Director Ownership, Governance, and Performance

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Abstract

We study the impact of the Sarbanes-Oxley Act on the relationship between corporate governance and company performance. We consider 5 measures of corporate governance during the period 1998–2007. We find a significant negative relationship between board independence and operating performance during the pre-2002 period, but a *positive* and significant relationship during the post-2002 period. Our most important contribution is a proposal of a governance measure, namely, dollar ownership of the board members, that is simple, intuitive, less prone to measurement error, and not subject to the problem of weighting a multitude of governance provisions in constructing a governance index.

Robustness Checks

Validity and Strength of Instruments

We conduct the Stock and Yogo (2004) test to ensure that our instruments are strong. We also perform the Hahn and Hausman (2002) weak instrument test, and the Hansen-Sargan overidentification test as discussed in Davidson and Mackinnon (2004); inferences from these tests are consistent with the reported Stock and Yogo test results. Detailed results are noted in Appendix A.

Second, following the suggestion of Larcker and Rusticus (2009), we consider an alternate set of instruments in addition to the instruments noted above. Specifically, we consider (one year) lagged performance for performance, lagged ownership for ownership, and lagged leverage for leverage.[1] Results using these instruments are consistent with the results reported above in Table 4.

Third, following the suggestions of Stock, Wright and Yogo (2002) and Hall, Rudebusch and Wilcox (1996) we perform the Cragg-Donald test for model identification. The Cragg-Donald test indicates that our system of equations is well-specified.

Fourth, we perform the Anderson-Rubin test suggested by Dufour (1997) to test the joint significance of the set of endogenous variables in our system of equations. The Anderson-Rubin test supports the joint significance of our set of endogenous variables.

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[1] Kennedy (2003) notes, "It may be possible to use as an instrument the lagged value of the independent variable in question; it is usually correlated with the original independent variable, and, although it is correlated with the disturbance vector, because it is lagged it is not contemporaneously correlated with the disturbance (assuming the disturbance is not autocorrelated)." We also conduct the Stock and Yogo (2004) and the Hahn and Hausman (2002) weak instrument tests on these lagged instruments.

Fixed Effects Estimator

While we have tried to control for differences across sample firms, unobserved heterogeneity across the sample firms can confound our estimated governance-performance relation. A similar problem arises if we omit yearly variables that impact firms similarly but differently across years. To address these concerns, we estimate the performance-governance relationship using OLS with fixed effects estimator including firm and year fixed effects, and clustered (Rogers) standard errors. These results are noted in Appendix B and are consistent with those reported in Table 4.

k-class Estimator

In the case of simultaneously determined variables, 2SLS can address this problem by using instrumental variables. There are estimators other than the 2SLS estimator, such as the *k*-class estimator that can address the endogeneity problem; see Kennedy (2003) and Guggenberger (2005). The results for *k*-class estimators and next year's operating performance, next two years' operating performance, stock return and Tobin's Q (for contemporaneous and for the two additional time periods) as the performance measures are consistent with the results reported in Table 4.

Estimation of Standard Errors

Petersen (2009) and Wooldridge (2002) provide a careful analysis of the impact of correlated residuals on the bias in standard errors in panel data. While Petersen's work is quite helpful in understanding the standard error estimates for a single equation model, it is unclear how his conclusions might apply to a system of simultaneous equations. Note that both the economics and econometrics of the performance-governance relationship as analyzed above strongly suggest that this relationship needs to be estimated as a system of simultaneous

equations. We estimate the performance-governance relationship using 2SLS and heteroscedasticity adjusted White and clustered (Rogers) standard errors. These results are consistent with those reported earlier.

Market-to-book in Governance and Ownership Equations

Market-to-book has been documented as a determinant of ownership structure and board structure by Himmelberg, Hubbard and Palia (1999) and Linck, Netter and Yang (2008), respectively. We include market-to-book in equations (1b) and (1c) above and re-estimate equations (1a) – (1d). The results are consistent with those reported in Table 4; see Appendix C.

