nd stage)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
F-statistic (1st stage)	50.1	11.8	83.7	50.1	11.8	83.7
R-square (1st stage)	0.165	0.130	0.177	0.165	0.130	0.177

Table A.8: Takeover likelihood as a function of individual provisions after accounting for endogeneity – using instruments calculated with a five-year lag.

This table repeats the analysis from Table 5 in the main paper using an instrument lagged by five years. In the main paper the geography- and IPO-year-based cohorts incidence of provisions from year t-3 are used to instrument the focus firms provisions in year t. In this table the cohorts incidence of the provisions from five years prior to the year of analysis are used to instrument the focus firms provisions in year t. Thus, in this robustness test not only is the cohort assignment based on decisions (headquarter location and IPO-year) made years or even decades in the past, and not only is the cohort made up of firms from other industries than the focus firm, but also the instrument calculations themselves now rely on data from five years before the year of analysis. Requiring five years of lagged data causes a significant drop in the number of observations. This table shows the key results for the subset of provisions highlighted in Table 5 as statically relating to takeover likelihood.

Provision	(1) LPM marginal effects (all together)	(2) LPM marginal effects (one at a time)	(3) 2SLS first-stage F-statistic	(4) Evidence of a strong instrument?	(5) Evidence of endogeneity?	(6) 2SLS marginal effects	(7) Recursive bivariate probit marginal effects	(8) LIML marginal effects
Anti-greenmail	-0.005	-0.008	114.732	yes	yes	-0.032***	-0.027***	-0.032***
Classified board	-0.009*	-0.006	1.556			-0.097	<0.001	-0.097
Compensation plans	0.004	0.006	3.564			-0.123	-0.020	-0.123
Not Cumulative voting	0.001	0.005	22.336	yes	yes	0.047*	0.025**	0.047*
Director indemnification	0.001	-0.005	86.311	yes		-0.017	-0.016	-0.017
Director contracts	-0.014**	-0.014***	10.031	yes		-0.004	-0.023	-0.004
Director liability	-0.007	-0.008**	294.760	yes		-0.012	-0.013	-0.012
Directors' duties	-0.002	-0.007	28.743	yes	yes	-0.042**	-0.034***	-0.042**
Fair price	0.003	-0.002	70.299	yes	yes	-0.044***	-0.028**	-0.044***
Golden parachutes	0.019***	0.018***	0.421			-0.086	0.023	-0.100
Supermajority	-0.009**	-0.012***	89.943	yes	yes	-0.032***	-0.032***	-0.032***
Unequal voting	-0.025**	-0.032***	4.234			0.140	0.117	0.140

Table A.9: Summary of the criteria for each provisions inclusion in, or exclusion from, the D-index

This table draws on the information from Table 5 in the paper as well as from Tables A.5 and A.6 and summarizes the statistical evidence used to decide which provisions to include in the D-index. LPM refers to linear probability models. 2SLS refers to two-stage-least squares. RBPM refers to recursive bivariate probit models. LIML refers to limited-information maximum likelihood models. Robustness tests refer to the tests reported in Tables A.5 and A.6.

Provision	Marginal Effect	Decision for inclusion in D-index?	Evidence for inclusion (exclusion) in D-index based on Table 5 and Appendix Tables A.5 and A.6
Anti-greenmail	-	Include	Strong IV and strong 2SLS, RBPM, and LIML results.
Blank check		Exclude	Strong IV but not found to be significant in the LPM, 2SLS, RBPM, and LIML results.
Classified board	-	Weak Include	Lacking strong IV but no evidence of endogeneity, significant in the LPM results and in some robustness tests (e.g., Table A.13)
Compensation plans	+	Weak Include	Lacking strong IV but no evidence of endogeneity and significant in the LPM results.
Not cumulative voting	+	Include	Strong IV and strong 2SLS, RBPM, and LIML results.
Director indemnification	-	Include	Strong IV and significant in LPM, 2SLS, RBPM, and LIML results.
Director contracts	-	Weak Include	Strong IV, no evidence of endogeneity, and significant in the LPM results, consistency in sign of coefficients between 2SLS and LPM results, significant in some models in Tables A.5 and A.6.
Director liability	-	Weak Include	Strong IV, no evidence of endogeneity, and significant in the LPM results, consistency in sign of coefficients between 2SLS and LPM results, significant in several models in Tables A.5 and A.6.
Directors duties	-	Include	Strong IV and strong 2SLS, RPBM, and LIML results.
Fair price	-	Include	Strong IV and strong 2SLS, RPBM, and LIML results.
Golden parachutes	+	Include	Lacking strong IV but no evidence of endogeneity and significant in LPM results.
Bylaws		Weak Exclude	Not significant in Table 5 2SLS, LIML, or LPM tests.
Charter		Weak Exclude	Lacking strong IV. Marginally significant in LPM results but sign on LPM results is opposite the 2SLS, RBPM, and LIML results. Given the contradiction in signs for the significant results in Table 5 and the contradiction in signs in Table A.6 we left this out of the D-index.
Cashouts		Exclude	Not significant in Table 5 tests.
Special meeting		Exclude	Not significant in Table 5 tests.
Written consent		Weak Exclude	Strong IV but not significant in the 2SLS, RBPM, and LIML results. Contradictions in the signs on the LPM vs the 2SLS, RBPM, and LIML.
Pension parachutes		Weak Exclude	Lacking strong IV and not significant in LPM results.
Business combination		Exclude	Not significant in Table 5 tests.
Poison pill		Weak Exclude	Lacking strong IV. Contradiction in signs across different tests.
Not secret ballot		Exclude	Not significant in Table 5 tests.
Executive severance		Exclude	Not significant in Table 5 tests.
Silver parachutes		Exclude	Lacking strong IV and not significant in LPM results.
Supermajority	-	Include	Strong IV and strong 2SLS, RBPM, and LIML results.
Unequal voting	-	Weak Include	Lacking strong IV but no evidence of endogeneity and significant in LPM results.

Table A.10: First-stage coefficients related to Table 4 in the main body of the paper

The table below shows the first-stage coefficients from a linear probability model after instrumenting the G-index, E-index, and O-index variables using both the geography-based and IPO-year-based instruments described in Section 2.3 of the main paper. In Table 4 columns 1–3 and columns 4-6 had different second stage dependent variables but the 1st stage regression were the same so only 3 columns are reported below. *p*-values are shown in parenthesis below the coefficients with significance at the 10%, 5%, and 1% levels noted using *, **, ***, respectively. Errors are robust to heteroskedasticity and clustered at the firm level.

	(1)	(2)	(3)
Dependent Variable:	G-index	E-index	O-index
G-index IV (geography based)	0.266***		
	(11.59)		
G-index IV (IPO year based)	0.285***		
	(18.62)		
E-index IV (geography based)		0.206***	
		(9.24)	
E-index IV (IPO year based)		0.120***	
		(5.58)	
O-index IV (geography based)			0.360***
			(15.54)
O-index IV (IPO year based)			0.375***
			(24.09)
Firm size	0.150***	-0.0205***	0.159***
	(8.96)	(-2.72)	(12.77)
Leverage	0.283**	0.188***	0.112
	(2.25)	(3.37)	(1.20)
Market to book	-0.111***	-0.0709***	-0.0361**
	(-5.70)	(-8.08)	(-2.44)
Property ratio	0.346***	0.112***	0.213***
	(4.56)	(3.22)	(3.78)
Liquidity ratio	-1.047***	-0.463***	-0.593***
	(-7.83)	(-7.52)	(-6.00)
Sales growth	-0.0986	-0.0156	-0.0628
	(-1.12)	(-0.39)	(-0.94)
ROA	0.327	0.238**	0.0116
	(1.33)	(2.15)	(0.06)
Market-adjusted return	0.120**	0.0695***	0.0504
	(2.53)	(3.29)	(1.41)
Industry concentration	-0.0241***	-0.0174***	-0.00725
	(-2.68)	(-3.82)	(-1.14)
Constant	3.002***	1.889***	0.526
	(6.59)	(11.19)	(1.52)
Year controls	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes
Observations	15,989	15,989	15,989
R-square (1st stage)	0.14	0.11	0.16
F-statistic (1st stage)	54.07	10.13	94.19

Table A.11: First-stage coefficients for column 7 models from Table 5 in the main body of the paper

Table 5 reports the second stage coefficients (∂_is) from the takeover equation shown in the Table 5 heading. Table A.11 reports the first-stage coefficients (π_i and θ_i). There are 24 different columns reported in this table corresponding with the 24 provisions ($p_i's$) related to Table 5. Given the large number of columns the table is broken into three tables (Parts 1, 2, and 3) each with 8 columns. Significance is shown using asterisks with significance at the 10%, 5% and 1% shown using *, **, and ***, respectively. Errors are corrected for heteroskedasticity and clustered by firm.