Accounting Performance Measurement Issue

One of the main aims of SOX was stronger scrutiny over financial reporting, especially with respect to revenue recognition.[2] Cohen, Dey and Lys (2005, 2008) document a significant change in reporting practices subsequent to the passage of SOX. Changes in reporting practices can have a significant effect on ROA. As a robustness check, we control for the changes in reporting practices when we consider ROA as the performance measure in equation (1a). We measure reporting practices by the level of discretionary accruals, and use the Larcker and Richardson (2004) model to estimate discretionary accruals.

Two separate analyses utilizing the abnormal accruals measure are performed. In the baseline model, the *Accruals* variable is simply added to equation (1a). Then, the sample is split into low accrual and high-accrual samples, for both pre-SOX and post-SOX periods, using the median value of *Accruals* as the dividing point. For conciseness, only the 2SLS results are presented. Also for conciseness, only the coefficients on the *Governance* and *Accruals* variables

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[2] We are indebted to an anonymous referee for helping us develop and focus our analysis here.

are presented. Intercepts, year dummies, industry dummies, and all other explanatory variables in equation (1) are included but not tabulated.

Appendix D, Panel A1 (A2) presents the results for all firms for the pre-SOX (post-SOX) period. Appendix D, Panel B1 (B2) presents the results for *Low Accrual* firms for the pre-SOX (post-SOX) period. Appendix D, Panel C1 (C2) presents the results for *High Accrual* firms for the pre-SOX (post-SOX) period. These tables provide evidence that performance-governance relationships noted in Table 4 are robust to consideration of accruals as a control variable.

Alternative ROA Estimates

Core, Guay and Rusticus (2006) note "to the extent that governance affects firm performance through capital expenditure programs, depreciation expense is an important component of a firm's governance." For this reason, we also consider operating income after depreciation in estimating ROA. The results are consistent with the results in Table 4.

Director Independence Measurement Issue

It is possible that firms responded to the new SOX-related director independence rule by being more lenient about their definition of director independence.[3] Approximately 2.9% of the director-years involve a classification change (from "Affiliated" to "Independent," or vice-versa). This results in 1,113 firms-years containing a director classification change. For conciseness, only the 2SLS results and the coefficients on *Governance* are presented. Intercepts, year dummies, industry dummies, and all other explanatory variables in equation (1) are included but not tabulated.   In Appendix E, Panels A and B, equation (1) is estimated on only those firms that contain a director classification change in the Pre-SOX and Post-SOX periods. In Appendix E, Panels C and D, equation (1) is estimated on only those firms that do not contain a director

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[3] We are indebted to an anonymous referee for helping us develop this analysis.

classification change in the Pre-SOX and Post-SOX periods. The performance-governance relationships are consistent with those reported in Table 4.

Firm Size and the Performance-Governance Relation

The performance-governance relationship could be sensitive to firm size for two reasons. First, SOX exempts firms with market capitalization less than $75 million. Second, Linck, Netter and Yang (2008) find that board structure determinants vary cross-sectionally with firm size. The first concern is not quite relevant for this study since less than 0.8% of sample firms have market capitalization less than $75 million in 2002; in 2006 all sample firms have market capitalization greater than $75 million. To address the second concern we estimate the system for five sub-samples categorized by size. During 1998-2001 (2003-2007) board independence is consistently negatively (positively) related to performance for all size quintiles; see Appendix F.

Information Cost and the Performance-Governance Relation

In a recent paper, Duchin, Matsusaka and Ozbas (2010) argue that increasing board independence does not improve performance when the high cost of obtaining useful information about the firm precludes efficient monitoring.[4] When the cost of information is low, firm performance is positively related to board independence. Following Duchin, Matsusaka and Ozbas, we construct an *Information Cost* index – "*IC_Index*". We gather data on number of analysts following each firm (number of unique analysts' forecasts), on the dispersion in analysts' forecasts (standard deviation of forecasts, divided by assets), and on the analyst forecast error (absolute difference between the mean analyst earnings forecast and the actual earnings, divided by assets). Firms are ranked from 'best' to 'worst' on each measure (high number of analysts, low dispersion and low error are considered 'best'). Each firm's percentile

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[4] We are indebted to an anonymous referee for helping us develop this insight.

ranking on each measure are averaged and scaled between zero and one, with one representing the highest amount of information. For conciseness, only the 2SLS results are presented. Further, only the 2 primary variables of interest are presented: the *Governance* variable, and the interactive *Governance x IC_Index* variable. Intercepts, year dummies, industry dummies, and all other explanatory variables in equation (1) are included but not tabulated. Appendix G, Panel A presents the results for the pre-SOX period, 1998-2001, and Panel B presents the results for the post-SOX period, 2003-2007.

Including the *Governance x IC_Index* interactive term does not change the tenor of any of our results. The interactive term – for all variables and for both periods – shows that low information costs and improvements in governance are associated with superior firm performance.[5]

R&D Heterogeneity and the Performance-Governance Relation

Coles, Daniel & Naveen (2008) suggest that R&D intensive firms benefit more from boards that include less independent directors (and correspondingly, more inside directors). In Appendix H, Panel A we analyze firms with below median R&D intensity and in Panel B we analyze firms with above median R&D intensity (R&D intensity measured by R&D expenses divided by assets). For conciseness, only the results from the 2SLS analyses are presented. Also for conciseness, only the coefficients on the *Governance* variable from equation (1a) are

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[5] Duchin, Matsusaka and Ozbas (2010) consider the period 2000-2005, and do not find a significant relation between board independence and firm performance. When we consider the period 2000-2005 for our sample, we also estimate an insignificant relation between board independence and firm performance; see Appendix G, Panel C. Perhaps the insignificant result for 2000-2005 can be attributed to *combining* the negative independence-performance relation in the pre-SOX period and the positive independence-performance relation in the post-SOX period.

presented, with p-values below in parentheses. The governance-performance relationships noted in Appendix H are consistent with those reported in Table 4. Additionally, the evidence supports the arguments in Coles, Daniel and Naveen (2008), that R&D intensive firms benefit more from boards that include less independent directors.

Appendix A: Endogeneity and Instrument Validity Tests

Hausman (1978) test for endogeneity – This tests for differences between the OLS and IV estimates. The test statistic normalizes the differences in coefficients by the differences in standard errors. Large differences between OLS and IV will result in large test statistics and low p-values, suggesting that endogeneity is a problem and that the IV results are more consistent than OLS results.

Stock and Yogo (2004) test for weak instruments – This test evaluates the strength of the first stage regression by considering the *F*-statistic of the reduced form first stage regression of excluded instruments. High *F*-statistics and low p-values suggest strong instruments.

Hahn and Hausman (2002) test for instrument validity – This test is a variation of the Hausman (1978) test for endogeneity, applied to the instruments rather than the specification. This test compares the 'forward' and 'reverse' IV estimates. If the instruments are valid, the difference between the 'forward' and the inverse of the 'reverse' estimates should be small, leading to large test statistics and small p-values.

Cragg-Donald (1993) – This is a test of underidentification. The Stock and Yogo (2004) test was, in part, derived from this test. If the Cragg-Donald *F*-statistic is below the critical value, or the p-value is high, the instruments are deemed to be weak.

Hansen-Sargan – This is a test for overidentifying restrictions, testing the joint significance of the set of endogenous variables in the system of equations. It has a Chi-square distribution (with degrees of freedom equal to the number of instruments minus the number of parameters), and the null hypothesis is that the instruments are valid. Large p-values suggest that the instruments are valid.

Anderson-Rubin – This is a test of the joint significance of a set of endogenous variables in a system of equations. It tests for the joint significance of the excluded instruments by essentially substituting the first-stage reduced-form equations into the second-stage structural equations. The test statistic has a Chi-square distribution; large test statistics and small p-values suggest instrument validity and joint significance of the system.

Shea (1997) Partial R^2 – This test provides the partial R^2 for the excluded instruments on the fitted value of the endogenous regressors. Higher partial R^2 values are deemed to represent valid instruments, although there is no formal test statistic.

Instruments: For each governance variable, we utilize two of three instruments for our governance variables. *Dir%Own* is the average percentage of common stock owned by all directors. *Dir%CEOs* is the percentage of directors who are CEOs. *Dir%15Ten* is the percentage of directors who have served on the board form at least 15 years. *Dir%Own* is used as an instrument for all governance variables. *Dir%CEOs* is used as an instrument for *Independence, DirectorOwn,* and *CEO-Duality; Dir%15Ten* is used as an instrument for *G-Index* and *E-Index*.