Table A.11, part 1 of 3	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variable:	Anti-greenmail	Blank check	Classified board	Compensation plans	Not Cumulative voting	Director indemnification	Director contracts	Director liability
Variable (Geography IV)	0.841***	0.087***	0.074***	0.095***	0.526***	0.500***	0.192***	0.450***
	(48.96)	(3.00)	(2.88)	(3.32)	(21.32)	(22.25)	(7.33)	(23.67)
Variable (IPO year IV)	0.424***	0.565***	0.234***	0.297***	0.395***	0.751***	0.644***	0.892***
	(12.30)	(14.37)	(4.27)	(7.39)	(8.73)	(33.92)	(14.02)	(68.11)
G-index23	0.012***	0.022***	0.069***	0.036***	0.001	0.019***	0.012***	0.009***
	(10.87)	(20.86)	(45.55)	(25.69)	(0.95)	(13.14)	(10.65)	(7.27)
Firm size	0.002	0.014***	-0.030***	0.016***	0.007***	0.013***	0.008***	0.022***
	(0.99)	(6.82)	(-9.95)	(5.48)	(3.39)	(4.43)	(3.41)	(8.54)
Leverage	0.009	0.089***	-0.093***	0.112***	0.016	-0.015	0.024	-0.061***
	(0.58)	(6.09)	(-3.97)	(5.16)	(1.17)	(-0.84)	(1.56)	(-3.40)
Market to book	0.003	0.012***	-0.004	0.004	0.001	0.006**	0.006**	0.003
	(1.20)	(4.90)	(-1.01)	(1.21)	(0.43)	(2.05)	(2.16)	(1.07)
Property ratio	-0.002	-0.035***	0.074***	0.004	-0.033***	0.003	0.018*	0.011
	(-0.15)	(-3.44)	(5.21)	(0.29)	(-3.49)	(0.27)	(1.77)	(0.91)
Liquidity ratio	0.038**	-0.100***	-0.016	-0.088***	-0.051***	0.064***	0.011	-0.084***
	(2.11)	(-5.66)	(-0.62)	(-3.63)	(-3.39)	(3.03)	(0.63)	(-4.02)
Sales growth	-0.021*	0.029**	0.040**	-0.008	0.003	-0.010	0.002	-0.023
	(-1.75)	(2.53)	(2.26)	(-0.48)	(0.22)	(-0.70)	(0.16)	(-1.59)
Industry-adjusted ROA	-0.011	-0.113***	-0.018	-0.107**	-0.052*	-0.002	0.005	0.117***
	(-0.39)	(-3.68)	(-0.37)	(-2.34)	(-1.73)	(-0.05)	(0.15)	(3.28)
Market-adjusted return	-0.002	0.008	-0.001	0.022***	0.006	-0.004	0.004	-0.005
	(-0.40)	(1.27)	(-0.13)	(2.70)	(0.92)	(-0.55)	(0.65)	(-0.66)
Industry concentration	0.001	-0.003**	-0.005***	0.004**	0.001	-0.002	0.002**	0.001
	(0.66)	(-2.45)	(-2.90)	(2.24)	(0.85)	(-1.18)	(2.06)	(0.63)
Constant	-0.199***	0.187***	-0.014	-0.049	-0.143*	-0.431***	-0.292***	-0.454***
	(-3.97)	(3.46)	(-0.18)	(-0.75)	(-1.90)	(-7.12)	(-7.36)	(-6.93)
Year controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-square (1st stage)	0.27	0.09	0.17	0.10	0.13	0.20	0.07	0.42
F-statistic (1st stage)	133.93	17.56	1.75	7.81	26.09	100.01	13.05	359.36

Table A.11 continued, part 2 of 3

	(9) Directors duties	(10) Fair price	(11) Golden parachutes	(12) Bylaws	(13) Charter	(14) Cashouts	(15) Special meeting	(16) Written consent
Variable (Geography IV)	0.646***	0.480***	-0.022	0.153***	0.218***	0.848***	0.250***	0.250***
	(25.76)	(27.12)	(-0.80)	(5.01)	(5.97)	(24.22)	(9.03)	(9.20)
Variable (IPO year IV)	0.085	0.560***	0.152***	0.714***	-0.148	0.218***	0.507***	0.696***
	(1.36)	(22.36)	(3.19)	(10.75)	(-1.50)	(3.54)	(11.23)	(16.69)
G-index23	0.025***	0.039***	0.034***	0.032***	0.007***	0.009***	0.048***	0.051***
	(23.56)	(25.57)	(21.99)	(25.65)	(11.39)	(14.99)	(32.39)	(34.36)
Firm size	-0.008***	0.013***	-0.024***	0.001	-0.001	-0.001	0.047***	0.026***
	(-4.11)	(4.44)	(-7.70)	(0.35)	(-0.65)	(-1.09)	(15.64)	(8.82)
Leverage	-0.043***	-0.094***	0.151***	0.043**	-0.010*	-0.017***	0.078***	0.005
	(-3.18)	(-4.49)	(6.63)	(2.27)	(-1.70)	(-2.75)	(3.37)	(0.23)
Market to book	-0.002	0.001	-0.035***	-0.012***	-0.000	0.001	0.012***	0.012***
	(-0.84)	(0.39)	(-9.15)	(-4.21)	(-0.28)	(1.33)	(3.00)	(3.17)
Property ratio	-0.023**	0.070***	-0.056***	0.021*	0.003	-0.015***	0.014	0.097***
	(-2.52)	(5.14)	(-4.13)	(1.77)	(0.81)	(-3.24)	(1.01)	(7.02)
Liquidity ratio	-0.031**	0.062**	-0.248***	-0.002	0.006	0.009	0.013	-0.060**
	(-2.06)	(2.44)	(-9.43)	(-0.10)	(1.11)	(1.31)	(0.50)	(-2.33)
Sales growth	-0.015	-0.008	-0.031*	0.017	-0.008*	0.005	-0.003	0.036**
	(-1.39)	(-0.50)	(-1.82)	(1.12)	(-1.85)	(0.94)	(-0.15)	(2.01)
Industry-adjusted ROA	0.041	0.063	0.115**	-0.018	-0.019*	-0.019*	-0.207***	-0.307***
	(1.57)	(1.42)	(2.30)	(-0.43)	(-1.74)	(-1.71)	(-4.22)	(-6.35)
Market-adjusted return	0.004	-0.012	0.026***	0.015**	0.004	-0.001	-0.007	-0.004
	(0.77)	(-1.35)	(2.84)	(2.05)	(1.58)	(-0.34)	(-0.77)	(-0.39)
Industry concentration	0.000	-0.004**	-0.001	-0.004***	0.000	-0.000	0.000	-0.002
	(0.42)	(-2.26)	(-0.49)	(-3.38)	(0.61)	(-0.77)	(0.31)	(-1.36)
Constant	-0.227***	-0.401***	0.487***	-0.205***	-0.064***	-0.108***	-0.448***	-0.425***
	(-6.96)	(-6.10)	(6.87)	(-4.04)	(-4.42)	(-5.83)	(-7.42)	(-6.24)
Year controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-square (1st stage)	0.15	0.26	0.14	0.08	0.06	0.33	0.15	0.15
F-statistic (1st stage)	33.81	87.50	1.19	13.80	1.99	28.81	17.75	33.40

Table A.11 continued, part 3 of 3

	(17) Pension parachutes	(18) Business combination	(19) Poison pill	(20) Not secret ballot	(21) Executive severance	(22) Silver parachutes	(23) Super-majority	(24) Unequal voting
Variable (Geography IV)	0.141***	0.654***	0.057**	-0.031	0.009	0.035	0.621***	-0.056***
	(3.82)	(30.30)	(2.17)	(-0.96)	(0.37)	(1.15)	(37.05)	(-3.50)
Variable (IPO year IV)	0.273***	0.205***	-0.021	0.609***	0.053	0.247***	0.568***	-0.415***
	(6.05)	(4.33)	(-0.47)	(18.98)	(0.92)	(3.83)	(17.59)	(-6.44)
G-index23	0.006***	0.009***	0.056***	-0.006***	-0.008***	0.005***	0.018***	0.003***
	(12.28)	(8.82)	(35.41)	(-5.99)	(-9.74)	(10.40)	(12.36)	(7.43)
Firm size	0.006***	0.006***	-0.025***	-0.061***	0.001	0.008***	-0.019***	-0.001**
	(7.48)	(3.15)	(-7.93)	(-25.56)	(0.48)	(7.78)	(-6.83)	(-2.04)
Leverage	-0.016***	0.014	0.075***	0.020	0.035**	-0.007	-0.018	-0.016***
	(-3.01)	(0.95)	(3.07)	(1.32)	(2.51)	(-1.02)	(-0.88)	(-3.26)
Market to book	-0.001	0.000	-0.011***	-0.002	0.004*	0.000	-0.004	-0.002***
	(-0.88)	(0.13)	(-2.67)	(-0.75)	(1.70)	(0.36)	(-1.17)	(-2.59)
Property ratio	0.011**	-0.043***	0.065***	-0.068***	-0.051***	0.049***	0.022*	-0.008*
	(2.41)	(-4.70)	(4.39)	(-7.01)	(-7.05)	(8.55)	(1.71)	(-1.95)
Liquidity ratio	-0.019***	-0.012	-0.130***	0.006	-0.003	0.006	0.069***	0.003
	(-2.79)	(-0.76)	(-4.91)	(0.44)	(-0.21)	(0.66)	(2.97)	(0.50)
Sales growth	-0.001	-0.009	0.024	0.078***	-0.011	0.013*	-0.021	0.001
	(-0.18)	(-0.93)	(1.33)	(7.04)	(-1.13)	(1.92)	(-1.33)	(0.18)
Industry-adjusted ROA	-0.033***	-0.133***	0.008	0.120***	0.009	-0.025	0.167***	-0.029**
	(-3.46)	(-4.69)	(0.16)	(4.79)	(0.31)	(-1.47)	(4.04)	(-1.97)
Market-adjusted return	0.003	-0.003	0.020**	0.002	-0.001	-0.001	0.001	0.003
	(1.53)	(-0.50)	(2.17)	(0.36)	(-0.17)	(-0.25)	(0.09)	(1.28)
Industry concentration	0.001	0.001	-0.006***	0.001	-0.001	-0.001***	-0.002	0.000
	(1.00)	(1.29)	(-3.43)	(1.08)	(-0.66)	(-2.93)	(-1.12)	(1.34)
Constant	-0.045	0.165***	0.271***	0.596***	0.115***	-0.093***	-0.293***	0.009
	(-1.64)	(3.10)	(4.05)	(8.86)	(3.08)	(-4.78)	(-4.96)	(0.89)
Year controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-square (1st stage)	0.06	0.16	0.13	0.19	0.04	0.07	0.21	0.04
F-statistic (1st stage)	3.64	57.29	0.39	19.99	0.13	1.37	113.79	4.88