TreasStock is the ratio of treasury stock to assets, which we use as the instrument for performance. *CEOTenAge* is the ratio of CEO tenure to CEO age; this variable is used as the instrument for ownership. *ZScore* is the modified Altman's Z-Score; this variable is used as the instrument for leverage.

APPENDIX A TABLE
Endogeneity and Instrument Validity Tests

This table presents the results from performing our endogeneity and weak instruments tests in estimating equation (1a). The p-values from each test are given. Brief descriptions of each test are given above. The results are given considering 5 different measures of governance, and considering 3 different time periods for measuring operating performance: Contemporaneous ROA, Next Year's ROA, and Next Two Years' ROA. The governance variables are Board Independence, Median Director Dollar Ownership, CEO-Chair Duality, Gompers, Ishii and Metrick (2003) G-Index, and Bebchuk, Cohen and Ferrell (2009) E-Index. The Hausman (1978) is a test for endogeneity, comparing the OLS and IV results; the other tests in this table are various forms of evaluating the strength and/or relevance of the instruments used in the instrumental variables analyses. For the Stock and Yogo (2004) test and the Shea Partial R^2, the p-values are given for each first-stage equation. For the other tests, the p-value pertains to the entire system.

	Dependent Variable: Contemporaneous *ROA*		Dependent Variable: Next Year's *ROA*		Dependent Variable: Next Two Years' *ROA*	
	1998-2001	**2003-2007**	**1998-2001**	**2003-2007**	**1998-2001**	**2003-2007**
Independence,						
Hausman Test	0.004	0.002	0.007	0.002	0.005	0.003
Stock & Yogo						
Governance	0.007	0.004	0.013	0.012	0.016	0.023
Ownership	0.019	0.004	0.037	0.006	0.047	0.012
Leverage	0.046	0.113	0.020	0.010	0.036	0.054
Hahn & Hausman	0.020	0.043	0.006	0.025	0.048	0.001
Cragg-Donald	0.001	0.004	0.012	0.007	0.009	0.007
Hansen-Sargan	0.847	0.902	0.473	0.605	0.352	0.506
Anderson-Rubin	0.036	0.039	0.025	0.045	0.059	0.054
Shea Partial R^2						
Governance	0.231	0.404	0.264	0.244	0.187	0.277
Ownership	0.330	0.360	0.220	0.302	0.143	0.189
Leverage	0.308	0.332	0.264	0.302	0.220	0.291

	Dependent Variable: Contemporaneous *ROA*		Dependent Variable: Next Year's *ROA*		Dependent Variable: Next Two Years' *ROA*	
	1998-2001	**2003-2007**	**1998-2001**	**2003-2007**	**1998-2001**	**2003-2007**
*DirectorOwn*ⱼ						
Hausman Test	0.001	0.004	0.002	0.001	0.006	0.007
Stock & Yogo						
Governance	0.002	0.003	0.015	0.004	0.007	0.011
Ownership	0.004	0.023	0.028	0.031	0.003	0.018
Leverage	0.004	0.045	0.029	0.095	0.148	0.130
Hahn & Hausman	0.074	0.046	0.008	0.020	0.034	0.064
Cragg-Donald	0.002	0.000	0.008	0.004	0.006	0.004
Hansen-Sargan	0.737	0.671	0.253	0.616	0.209	0.220
Anderson-Rubin	0.060	0.033	0.024	0.016	0.083	0.026
Shea Partial R^2						
Governance	0.264	0.288	0.231	0.230	0.154	0.175
Ownership	0.297	0.432	0.220	0.273	0.220	0.248
Leverage	0.308	0.346	0.187	0.359	0.198	0.204

	Dependent Variable: Contemporaneous *ROA*		Dependent Variable: Next Year's *ROA*		Dependent Variable: Next Two Years' *ROA*	
	1998-2001	**2003-2007**	**1998-2001**	**2003-2007**	**1998-2001**	**2003-2007**
CEO-Duality_t						
Hausman Test	0.007	0.004	0.007	0.005	0.011	0.009
Stock & Yogo						
Governance	0.005	0.007	0.016	0.010	0.010	0.016
Ownership	0.008	0.018	0.027	0.019	0.022	0.025
Leverage	0.038	0.055	0.029	0.055	0.067	0.073
Hahn & Hausman	0.021	0.039	0.023	0.018	0.046	0.033
Cragg-Donald	0.002	0.007	0.007	0.004	0.008	0.007
Hansen-Sargan	0.552	0.586	0.275	0.414	0.266	0.312
Anderson-Rubin	0.041	0.024	0.021	0.026	0.048	0.032
Shea Partial R^2						
Governance	0.244	0.342	0.216	0.212	0.166	0.217
Ownership	0.268	0.360	0.207	0.263	0.169	0.219
Leverage	0.257	0.324	0.209	0.287	0.162	0.192