Table A.12: Takeover bid likelihood and takeover indices accounting for endogeneity

This table corresponds with Table 4 Panel A from the main body of the paper. Unlike in Table 4 where the dependent variable was set to one if the firm was acquired in a given year, in this table the dependent variable is set to one if the firm received a bid. Bid dates were estimated as the announcement dates for completed and withdrawn deals from SDC. The table below shows the second-stage coefficients from a linear probability model after instrumenting the G-index, E-index, and O-index variables using both the geography-based and IPO-year-based instruments described in Section 2.3 of the main paper. In columns 1–3 (4–6) the dependent variable is set to one if the firm received a bid in the next year (five years). The control variables are described in Table 2. The last two columns report the second-stage coefficients from six regressions that mirror those in columns 1–3, and 4–6, respectively, but using standardized versions of the G-index, E-index, and O-index variables where a one-unit increase in the standardized variable represents a standard deviation increase in the underlying index. To save space only the main variables of interest are reported (and stacked) in the last two columns from six separate regressions that in each case include the same control variables as shown in columns 1–6. *p*-values are shown in parenthesis below the coefficients with significance at the 10%, 5%, and 1% levels noted using *, **, ***, respectively. Errors are robust to heteroskedasticity and clustered at the firm level.

	(1)	(2)	(3)	(4)	(5)	(6)	Columns 1-3, standardized	Columns 4-6, standardized
	Received bid within 1 year			Received bid within 5 years				
	(t+1)	(t+1)	(t+1)	(t+1,t+5)	(t+1,t+5)	(t+1,t+5)	coefficients	coefficients
G-index	-0.008*			-0.039***			-0.021*	-0.104***
	(0.054)			(0.004)			(0.054)	(0.004)
E-index		-0.036*			-0.175**		-0.043*	-0.205**
		(0.083)			(0.021)		(0.083)	(0.021)
O-index			-0.008*			-0.036***	-0.015*	-0.071***
			(0.068)			(0.009)	(0.068)	(0.009)
Firm size	-0.008***	-0.010***	-0.008***	-0.024***	-0.036***	-0.024***		
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)		
Leverage	0.009	0.014	0.007	0.156***	0.181***	0.149***		
	(0.543)	(0.369)	(0.612)	(<.001)	(<.001)	(<.001)		
Market to book	-0.007***	-0.008***	-0.006***	-0.036***	-0.044***	-0.033***		
	(0.001)	(0.001)	(0.001)	(<.001)	(<.001)	(<.001)		
Property ratio	-0.008	-0.007	-0.009	0.021	0.025	0.014		
	(0.355)	(0.442)	(0.272)	(0.460)	(0.443)	(0.607)		
Liquidity ratio	-0.047***	-0.055***	-0.043**	-0.161***	-0.203***	-0.141***		
	(0.010)	(0.007)	(0.015)	(<.001)	(0.001)	(0.001)		
Sales growth	-0.023**	-0.022**	-0.023**	-0.039**	-0.035*	-0.037*		
	(0.021)	(0.027)	(0.023)	(0.049)	(0.095)	(0.058)		
ROA	-0.073***	-0.068**	-0.077***	-0.080	-0.056	-0.097		
	(0.010)	(0.021)	(0.007)	(0.320)	(0.529)	(0.221)		
Market-adjusted return	0.002	0.004	0.001	0.005	0.012	0.002		
	(0.679)	(0.496)	(0.766)	(0.587)	(0.256)	(0.844)		
Industry concentration	-0.000	-0.001	-0.000	-0.004	-0.006*	-0.003		
	(0.763)	(0.448)	(0.897)	(0.192)	(0.078)	(0.280)		
Constant	0.221***	0.257***	0.197***	0.977***	1.147***	0.855***		
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)		
Year controls	Yes	Yes	Yes	Yes	Yes	Yes		
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes		
Observations	15,989	15,989	15,989	15,989	15,989	15,989		
Chi-square (2nd stage)	390.1	324.0	533.1	396.0	318.5	409.5		
Prob < Chi-square (2nd stage)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
F-statistic (1st stage)	54.1	10.1	94.2	54.1	10.1	94.2		
R-square (1st stage)	0.139	0.110	0.158	0.139	0.110	0.158		

Table A.13: Takeover bid likelihood as a function of individual provisions after accounting for endogeneity

Columns 1, 2, 7, 8, and 9 report the marginal effects related to the ∂_is shown in the takeover equation below where p_i is an indicator variable for each of the 24 takeover provisions considered in the paper. In all specifications the dependent variable (y_1) is set to 1 in year t if the firm in question received a bid in t+1. Bid dates were estimated as the announcement dates for completed and withdrawn deals from SDC. In all specifications the same 73 control variables used in Table 4 are also included (but not tabulated) controlling for various firm, industry and year effects.

$$y_1 = \propto_0 + p_i\partial_i + Index_{23}\vartheta_{23} + \sum_{j=1}^{73} x_j\beta_j + e \qquad \text{(takeover bid equation, columns 2-9)}$$

$$p_i = \alpha_0 + z\_p_{geo,i}\pi_i + z\_p_{ipo,i}\theta_i + Index_{23}\alpha_{23} + \sum_{j=1}^{73} x_j\gamma_j + u \qquad \text{(first stage equation, columns 3-9)}$$

The results in columns 1 and 2 are estimated using only the takeover bid equation whereas the results in the other columns are estimated using both equations. In column 1 the marginal effects are all from a single linear probability regression model (LPM) that includes all 24 provisions together each as separate indicator variables in addition to the control variables. Hence for column 1, unlike the other columns, the takeover equation does not include an *Index*$_{23}$ variable and instead includes 24 p_i's. In contrast, the marginal effects in column 2 (and in each of the other columns) are from 24 separate regressions where for each regression one provision at a time is included as an indicator variable (p_i) while simultaneously controlling collectively for the other 23 provisions using an index (index$_{23}$). The results in columns 3-7 all come from 2SLS LPMs that include both the geography- and IPO-year-based instruments (z_p_{geo} and z_p_{ipo}) in the first stage. The instruments are described in Section 2.3. Columns 3 and 4 report the R-square and F-statistic from the first-stage equations and provide a sense as to the strength of the instruments. Column 5 indicates whether there is evidence of a strong instrument using the F-statistic rule-of-thumb cutoff of 10 as advocated in Staiger and Stock (1997). Column 6 indicates whether the p-value from the test for exogeneity is less than 10%. For this test the null hypothesis is that the variables are exogenous, so a p-value < 10% provides evidence that the provision in question needs to be treated as endogenous. Column 7 reports the marginal effect of each provision on being acquired as estimated in the second stage (takeover) equation. For robustness, columns 8 and 9 are based on alternative modeling approaches and report the marginal effects from a recursive bivariate probit model (RBPM) and a limited-information maximum likelihood (LIML) model, respectively. The underlying equations (shown above) are similar for the 2SLS LPM, RBPM, and LIML models but different key assumptions are made in each approach. For the RBPM, the two left-hand side variables in the equations above are considered latent variables (y_1^*, p_i^*). By assumption, y_1 and p_i are observed to equal 1 when their underlying respective latent variables are above a certain threshold. In the RBPM the errors are assumed to have a bivariate normal distribution with a modeled correlation of ρ: $\binom{u}{e} \sim N\left\{\binom{0}{0}, \binom{1\ \rho}{\rho\ 1}\right\}$. RBPM marginal effects are estimated as the difference in the predicted probability of observing a takeover conditional on having or not having the provision while holding all other characteristics at the firm constant following Greene (5 ed., page 716). For both the RBPM and LIML approaches, maximum likelihood estimation techniques are used to estimate both equations. Column 10 summarizes the sign of each provisions marginal effect on the likelihood of being acquired using a 10% p-value cutoff. Column 10 uses the signs and significance of the 2SLS LPM results if there is evidence of a strong instrument. If the instrument is weak and there is no evidence of endogeneity then the LPM results from columns 1 and 2 are used. Significance of the 2SLS, RBPM, and LIML marginal effects is shown using asterisks with significance at the 10%, 5% and 1% shown using *, **, and ***, respectively. Errors are corrected for heteroskedasticity and clustered by firm.