	Dependent Variable: Contemporaneous *ROA*		Dependent Variable: Next Year's *ROA*		Dependent Variable: Next Two Years' *ROA*	
	1998-2001	**2003-2007**	**1998-2001**	**2003-2007**	**1998-2001**	**2003-2007**
G-Index_t						
Hausman Test	0.001	0.000	0.005	0.005	0.008	0.002
Stock & Yogo						
Governance	0.003	0.004	0.019	0.005	0.003	0.009
Ownership	0.006	0.027	0.005	0.036	0.017	0.034
Leverage	0.019	0.021	0.015	0.051	0.014	0.045
Hahn & Hausman	0.017	0.066	0.058	0.015	0.026	0.047
Cragg-Donald	0.003	0.003	0.000	0.000	0.001	0.004
Hansen-Sargan	0.341	0.649	0.231	0.242	0.165	0.352
Anderson-Rubin	0.056	0.018	0.013	0.008	0.042	0.004
Shea Partial R^2						
Governance	0.297	0.432	0.220	0.230	0.220	0.219
Ownership	0.253	0.389	0.275	0.359	0.220	0.291
Leverage	0.308	0.418	0.220	0.287	0.154	0.175

	Dependent Variable: Contemporaneous *ROA*		Dependent Variable: Next Year's *ROA*		Dependent Variable: Next Two Years' *ROA*	
	1998-2001	**2003-2007**	**1998-2001**	**2003-2007**	**1998-2001**	**2003-2007**
E-Index_t						
Hausman Test	0.002	0.005	0.008	0.008	0.007	0.007
Stock & Yogo						
Governance	0.008	0.009	0.013	0.016	0.015	0.024
Ownership	0.001	0.014	0.033	0.010	0.030	0.048
Leverage	0.086	0.052	0.049	0.082	0.080	0.084
Hahn & Hausman	0.002	0.007	0.022	0.012	0.079	0.026
Cragg-Donald	0.001	0.006	0.007	0.002	0.004	0.004
Hansen-Sargan	0.550	0.418	0.264	0.385	0.451	0.308
Anderson-Rubin	0.017	0.012	0.016	0.038	0.030	0.051
Shea Partial R^2						
Governance	0.286	0.418	0.242	0.244	0.176	0.291
Ownership	0.319	0.432	0.198	0.230	0.165	0.248
Leverage	0.231	0.346	0.264	0.345	0.143	0.189

APPENDIX B TABLE
Fixed Effects Estimation

This table presents the results from estimating equation (1a), the performance equation, using fixed effects estimation. Specifications are presented with five different governance variables: *Independence,* board independence; *DirectorOwn,* the dollar value of the median director's stock ownership; *CEO-Duality*, whether or not the CEO is also the board chair; *G-Index,* the Gompers, Ishii and Metrick (2003) Governance Index; and, *E-Index*, the Bebchuk, Cohen and Ferrell Entrenchment index. *ROA,* return on assets in the current period is used as the measure of performance. Only the coefficient and corresponding *p*-value for the *Governance* variable in equation (1a) is presented. All other variables in equation (1a) are as defined in the text, and are included in the estimation but not shown in the Table. Panel A presents the results for the 1998-2001 period; Panel B presents the results for the 1998-2001 period. An intercept and year and firm fixed effects are also included but not presented. Standard errors are clustered by firm. Coefficients are presented with *p*-values below in parentheses. Statistical significance at the 1%, 5%, and 10% levels is indicated by ***, ** and *, respectively.

Panel A: 1998-2001

	Fixed Effects Estimation				
	Dependent Variable: Return on Assets (ROA_t)				
	Independence$_t$	*DirectorOwn$_t$*	*CEO-Duality$_t$*	*G-Index$_t$*	*E-Index$_t$*
Governance$_t$	-0.009**	0.004***	-0.002*	-0.001*	-0.004
	(0.04)	(0.00)	(0.06)	(0.06)	(0.20)
# of Observations	5,156	4,665	5,156	4,566	4,566

Panel B: 2003-2007

	Fixed Effects Estimation				
	Dependent Variable: Return on Assets (ROA_t)				
	Independence$_t$	*DirectorOwn$_t$*	*CEO-Duality$_t$*	*G-Index$_t$*	*E-Index$_t$*
Governance$_t$	0.020***	0.005***	0.003	-0.002	-0.002**
	(0.01)	(0.00)	(0.90)	(0.11)	(0.02)
# of Observations	6,515	6,377	6,515	7,665	7,665

APPENDIX C TABLE

Market-to-Book in Governance and Ownership Equations

This table presents the results from estimating equation (1a), the performance equation, including Market-to-book in governance and ownership equations. Specifications are presented with five different governance variables: *Independence,* board independence; *DirectorOwn,* the dollar value of the median director's stock ownership; *CEO-Duality*, whether or not the CEO is also the board chair; *G-Index,* the Gompers, Ishii and Metrick (2003) Governance Index; and, *E-Index*, the Bebchuk, Cohen and Ferrell Entrenchment index. *ROA,* return on assets in the current period is used as the measure of performance. Only the coefficient and corresponding *p*-value for the *Governance* variable in equation (1a) is presented. All other variables in equation (1a) are as defined in the text, and are included in the estimation but not shown in the Table. Panel A presents the results for the 1998-2001 period; Panel B presents the results for the 1998-2001 period. An intercept and year and firm fixed effects are also included but not presented. Standard errors are clustered by firm. Coefficients are presented with *p*-values below in parentheses. Statistical significance at the 1%, 5%, and 10% levels is indicated by ***, ** and *, respectively.

Panel A: 1998-2001

	2SLS Estimation				
	Dependent Variable: Return on Assets (ROA$_t$)				
	Independence$_t$	*DirectorOwn$_t$*	*CEO-Duality$_t$*	*G-Index$_t$*	*E-Index$_t$*
Governance$_t$	-0.441**	0.022***	-0.199***	-0.078**	-0.145*
	(0.02)	(0.01)	(0.00)	(0.01)	(0.07)

Panel B: 2003-2007

	2SLS Estimation				
	Dependent Variable: Return on Assets (ROA$_t$)				
	Independence$_t$	*DirectorOwn$_t$*	*CEO-Duality$_t$*	*G-Index$_t$*	*E-Index$_t$*
Governance$_t$	0.209***	0.006**	-0.106**	0.028	-0.192
	(0.00)	(0.02)	(0.02)	(0.12)	(0.20)

APPENDIX D TABLE
Accruals and Measurement of Accounting Performance

This table presents the results from estimating equation (1a), the performance equation, adding a measure of discretionary accruals, *Accruals*. Specifications are presented with the five different governance variables. *ROA,* return on assets in the current period is used as the measure of performance. Only the coefficients and corresponding *p*-values for the *Governance* and *Accruals* variables in equation (1a) are presented for conciseness. All other variables in equation (1a) are as defined in the text, and are included in the estimation but not shown in the Tables. Panels A1 and A2 present the results for all firms in the Pre-SOX and Post-SOX periods. Panels B1 and B2 present the results for firms with an *Accruals* value less than the sample median in the Pre-SOX and Post-SOX periods. Panels C1 and C2 present the results for firms with and *Accruals* value greater than the sample median in the Pre-SOX and Post-SOX periods. Standard errors are clustered by firm. Statistical significance at the 1%, 5%, and 10% levels is indicated by ***, ** and *, respectively.