Table A.13, continued

Provision	(1) LPM marginal effects (all together)	(2) LPM marginal effects (one at a time)	(3) 2SLS first-stage R-square	(4) 2SLS first-stage F-statistic	(5) Evidence of a strong instrument?	(6) Evidence of endogeneity?	(7) 2SLS marginal effects	(8) Recursive bivariate probit marginal effects	(9) LIML marginal effects
Anti-greenmail	-0.003	-0.005	0.268	133.928	yes	yes	-0.037***	-0.031***	-0.037***
Blank check	-0.003	-0.001	0.094	17.562	yes		-0.021	0.001	-0.021
Classified board	-0.009**	-0.007*	0.167	1.749			-0.148	-0.008	-0.148
Compensation plans	0.004	0.008*	0.098	7.812			0.002	0.004	0.002
Not Cumulative voting	0.007	0.008	0.129	26.092	yes	yes	0.059**	0.041***	0.059**
Director indemnification	0.001	-0.005	0.197	100.013	yes		-0.023	-0.020*	-0.023
Director contracts	-0.008	-0.008	0.065	13.046	yes		-0.005	-0.021	-0.005
Director liability	-0.006	-0.006	0.416	359.364	yes		-0.007	-0.008	-0.007
Directors' duties	-0.005	-0.008	0.151	33.814	yes		-0.025	-0.018	-0.025
Fair price	<0.001	-0.004	0.262	87.499	yes	yes	-0.029*	-0.026**	-0.029*
Golden parachutes	0.022***	0.022***	0.143	1.194			0.216	0.125***	0.241
Bylaws	-0.001	0.001	0.078	13.797	yes	yes	-0.106**	-0.070***	-0.106**
Charter	0.025	0.025	0.062	1.988		yes	-0.379	-0.067***	-0.385
Cashouts	0.001	-0.005	0.328	28.808	yes		-0.015	-0.013	-0.015
Special meeting	-0.006	-0.002	0.148	17.753	yes		-0.047	-0.041*	-0.047
Written consent	0.007	0.006	0.148	33.396	yes		-0.008	-0.027	-0.009
Pension parachutes	0.011	0.018	0.061	3.644			-0.135	-0.059***	-0.135
Business combination	-0.005	-0.004	0.163	57.290	yes		0.011	0.012	0.011
Poison pill	0.001	0.006	0.135	0.386			-0.044	-0.003	-0.046
Not secret ballot	-0.007	-0.007	0.194	19.994	yes		-0.016	0.002	-0.016
Executive severance	0.002	-0.009	0.043	0.134			0.028	-0.021	0.046
Silver parachutes	<0.001	-0.001	0.067	1.367			-0.343	-0.044***	-0.343
Supermajority	-0.006	-0.009**	0.208	113.795	yes		-0.027**	-0.027***	-0.027**
Unequal voting	-0.016	-0.022	0.039	4.883			0.017	0.225	0.018

Table A.14: Takeover likelihood and takeover indices accounting for endogeneity using a variation of the geography instrument

This table corresponds with Table 4 Panel A from the main body of the paper. Different than in Table 4, the results in this table are based on an alternative calculation of the geography-based instrument (the IPO-year instrument is the same as in Table 4). In Table 4 the geographically-proximate peer set of firms are selected from the same state as the focus firm. In this table the geographically proximate firms are allowed to cross state boundaries. If there are no geographically-proximate non-industry peer firms within 100 miles then a radius of 500 miles is used in identifying non-industry peers. The table below shows the second stage coefficients from a linear probability model after instrumenting the G-index, E-index, and O-index variables using both the geography-based and IPO-year-based instruments described in Section 2.3. In columns 1–3 (4–6) the dependent variable is set to one if the firm was acquired in the next year (five years). The control variables are described in Table 2. *p*-values are shown in parenthesis below the coefficients with significance at the 10%, 5%, and 1% levels noted using *, **, ***, respectively. Errors are robust to heteroskedasticity and clustered at the firm level.

	(1)	(2)	(3)	(4)	(5)	(6)
	Acquired within 1 year			Acquired within 5 years		
	(t+1)	(t+1)	(t+1)	(t+1,t+5)	(t+1,t+5)	(t+1,t+5)
G-index	-0.009**			-0.055***		
	(0.023)			(<.001)		
E-index		-0.048*			-0.273**	
		(0.055)			(0.011)	
O-index			-0.009**			-0.054***
			(0.023)			(<.001)
Firm size	-0.009***	-0.012***	-0.009***	-0.028***	-0.045***	-0.028***
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
Leverage	0.005	0.012	0.003	0.150***	0.190***	0.140***
	(0.714)	(0.427)	(0.806)	(<.001)	(0.001)	(<.001)
Market to book	-0.005***	-0.007***	-0.004**	-0.030***	-0.044***	-0.026***
	(0.006)	(0.006)	(0.015)	(<.001)	(<.001)	(<.001)
Property ratio	-0.006	-0.004	-0.007	0.022	0.031	0.014
	(0.414)	(0.671)	(0.305)	(0.438)	(0.416)	(0.605)
Liquidity ratio	-0.057***	-0.070***	-0.053***	-0.168***	-0.239***	-0.141***
	(<.001)	(0.001)	(0.001)	(<.001)	(0.002)	(0.001)
Sales growth	-0.021**	-0.020**	-0.020**	-0.050***	-0.045**	-0.048***
	(0.016)	(0.022)	(0.016)	(0.007)	(0.037)	(0.007)
ROA	-0.069***	-0.060**	-0.072***	-0.095	-0.051	-0.116
	(0.007)	(0.031)	(0.005)	(0.229)	(0.610)	(0.133)
Market-adjusted return	0.006	0.008	0.005	0.011	0.023*	0.007
	(0.215)	(0.111)	(0.267)	(0.158)	(0.053)	(0.336)
Industry concentration	-0.000	-0.001	-0.000	-0.005*	-0.008**	-0.004
	(0.629)	(0.244)	(0.800)	(0.064)	(0.022)	(0.130)
Constant	0.196***	0.258***	0.171***	0.993***	1.305***	0.841***
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
Year controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15,989	15,989	15,989	15,989	15,989	15,989
Chi-square(2nd stage)	335.0	272.2	389.4	348.5	225.8	375.1
Prob < Chi-square(2nd stage)	0.000	<0.001	<0.001	<0.001	<0.001	<0.001
F-statistic(1st stage)	52.8	7.4	92.4	52.8	7.4	92.4
R-square(1st stage)	0.136	0.108	0.153	0.136	0.108	0.153

Table A.15: Takeover likelihood as a function of individual provisions after accounting for endogeneity using a variation of the geography instrument
This table corresponds with Table 5 from the main body of the paper. Different than in Table 5, the results in this table are based on an alternative calculation of the geography-based instrument (the IPO-year instrument is the same as in Table 5). In Table 5 the geographically-proximate peer set of firms are selected from the same state as the focus firm. In this table the geographically proximate firms are allowed to cross state boundaries. If there are no geographically-proximate non-industry peer firms within 100 miles then a radius of 500 miles is used in identifying non-industry peers. Significance of the 2SLS, RBPM, and LIML marginal effects is shown using asterisks with significance at the 10%, 5% and 1% shown using *, **, and ***, respectively. Errors are corrected for heteroskedasticity and clustered by firm.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Provision	LPM marginal effects (all together)	LPM marginal effects (one at a time)	2SLS first-stage R-square	2SLS first-stage F-statistic	Evidence of strong instrument	Evidence of endogeneity?	2SLS marginal effects	Recursive bivariate probit marginal effects	LIML marginal effects
Anti-greenmail	<0.001	-0.003	0.218	97.444	yes	yes	-0.026***	-0.020***	-0.026***
Blank check	-0.004	-0.001	0.096	17.772	yes		0.015	0.026*	0.015
Classified board	-0.007*	-0.004	0.167	2.024			-0.097	-0.006	-0.098
Compensation plans	0.005	0.008**	0.097	9.820			-0.027	-0.010	-0.027
Not Cumulative voting	0.003	0.006	0.136	29.336	yes		0.038*	0.028***	0.038*
Director indemnification	0.001	-0.006*	0.195	96.572	yes		-0.023*	-0.020**	-0.023*
Director contracts	-0.011**	-0.012**	0.065	13.212	yes		-0.022	-0.017	-0.022
Director liability	-0.007*	-0.008**	0.407	336.840	yes		-0.011	-0.013*	-0.011
Directors' duties	-0.005	-0.008	0.096	12.439	yes		-0.056*	-0.039***	-0.056*
Fair price	-0.001	-0.004	0.258	85.107	yes	yes	-0.029**	-0.024**	-0.029**
Golden parachutes	0.018***	0.019***	0.145	1.574			0.191	0.054**	0.199
Bylaws	-0.001	0.003	0.078	13.986	yes		-0.043	-0.040**	-0.043
Charter	0.024*	0.025*	0.059	1.168			-0.331	-0.057***	-0.344
Cashouts	<0.001	-0.007	0.229	20.762	yes		-0.029	-0.025**	-0.029
Special meeting	-0.004	0.002	0.144	13.450	yes		-0.037	-0.031	-0.037
Written consent	0.013***	0.012***	0.151	38.461	yes		0.003	-0.010	0.003
Pension parachutes	0.005	0.010	0.064	4.825			-0.106	-0.043***	-0.106
Business combination	-0.003	-0.001	0.153	51.375	yes		-0.011	0.001	-0.011
Poison pill	0.001	0.006*	0.134	0.047			-0.393	-0.006	-0.420
Not secret ballot	-0.007	-0.007	0.197	20.597	yes		-0.007	0.003	-0.007
Executive severance	0.002	-0.007	0.043	0.319			0.881	-0.011	1.056
Silver parachutes	0.001	0.001	0.068	1.870		yes	-0.382	-0.033***	-0.384
Supermajority	-0.007*	-0.010***	0.188	85.262	yes	yes	-0.035***	-0.033***	-0.035***
Unequal voting	-0.020*	-0.026**	0.04	5.138		yes	0.370	0.107	0.372