Panel A1: All firms, pre-SOX 1998-2001

	Dependent Variable: Return on Assets (ROA_t)				
	$Independence_t$	$DirectorOwn_t$	$CEO\text{-}Duality_t$	$G\text{-}Index_t$	$E\text{-}Index_t$
$Governance_t$	-0.369***	0.015**	-0.138***	-0.057***	-0.120**
	(0.00)	(0.04)	(0.00)	(0.01)	(0.02)
$Accruals_t$	-0.036	-0.026	-0.031	-0.024	-0.014
	(0.15)	(0.28)	(0.21)	(0.44)	(0.63)
# of Observations	3,558	3,558	3,558	3,313	3,313

Panel A2: All firms, post-SOX 2003-2007

	Dependent Variable: Return on Assets (ROA_t)				
	$Independence_t$	$DirectorOwn_t$	$CEO\text{-}Duality_t$	$G\text{-}Index_t$	$E\text{-}Index_t$
$Governance_t$	0.367***	0.092**	-0.118***	0.0368**	-0.070**
	(0.00)	(0.05)	(0.00)	(0.01)	(0.05)
$Accruals_t$	0.030***	0.032**	0.039**	0.045**	0.041*
	(0.07)	(0.01)	(0.03)	(0.03)	(0.10)
# of Observations	3,495	3,495	3,495	3,359	3,359

Panel B1: Low Accrual firms, pre-SOX 1998-2001

	Dependent Variable: Return on Assets (ROA$_t$)				
	Independence$_t$	DirectorOwn$_t$	CEO-Duality$_t$	G-Index$_t$	E-Index$_t$
Governance$_t$	-0.343***	0.020***	-0.105***	-0.062***	-0.099***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
Accruals$_t$	-0.005	-0.052**	-0.050*	0.513	0.041
	(0.85)	(0.02)	(0.06)	(0.30)	(0.36)
# of Observations	1,802	1,802	1,802	1,632	1,632

Panel B2: Low Accrual firms, post-SOX 2003-2007

	Dependent Variable: Return on Assets (ROA$_t$)				
	Independence$_t$	DirectorOwn$_t$	CEO-Duality$_t$	G-Index$_t$	E-Index$_t$
Governance$_t$	0.269***	0.041**	-0.145***	0.007	-0.009*
	(0.00)	(0.04)	(0.00)	(0.47)	(0.07)
Accruals$_t$	0.037	0.059**	0.055	0.048*	0.048*
	(0.27)	(0.02)	(0.17)	(0.09)	(0.08)
# of Observations	1,823	1,823	1,823	1,776	1,776

Panel C1: High Accrual firms, pre-SOX 1998-2001

	Dependent Variable: Return on Assets (ROA$_t$)				
	Independence$_t$	DirectorOwn$_t$	CEO-Duality$_t$	G-Index$_t$	E-Index$_t$
Governance$_t$	-0.535	0.003*	-0.221**	-0.014	-0.100
	(0.10)	(0.09)	(0.03)	(0.66)	(0.26)
Accruals$_t$	0.381***	0.377***	0.433***	0.325***	0.240**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.02)
# of Observations	1,756	1,756	1,756	1,681	1,681

Panel C2: High Accrual firms, post-SOX 2003-2007

	Dependent Variable: Return on Assets (ROA$_t$)				
	Independence$_t$	DirectorOwn$_t$	CEO-Duality$_t$	G-Index$_t$	E-Index$_t$
Governance$_t$	0.181	0.006**	-0.085***	0.008	-0.101***
	(0.11)	(0.04)	(0.00)	(0.32)	(0.04)
Accruals$_t$	0.055***	0.061***	0.090***	0.073***	0.040
	(0.00)	(0.00)	(0.00)	(0.00)	(0.17)
# of Observations	1,872	1,872	1,872	1,783	1,783

APPENDIX E TABLE
Governance and Performance, Equation (1a), by Director Classification

This table presents the results from estimating equation (1a), the performance equation, on two different sub-samples: those firms which had an individual director's classification change from year-to-year and those firms which did not have such a director classification change. A director classification change would be a director changing from *Independent* to *Affiliated*, or vice versa. Specifications are presented with the five different governance variables. *ROA,* return on assets in the current period is used as the measure of performance. Only the coefficient and corresponding *p*-value for the *Governance* variable in equation (1a) is presented. All other variables in equation (1a) are as defined in the text, and are included in the estimation but not shown in the Table. Panel A presents the results for the firms that did have a director change during the 1998-2001 period; Panel B presents the results for the firms that did have a director change during the 1998-2001 period; Panel C presents the results for the firms that did not have a director change during the 1998-2001 period; Panel D presents the results for the firms that did not have a director change during the 1998-2001 period. An intercept and year and firm fixed effects are also included but not presented. Standard errors are clustered by firm. Coefficients are presented with *p*-values below in parentheses. Statistical significance at the 1%, 5%, and 10% levels is indicated by ***, ** and *, respectively.