Table A.16: Takeover likelihood and takeover indices accounting for endogeneity focusing on firms that have been public for at least 5 or 10 years

This table corresponds with Table 4 Panel A from the main body of the paper. Different than in Table 4, the results in this table are based only on firm years where the firm has been public for at least 5 (columns 1-6) or 10 years (columns 7-9). The table below shows the second stage coefficients from a linear probability model after instrumenting the G-index, E-index, and O-index variables using both the geography-based and IPO-year-based instruments described in Section 2.3. In columns 1–3 (4–9) the dependent variable is set to one if the firm was acquired in the next year (five years). The control variables are described in Table 2. *p*-values are shown in parenthesis below the coefficients with significance at the 10%, 5%, and 1% levels noted using *, **, ***, respectively. Errors are robust to heteroskedasticity and clustered at the firm level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Acquired within 1 year			Acquired within 5 years			Acquired within 5 years		
	(t+1)	(t+1)	(t+1)	(t+1,t+5)	(t+1,t+5)	(t+1,t+5)	(t+1,t+5)	(t+1,t+5)	(t+1,t+5)
G-index	-0.005*			-0.047***			-0.033***		
	(0.088)			(<.001)			(0.003)		
E-index		-0.025*			-0.195***			-0.128**	
		(0.094)			(0.001)			(0.019)	
O-index			-0.005*			-0.047***			-0.037***
			(0.088)			(<.001)			(0.003)
Firm size	-0.010***	-0.011***	-0.010***	-0.030***	-0.043***	-0.029***	-0.033***	-0.042***	-0.031***
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
Leverage	0.004	0.008	0.003	0.152***	0.180***	0.143***	0.165***	0.183***	0.156***
	(0.739)	(0.562)	(0.797)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
Market to book	-0.005***	-0.006***	-0.004***	-0.030***	-0.039***	-0.026***	-0.025***	-0.031***	-0.023***
	(0.004)	(0.003)	(0.006)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
Property ratio	-0.008	-0.007	-0.008	0.016	0.020	0.010	0.009	0.013	0.006
	(0.282)	(0.367)	(0.235)	(0.558)	(0.536)	(0.714)	(0.748)	(0.658)	(0.830)
Liquidity ratio	-0.054***	-0.061***	-0.052***	-0.163***	-0.207***	-0.141***	-0.137***	-0.161***	-0.123***
	(0.001)	(<.001)	(0.001)	(<.001)	(<.001)	(0.001)	(0.003)	(0.004)	(0.006)
Sales growth	-0.018**	-0.018**	-0.018**	-0.048***	-0.043**	-0.046**	-0.057***	-0.054***	-0.057***
	(0.036)	(0.041)	(0.036)	(0.009)	(0.029)	(0.011)	(0.004)	(0.008)	(0.004)
ROA	-0.058**	-0.054**	-0.060**	-0.088	-0.061	-0.106	-0.107	-0.074	-0.123
	(0.022)	(0.039)	(0.017)	(0.267)	(0.490)	(0.174)	(0.210)	(0.422)	(0.145)
Market-adjusted return	0.004	0.006	0.004	0.009	0.018*	0.006	0.001	0.007	-0.002
	(0.338)	(0.238)	(0.379)	(0.248)	(0.067)	(0.458)	(0.934)	(0.490)	(0.814)
Industry concentration	-0.000	-0.001	-0.000	-0.004*	-0.007**	-0.004	-0.004*	-0.006**	-0.004
	(0.691)	(0.410)	(0.796)	(0.062)	(0.017)	(0.117)	(0.085)	(0.040)	(0.129)
Constant	0.170***	0.196***	0.157***	0.930***	1.092***	0.808***	0.850***	0.934***	0.778***
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
Year and Industry controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15,733	15,733	15,733	15,733	15,733	15,733	13,660	13,660	13,660
Chi-square(2nd stage)	346.3	301.0	397.5	357.2	274.5	376.3	347.4	283.4	449.6
Prob < Chi-square(2nd stage)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
F-statistic(1st stage)	69.5	16.3	112.0	69.5	16.3	112.0	58.4	15.3	86.4
R-square(1st stage)	0.150	0.113	0.170	0.150	0.113	0.170	0.148	0.116	0.160

Table A.17: Takeover likelihood and takeover indices accounting for endogeneity using alternative industry groups in instrument calculation

This table corresponds with Table 4 Panel A from the main body of the paper. In Table 4 the geographically-proximate and IPO-year cohorts of peer firms eliminated within industry matches using Fama-French industry classifications. For the analysis in this table the within industry peer firms were eliminated using the 24 industry groups classified using GICs. The table below shows the second stage coefficients from a linear probability model after instrumenting the G-index, E-index, and O-index variables using both the geography-based and IPO-year-based instruments described in Section 2.3 of the main paper. In columns 1–3 (4–6) the dependent variable is set to one if the firm received a bid in the next year (five years). The control variables are described in Table 2. *p*-values are shown in parenthesis below the coefficients with significance at the 10%, 5%, and 1% levels noted using *, **, ***, respectively. Errors are robust to heteroskedasticity and clustered at the firm level.

	(1)	(2)	(3)	(4)	(5)	(6)
	Acquired within 1 year			Acquired within 5 years		
	(t+1)	(t+1)	(t+1)	(t+1,t+5)	(t+1,t+5)	(t+1,t+5)
G-index	-0.005**			-0.036***		
	(0.046)			(0.001)		
E-index		-0.018			-0.132***	
		(0.122)			(0.008)	
O-index			-0.006**			-0.038***
			(0.046)			(0.001)
Firm size	-0.010***	-0.011***	-0.010***	-0.031***	-0.041***	-0.030***
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
Leverage	0.006	0.009	0.005	0.147***	0.165***	0.141***
	(0.642)	(0.531)	(0.694)	(<.001)	(<.001)	(<.001)
Market to book	-0.005***	-0.006***	-0.005***	-0.029***	-0.035***	-0.027***
	(0.003)	(0.002)	(0.004)	(<.001)	(<.001)	(<.001)
Property ratio	-0.007	-0.007	-0.007	0.012	0.012	0.008
	(0.325)	(0.334)	(0.284)	(0.649)	(0.664)	(0.765)
Liquidity ratio	-0.050***	-0.054***	-0.048***	-0.144***	-0.169***	-0.128***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
Sales growth	-0.015*	-0.015*	-0.015*	-0.047**	-0.042**	-0.046**
	(0.070)	(0.083)	(0.070)	(0.011)	(0.024)	(0.011)
ROA	-0.064**	-0.062**	-0.066***	-0.111	-0.092	-0.124
	(0.012)	(0.018)	(0.010)	(0.154)	(0.255)	(0.105)
Market-adjusted return	0.004	0.004	0.003	0.007	0.012	0.005
	(0.425)	(0.357)	(0.471)	(0.341)	(0.169)	(0.527)
Industry concentration	-0.000	-0.001	-0.000	-0.004*	-0.006**	-0.004
	(0.571)	(0.399)	(0.669)	(0.066)	(0.026)	(0.110)
Constant	0.168***	0.178***	0.156***	0.847***	0.924***	0.758***
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
Year controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15,662	15,662	15,662	15,662	15,662	15,662
Chi-square(2nd stage)	347.5	309.9	404.3	369.3	318.8	381.5
Prob < Chi-square(2nd stage)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
F-statistic(1st stage)	62.2	15.8	102.4	62.2	15.8	102.4
R-square(1st stage)	0.158	0.117	0.177	0.158	0.117	0.177

Table A.18: Takeover likelihood as a function of individual provisions after accounting for endogeneity using alternative industry groups in instrument calculation

This table corresponds with Table 5 from the main body of the paper. In Table 5 the geographically-proximate and IPO-year cohorts of peer firms eliminated within industry matches using Fama-French industry classifications. For the analysis in this table, the within-industry peer firms were eliminated using the 24 industry groups classified using GICs. Significance of the 2SLS, RBPM, and LIML marginal effects is shown using asterisks with significance at the 10%, 5% and 1% shown using *, **, and ***, respectively. Errors are corrected for heteroskedasticity and clustered by firm.

Provision	(1) LPM marginal effects (all together)	(2) LPM marginal effects (one at a time)	(3) 2SLS first-stage R-square	(4) 2SLS first-stage F-statistic	(5) Evidence of strong instrument	(6) Evidence of endogeneity?	(7) 2SLS marginal effects	(8) RBPM marginal effects	(9) LIML marginal effects
Anti-greenmail	<0.001	-0.003	0.259	127.680	yes	yes	-0.027***	-0.022***	-0.027***
Blank check	-0.004	-0.001	0.094	19.040	yes		0.023	0.027*	0.023
Classified board	-0.007*	-0.004	0.169	2.028			-0.115	-0.008	-0.116
Compensation plans	0.005	0.008**	0.099	8.874			-0.039	-0.012	-0.039
Not Cumulative voting	0.003	0.006	0.127	25.036	yes	yes	0.048**	0.032***	0.048**
Director indemnification	0.001	-0.006*	0.195	92.107	yes		-0.020	-0.019**	-0.020
Director contracts	-0.011**	-0.012**	0.068	15.432	yes		-0.010	-0.013	-0.010
Director liability	-0.007*	-0.008**	0.413	346.051	yes		-0.009	-0.009	-0.009
Directors' duties	-0.005	-0.008	0.149	31.888	yes	yes	-0.036**	-0.027***	-0.036**
Fair price	-0.001	-0.004	0.263	87.652	yes	yes	-0.034***	-0.026***	-0.034***
Golden parachutes	0.018***	0.019***	0.146	1.646		yes	0.231	0.056**	0.237
Bylaws	-0.001	0.003	0.082	18.233	yes		-0.039	-0.033*	-0.039
Charter	0.024*	0.025*	0.063	1.984		yes	-0.257	-0.055***	-0.257
Cashouts	<0.001	-0.007	0.318	26.099	yes	yes	-0.028*	-0.022**	-0.028*
Special meeting	-0.004	0.002	0.146	16.667	yes		-0.045	-0.033	-0.045
Written consent	0.013***	0.012***	0.146	32.153	yes		0.004	-0.011	0.004
Pension parachutes	0.005	0.010	0.063	4.787			-0.095	-0.045***	-0.096
Business combination	-0.003	-0.001	0.162	55.529	yes		-0.004	0.005	-0.004
Poison pill	0.001	0.006*	0.136	0.156			-0.041	-0.006	-0.048
Not secret ballot	-0.007	-0.007	0.198	21.577	yes		-0.007	0.001	-0.007
Executive severance	0.002	-0.007	0.043	0.454			0.143	-0.023	0.152
Silver parachutes	0.001	0.001	0.070	2.627		yes	-0.313	-0.032***	-0.316
Supermajority	-0.007*	-0.010***	0.204	104.834	yes	yes	-0.031***	-0.031***	-0.031***
Unequal voting	-0.020*	-0.026**	0.039	3.510			0.280	0.125	0.281

Table A.19: Takeover likelihood as a function of index values after accounting for endogeneity – using data extended through 2010

This table corresponds to Table 4 Panel A in the main body of the paper using data where the 2006 IRRC data has been extended through 2010 instead of 2008. This table shows the second stage coefficients from a linear probability model after instrumenting the G-index, E-index, and O-index. In columns 1–3 (4–6) the dependent variable is set to 1 if the firm was acquired in the next year (five years). The control variables are described in Table 2 in the paper. *p*-values are shown in parentheses below the coefficients with significance at the 10%, 5%, and 1% levels noted using *, **, ***, respectively. Errors are robust to heteroskedasticity and are clustered at the firm level.

	(1)	(2)	(3)	(4)	(5)	(6)
	Acquired within 1 year			Acquired within 5 years		
	(t+1)	(t+1)	(t+1)	(t+1,t+5)	(t+1,t+5)	(t+1,t+5)
G-index	-0.009***			-0.052***		
	(0.006)			(<.001)		
E-index		-0.039**			-0.199***	
		(0.024)			(0.004)	
O-index			-0.009***			-0.050***
			(0.005)			(<.001)
Firm size	-0.009***	-0.012***	-0.009***	-0.030***	-0.045***	-0.029***
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
Leverage	0.007	0.013	0.005	0.140***	0.169***	0.129***
	(0.575)	(0.344)	(0.679)	(<.001)	(<.001)	(<.001)
Market to book	-0.005***	-0.007***	-0.005***	-0.031***	-0.039***	-0.027***
	(0.001)	(0.001)	(0.003)	(<.001)	(<.001)	(<.001)
Property ratio	-0.009	-0.009	-0.010	0.014	0.011	0.008
	(0.177)	(0.211)	(0.119)	(0.583)	(0.713)	(0.751)
Liquidity ratio	-0.055***	-0.064***	-0.050***	-0.153***	-0.195***	-0.128***
	(<.001)	(<.001)	(0.001)	(<.001)	(0.001)	(0.001)
Sales growth	-0.022***	-0.021**	-0.022***	-0.047***	-0.039**	-0.045***
	(0.006)	(0.010)	(0.006)	(0.005)	(0.028)	(0.006)
ROA	-0.088***	-0.052**	-0.047*	-0.055**	-0.084	-0.067
	(0.028)	(0.054)	(0.019)	(0.253)	(0.418)	(0.148)
Market-adjusted return	0.005	0.006	0.004	0.010	0.016*	0.007
	(0.273)	(0.175)	(0.338)	(0.149)	(0.061)	(0.317)
Industry concentration	-0.000	-0.001	-0.000	-0.004	-0.006**	-0.003
	(0.444)	(0.171)	(0.617)	(0.110)	(0.030)	(0.216)
Constant	0.212***	0.248***	0.185***	0.975***	1.128***	0.823***
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
Year controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	18,208	18,208	18,208	18,208	18,208	18,208
Chi-square (2nd stage)	345.9	305.6	359.1	424.4	334.0	450.0
Prob < Chi-square (2nd stage)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
F-statistic (1st stage)	55.3	11.3	96.7	55.3	11.3	96.7
R-square (1st stage)	0.140	0.110	0.160	0.140	0.110	0.160

Table A.20: Takeover likelihood as a function of index values after accounting for endogeneity – without industry fixed effects

This table corresponds to Table 4 Panel A in the main body of the paper but does not include industry fixed effects. This table shows the second stage coefficients from a linear probability model after instrumenting the G-index, E-index, and O-index variables. In columns 1–3 (4–6) the dependent variable is set to 1 if the firm was acquired in the next year (five years). The control variables are described in Table 2 in the paper. *p*-values are shown in parentheses below the coefficients with significance at the 10%, 5%, and 1% levels noted using *, **, ***, respectively. Errors are robust to heteroskedasticity and are clustered at the firm level.

	(1)	(2)	(3)	(4)	(5)	(6)
	Acquired within 1 year			Acquired within 5 years		
	(t+1)	(t+1)	(t+1)	(t+1,t+5)	(t+1,t+5)	(t+1,t+5)
G-index	-0.012***			-0.061***		
	(<.001)			(<.001)		
E-index		-0.042***			-0.205***	
		(0.005)			(<.001)	
O-index			-0.013***			-0.064***
			(<.001)			(<.001)
Firm size	-0.008***	-0.011***	-0.007***	-0.028***	-0.045***	-0.025***
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
Leverage	0.010	0.020	0.006	0.167***	0.216***	0.148***
	(0.458)	(0.172)	(0.649)	(<.001)	(<.001)	(<.001)
Market to book	-0.003	-0.005**	-0.001	-0.021***	-0.031***	-0.014***
	(0.137)	(0.040)	(0.439)	(0.001)	(<.001)	(0.008)
Property ratio	-0.009*	-0.009	-0.010*	-0.014	-0.012	-0.016
	(0.088)	(0.142)	(0.064)	(0.528)	(0.639)	(0.434)
Liquidity ratio	-0.065***	-0.079***	-0.058***	-0.186***	-0.256***	-0.152***
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
Sales growth	-0.018**	-0.017*	-0.018**	-0.043**	-0.034*	-0.042**
	(0.033)	(0.056)	(0.034)	(0.022)	(0.091)	(0.025)
ROA	-0.081***	-0.072***	-0.090***	-0.151*	-0.104	-0.196**
	(0.001)	(0.008)	(<.001)	(0.059)	(0.266)	(0.010)
Market-adjusted return	0.006	0.007	0.005	0.009	0.017*	0.005
	(0.219)	(0.129)	(0.292)	(0.255)	(0.085)	(0.507)
Industry concentration	-0.001**	-0.001***	-0.000*	-0.002**	-0.004***	-0.002*
	(0.025)	(0.007)	(0.076)	(0.022)	(0.005)	(0.069)
Constant	0.224***	0.241***	0.192***	1.032***	1.112***	0.873***
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
Year controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15,989	15,989	15,989	15,989	15,989	15,989
Chi-square (2nd stage)	220.5	204.8	224.2	233.9	183.0	250.2
Prob < Chi-square (2nd stage)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
F-statistic (1st stage)	64.0	16.3	95.1	64.0	16.3	95.1
R-square (1st stage)	0.082	0.058	0.108	0.082	0.058	0.108

Table A.21: Takeover likelihood as a function of index values after accounting for endogeneity – including remaining provisions as an additional control variable

This table corresponds to Table 4 Panel A (columns 2, 3, 5, and 6) in the main body of the paper but includes an additional control variable for the set of provisions not being focused on. For example in Table 4 column 2 the E-index was included as the main variable of interest (and instrumented) but the remaining provisions from the G-index were not included. In column 1 below that same analysis is repeated but this time including an index of the other provisions. This table shows the second stage coefficients from a linear probability model after instrumenting the E-index and O-index variables. In columns 1–3 (4–6) the dependent variable is set to 1 if the firm was acquired in the next year (five years). The control variables are described in Table 2 in the paper. *p*-values are shown in parentheses below the coefficients with significance at the 10%, 5%, and 1% levels noted using *, **, ***, respectively. Errors are robust to heteroskedasticity and are clustered at the firm level.

	(1)	(2)	(3)	(4)
	Acquired within 1 year		Acquired within 5 years	
	(t+1)	(t+1)	(t+1,t+5)	(t+1,t+5)
E-index (instrumented)	-0.050*		-0.195*	
	(0.079)		(0.068)	
O-index (instrumented)		-0.009**		-0.052***
		(0.012)		(<.001)
Remaining provisions included as additional control	0.010*	0.007***	0.040*	0.037***
	(0.095)	(0.007)	(0.074)	(<.001)
Firm size	-0.014***	-0.009***	-0.052***	-0.027***
	(<.001)	(<.001)	(<.001)	(<.001)
Leverage	0.012	0.002	0.175***	0.133***
	(0.428)	(0.882)	(<.001)	(<.001)
Market to book	-0.007***	-0.004**	-0.035***	-0.023***
	(0.009)	(0.033)	(<.001)	(<.001)
Property ratio	-0.007	-0.008	0.005	0.008
	(0.378)	(0.252)	(0.866)	(0.763)
Liquidity ratio	-0.065***	-0.050***	-0.179***	-0.123***
	(0.001)	(0.002)	(0.004)	(0.002)
Sales growth	-0.018**	-0.020**	-0.035*	-0.047***
	(0.037)	(0.016)	(0.073)	(0.009)
ROA	-0.066**	-0.074***	-0.104	-0.130*
	(0.017)	(0.004)	(0.226)	(0.090)
Market-adjusted return	0.007	0.004	0.016	0.005
	(0.126)	(0.312)	(0.136)	(0.543)
Industry concentration	-0.001	-0.000	-0.006**	-0.003
	(0.273)	(0.939)	(0.038)	(0.215)
Constant	0.213***	0.155***	0.898***	0.733***
	(<.001)	(<.001)	(<.001)	(<.001)
Year controls	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes
Observations	15,989	15,989	15,989	15,989
Chi-square (2nd stage)	272.1	447.0	274.0	383.4
Prob < Chi-square (2nd stage)	<0.001	<0.001	<0.001	<0.001
F-statistic (1st stage)	4.6	110.0	4.6	110.0
R-square (1st stage)	0.216	0.266	0.216	0.266

Table A.22: Takeover likelihood as a function of index values after accounting for endogeneity –including indicator for incorporation in Delaware.

This table corresponds to Table 4 Panel A in the main body of the paper but also includes a control for Delaware incorporation. This table shows the second stage coefficients from a linear probability model after instrumenting the G-index, E-index, and O-index variables using only the IPO-year-based instrument described in Section 2.3 of the paper. In columns 1–3 (4–6) the dependent variable is set to 1 if the firm was acquired in the next year (five years). The control variables are described in Table 2 in the paper. *p*-values are shown in parentheses below the coefficients with significance at the 10%, 5%, and 1% levels noted using *, **, ***, respectively. Errors are robust to heteroskedasticity and are clustered at the firm level.

	(1)	(2)	(3)	(4)	(5)	(6)
	Acquired within 1 year			Acquired within 5 years		
	(t+1)	(t+1)	(t+1)	(t+1,t+5)	(t+1,t+5)	(t+1,t+5)
G-index	-0.010**			-0.055***		
	(0.019)			(<.001)		
E-index		-0.052**			-0.260**	
		(0.050)			(0.015)	
O-index			-0.009**			-0.050***
			(0.020)			(<.001)
Firm size	-0.009***	-0.012***	-0.009***	-0.028***	-0.044***	-0.029***
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
Leverage	0.006	0.015	0.003	0.152***	0.196***	0.138***
	(0.676)	(0.353)	(0.805)	(<.001)	(0.001)	(<.001)
Market to book	-0.005***	-0.007***	-0.004**	-0.030***	-0.042***	-0.025***
	(0.005)	(0.005)	(0.014)	(<.001)	(<.001)	(<.001)
Property ratio	-0.006	-0.004	-0.007	0.021	0.027	0.012
	(0.436)	(0.661)	(0.308)	(0.451)	(0.475)	(0.632)
Liquidity ratio	-0.058***	-0.073***	-0.053***	-0.168***	-0.236***	-0.138***
	(<.001)	(0.001)	(0.001)	(<.001)	(0.002)	(0.001)
Sales growth	-0.021**	-0.020**	-0.020**	-0.050***	-0.042**	-0.048***
	(0.015)	(0.026)	(0.016)	(0.007)	(0.045)	(0.008)
ROA	-0.069***	-0.062**	-0.072***	-0.098	-0.071	-0.116
	(0.007)	(0.025)	(0.005)	(0.214)	(0.458)	(0.130)
Market-adjusted return	0.006	0.008	0.005	0.011	0.022*	0.007
	(0.208)	(0.103)	(0.266)	(0.161)	(0.062)	(0.351)
Industry concentration	-0.000	-0.001	-0.000	-0.005*	-0.008**	-0.004
	(0.617)	(0.235)	(0.799)	(0.065)	(0.025)	(0.129)
Delaware	-0.003	-0.011	-0.000	-0.009	-0.046	0.007
	(0.508)	(0.202)	(0.980)	(0.624)	(0.211)	(0.628)
Constant	0.204***	0.276***	0.172***	0.996***	1.299***	0.816***
	(<.001)	(0.001)	(<.001)	(<.001)	(<.001)	(<.001)
Year controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15,989	15,989	15,989	15,989	15,989	15,989
Chi-square(2nd stage)	333.6	268.7	389.3	351.3	236.8	380.7
Prob < Chi-square(2nd stage)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
F-statistic(1st stage)	46.8	6.1	90.0	46.8	6.1	90.0
R-square(1st stage)	0.143	0.118	0.159	0.143	0.118	0.159

Table A.23: Takeover likelihood as a function of index values after accounting for endogeneity – including an indicator for headquarter state being the same as state of incorporation.

This table corresponds to Table 4 Panel A in the main body of the paper but also includes an indicator variable for a firm having its headquarters in the same state in which it was incorporated. This table shows the second stage coefficients from a linear probability model after instrumenting the G-index, E-index, and O-index variables using only the IPO-year-based instrument described in Section 2.3 of the paper. In columns 1–3 (4–6) the dependent variable is set to 1 if the firm was acquired in the next year (five years). The control variables are described in Table 2 in the paper. *p*-values are shown in parentheses below the coefficients with significance at the 10%, 5%, and 1% levels noted using *, **, ***, respectively. Errors are robust to heteroskedasticity and are clustered at the firm level.

	(1)	(2)	(3)	(4)	(5)	(6)
	Acquired within 1 year			Acquired within 5 years		
	(t+1)	(t+1)	(t+1)	(t+1,t+5)	(t+1,t+5)	(t+1,t+5)
G-index	-0.008**			-0.049***		
	(0.032)			(<.001)		
E-index		-0.043*			-0.221**	
		(0.068)			(0.018)	
O-index			-0.008**			-0.046***
			(0.032)			(<.001)
Firm size	-0.009***	-0.012***	-0.009***	-0.030***	-0.044***	-0.030***
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
Leverage	0.004	0.011	0.002	0.143***	0.180***	0.132***
	(0.769)	(0.456)	(0.883)	(<.001)	(0.001)	(0.001)
Market to book	-0.005***	-0.007***	-0.004**	-0.030***	-0.039***	-0.025***
	(0.006)	(0.006)	(0.014)	(<.001)	(<.001)	(<.001)
Property ratio	-0.006	-0.005	-0.007	0.020	0.024	0.013
	(0.417)	(0.591)	(0.311)	(0.461)	(0.486)	(0.620)
Liquidity ratio	-0.056***	-0.068***	-0.051***	-0.159***	-0.214***	-0.132***
	(0.001)	(0.001)	(0.001)	(<.001)	(0.002)	(0.001)
Sales growth	-0.021**	-0.020**	-0.021**	-0.050***	-0.044**	-0.049***
	(0.015)	(0.022)	(0.015)	(0.006)	(0.030)	(0.006)
ROA	-0.068***	-0.062**	-0.071***	-0.093	-0.070	-0.109
	(0.008)	(0.021)	(0.005)	(0.235)	(0.441)	(0.152)
Market-adjusted return	0.006	0.007	0.005	0.010	0.020*	0.007
	(0.219)	(0.124)	(0.270)	(0.182)	(0.074)	(0.358)
Industry concentration	-0.000	-0.001	-0.000	-0.005*	-0.007**	-0.004
	(0.611)	(0.274)	(0.762)	(0.059)	(0.023)	(0.109)
Same state indicator	-0.004	0.001	-0.006*	-0.027	-0.000	-0.039**
	(0.289)	(0.839)	(0.086)	(0.108)	(0.990)	(0.011)
Constant	0.194***	0.244***	0.170***	0.957***	1.165***	0.815***
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
Year controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15,989	15,989	15,989	15,989	15,989	15,989
Chi-square(2nd stage)	341.6	284.6	396.7	365.5	263.5	391.0
Prob < Chi-square(2nd stage)	<.001	<.001	<.001	<.001	<.001	<.001
F-statistic(1st stage)	50.2	7.1	92.5	50.2	7.1	92.5
R-square(1st stage)	0.141	0.114	0.158	0.141	0.114	0.158

Table A.24: Takeover likelihood and takeover indices using reduced form models

The 2SLS coefficients reported in Table 4 Panel A of the main paper are estimates of the structural coefficients from the takeover equation (equation 1 in main paper). The ability to instrument an overall index using 2SLS requires the assumption that each provision within the index be of equal importance in explaining takeover likelihood. This assumption is implicit in the construction of the G-index and E-index, where each provision is simply added to the overall total index value. The analysis surrounding Tables 5 and 6 in the main paper suggests that although this assumption is widespread in the literature, it is unrealistic.

The violation of this assumption (viz., if each provision instead has a different marginal effect on takeover likelihood) in a 2SLS model that estimates a single marginal effect for an overall index calls into question the exclusion condition. This is because the error term in such a model is a function of the differences between the true marginal effects of each of the provisions and the estimated marginal effect of the overall index. Hence, even if each instrument at the provision level meets the exclusion condition there is a possibility that the instrument at the overall index level violates the exclusion condition. This type of measurement error is specific to using an index and unlike most types of measurement error is not necessarily addressed by using an instrument.

We address the above concern in four specific ways. First, there are reasons to expect the measurement error-induced violation of the exclusion condition is small. These reasons include (a) the idea that the marginal effects for half of the 24 provisions individually are not statistically different from zero in explaining takeover likelihood, and (b) the estimated marginal effect on the overall index mechanically must be larger than some, while being smaller than others, of the marginal effects of the individual provisions because the overall effect is in some sense an average of the individual effects. Thus, since the problematic portion of the error is a weighted sum of the differences between the overall and individual marginal effects, this sum tends toward zero and hence the violation of the exclusion condition is unlikely to be large.

Second, we note the strength of our instruments—particularly in the models focused on the overall G-index. Previous research shows that, even with small violations of the exclusion condition, the 2SLS approach often yields estimates that are close to the true parameter values if the instruments are sufficiently strong, (e.g., see the discussion in Conley, Hansen, and Rossi, 2012; Kiviet and Niemczyk, 2013; and Murray, 2006). Thus given the strength of our instruments and the discussion above suggesting that the measurement error-induced violation of the exclusion condition is likely small, we argue that our main empirical conclusions are reasonably identified even in the possible presence of slight violations of the exclusion condition.

Third, we corroborate our 2SLS results in the main paper using both LIML and RBPM methodologies. LIML results are known to be less susceptible to finite sample and weak instrument-related bias than 2SLS estimates. RBPMs do not necessarily require the exclusion condition for identification (Wilde, 2000; Greene, 2003, pp. 714-717).[26] Thus the 2SLS results are corroborated using methodologies less dependent on the exclusion condition, supporting our conclusion that the 2SLS results are not being driven by violations of the exclusion condition.

As a fourth way to address this concern we also examine the reduced form equations rather than the 2SLS formulations. Angrist and Krueger (2001), Murray (2006), and Chernozhukov and Hansen (2008) suggest that reduced form models of the dependent variable of interest (y_1) regressed directly on the instrument can offer corroborating evidence for inference taken from 2SLS models particularly in settings with potential

[26] Wilde (2000) notes that in RBPMs no exclusion condition is needed for identification as long as there is sufficient variation in the variables. Mourifie and Meango (2010) note that partial identification is possible without the exclusion condition but that point identification in some cases requires more information. Han and Vytlacil (2013) show that although the exclusion restriction is sufficient, it is not necessary for identification in these types of models as long as there are common exogenous variables included as controls across the two equations.

2SLS bias. We apply the same approach here to partially mitigate bias-related concerns associated with measurement error when instrumenting an index. In the reduced form model takeover likelihood (y_1) is modeled as a direct function of (plausibly) exogenous proxy measures (z) for the firm's takeover defense, y_2, as shown in the equation below:

$$y_1 = \partial z + \beta_1 x_1 + \cdots \beta_k x_k + e$$

The intuition for this approach is similar to 2SLS but the proxy for y_2 in equation (1) in the main paper is the instrument itself rather than a linear projection of y_2 on the instrument and control variables. As noted in the main paper, if we use an OLS model and an endogenous measure of the firm's own takeover defenses (y_2), as in equation (1) in the main paper, the coefficient estimate will be biased and inconsistent. If, instead of y_2, we use a proxy for y_2 that is plausibly exogenous to the firm's takeover likelihood, then the OLS coefficient is an unbiased estimate of the effect exogenous variation in takeover defenses has on takeover likelihood. In Section 2.3 in the main paper, we argue that our measures for z in the equation above are exogenous not only because they are based on cohorts of unrelated firms from other industries, but also because the cohort information used to create z is lagged by three years before the year of analysis and hence predetermined relative to the takeover likelihood at the firm in any given year.[27] One limitation of this approach is that even if z is exogenous (or at least predetermined) with respect to the firm's own takeover likelihood, it represents a noisy proxy for the firm's own defenses. But as a robustness test, and as noted in the literature (e.g., see Chernozhukov and Hansen, 2008), the signs and significance of the reduced form coefficients can corroborate inference from the 2SLS models. We tabulate the reduced form coefficients on the next page.

Table A.24, continued: Takeover likelihood and takeover indices using reduced form models

The table below shows OLS coefficients from a linear probability reduced form model based on the equation shown above. In columns 1–6 the dependent variable is set to one if the firm was acquired in the next five years. The control variables are described in Table 2 in the main paper. The geography-based and IPO-

[27] One way to motivate the reduced form tests is to decompose the firm's current G-index ($y_{2,it}$ - using the y_2 notation form equation (1)) into a predetermined component and an endogenous component as follows: $y_{2,it} = z_{t-3} + v_{it}$. We measure z_{t-3} with the firm's cohort's average G-index (or E-index or O-index) and not with the firm's own G-index. The logic for, and details about the construction of, the cohorts are described in more detail in Section 2.3 of the main paper but relevant for our current discussion of the plausible exogeneity of z_{t-3} we note here that the cohort is constructed to exclude firm *i* and all firms in the same industry as firm *i*, using the cohort's G-index from three years before year t. This construction ensures that z_{t-3} is predetermined and hence not correlated with v_{it} or the structural error (u_{it}), which are both firm-year-specific quantities in the year of analysis. Substituting the expression for $y_{2,it}$ into equation (1) in the main paper yields the reduced form model shown above with the error term $e = u_{it} + \partial v_{it}$. OLS estimates of ∂ are consistent in this equation if $E(e|z_{t-3}, x_1, \ldots, x_k) = 0$, i.e., if $\text{cov}(z_{t-3}, u_{it}) = 0$ and $\text{cov}(z_{t-3}, v_{it}) = 0$. Stated differently, the reduced form model directly measures the relation between takeover likelihood and takeover defenses by using plausibly exogenous proxies for the firm's takeover defenses in an OLS regression.

year-based cohort variables are described in Section 2.3. *p*-values are shown in parenthesis below the coefficients with significance at the 10%, 5%, and 1% levels noted using *, **, ***, respectively. Errors are robust to heteroskedasticity and clustered at the firm level.

	(1)	(2)	(3)	(4)	(5)	(6)
Geography Cohort G-index (t-3)	-0.019***					
	(0.005)					
IPO Cohort G-index (t-3)		-0.015***				
		(<.001)				
Geography Cohort E-index (t-3)			-0.036**			
			(0.018)			
IPO Cohort E-index (t-3)				-0.047***		
				(0.001)		
Geography Cohort O-index (t-3)					-0.021**	
					(0.024)	
IPO Cohort O-index (t-3)						-0.020***
						(<.001)
Firm size	-0.040***	-0.037***	-0.040***	-0.038***	-0.039***	-0.036***
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
Leverage	0.139***	0.135***	0.140***	0.137***	0.139***	0.134***
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
Market to book	-0.023***	-0.023***	-0.023***	-0.023***	-0.022***	-0.023***
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
Property ratio	-0.003	-0.001	-0.004	-0.003	-0.004	-0.000
	(0.903)	(0.982)	(0.878)	(0.916)	(0.859)	(0.995)
Liquidity ratio	-0.111***	-0.109***	-0.111***	-0.111***	-0.111***	-0.108***
	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.005)
Sales growth	-0.038**	-0.044**	-0.038**	-0.041**	-0.038**	-0.044**
	(0.027)	(0.012)	(0.028)	(0.018)	(0.028)	(0.011)
ROA	-0.130*	-0.129*	-0.135*	-0.135*	-0.137*	-0.128*
	(0.080)	(0.082)	(0.070)	(0.067)	(0.066)	(0.085)
Market-adjusted return	0.004	0.005	0.004	0.005	0.004	0.005
	(0.577)	(0.523)	(0.575)	(0.525)	(0.572)	(0.525)
Industry concentration	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
	(0.151)	(0.144)	(0.140)	(0.140)	(0.155)	(0.146)
Constant	0.745***	0.691***	0.663***	0.680***	0.711***	0.687***
	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
Year controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15,989	15,989	15,989	15,989	15,989	15,989
R-square	0.062	0.063	0.061	0.062	0.061	0.063