Panel A: Firms with Director Classification Changes, Pre-SOX, 1998-2001

	Independence$_t$	*DirectorOwn$_t$*	*CEO-Duality$_t$*	*G-Index$_t$*	*E-Index$_t$*
Governance$_t$	-0.227*	0.020*	0.066	-0.031	-0.067**
	(0.06)	(0.07)	(0.33)	(0.14)	(0.01)

Panel B: Firms with Director Classification Changes, Post-SOX, 2003-2007

	Independence$_t$	*DirectorOwn$_t$*	*CEO-Duality$_t$*	*G-Index$_t$*	*E-Index$_t$*
Governance$_t$	0.171	0.010*	-0.377	0.023	-0.063*
	(0.19)	(0.06)	(0.45)	(0.24)	(0.07)

Panel C: Firms with NO Classification Changes, Pre-SOX, 1998-2001

	Independence$_t$	*DirectorOwn$_t$*	*CEO-Duality$_t$*	*G-Index$_t$*	*E-Index$_t$*
Governance$_t$	-0.437**	0.018**	-0.210***	-0.088***	-0.201**
	(0.03)	(0.04)	(0.00)	(0.01)	(0.02)

Panel D: Firms with NO Classification Changes, Post-SOX, 2003-2007

	$Independence_t$	$DirectorOwn_t$	$CEO\text{-}Duality_t$	$G\text{-}Index_t$	$E\text{-}Index_t$
$Governance_t$	0.266***	0.011*	-0.117***	0.045**	-0.221
	(0.00)	(0.06)	(0.00)	(0.01)	(0.31)

APPENDIX F TABLE
Board Independence on Performance by Size Quintile

This table presents the results from estimating equation (1a) with *Independence* as the governance variable by quintiles sorted by the market value of equity. Only the coefficient and corresponding *p*-value on *Independence*, the *Governance* variable in equation (1a) is presented. All other variables in equation (1a) are as defined in the text, and are included in the estimation but not shown in the Table. The smallest firms are in Quintile 1; the largest firms are in Quintile 5. *ROA* is the performance variable. The Mean MVE shows the average market value of equity for each quintile. Two-Stage Least Squares (2SLS) estimation is used. Panel A presents the results for the 1998-2001 period; Panel B presents the results for the 2003-2007 period. An intercept and year and industry dummy variables are included but not presented. Standard errors are clustered by firm. Coefficients are presented with *p*-values below in parentheses. Statistical significance at the 1%, 5%, and 10% levels is indicated by ***, ** and *, respectively.

Panel A: 1998-2001

	2LS Estimation				
	Dependent Variable: Return on Assets (ROA_t)				
	Smallest Firms----------Sorted by Market Value of Equity----------*Largest Firms*				
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Independence$_t$	-0.124	-0.353	-0.082	-0.157	-0.026*
	(0.18)	(0.11)	(0.23)	(0.10)	(0.08)
Mean MVE (millions)	$185.6	$643.3	$1,435.6	$3,555.7	$14,508.1
# of Observations	1,028	1,027	1,027	1,028	1,027

Panel B: 2003-2007

	2LS Estimation				
	Dependent Variable: Return on Assets (ROA_t)				
	Smallest Firms----------Sorted by Market Value of Equity----------*Largest Firms*				
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Independence$_t$	0.561**	0.227	0.082	0.104**	0.120**
	(0.05)	(0.13)	(0.14)	(0.05)	(0.02)
Mean MVE (millions)	$455.3	$1,077.3	$2,206.6	$5,036.3	$18,447.8
# of Observations	1,301	1,300	1,300	1,301	1,301

APPENDIX G TABLE
Information Cost and the Governance-Performance Relation

This table presents the results from estimating equation (1a), the performance equation, adding a measure of the cost of information at each firm. Following Duchin, Matsusaka and Ozbas (2010) we construct an *Information Cost* index: *IC_Index.* Higher measures of *IC_Index* are associated with higher levels of information. We combine the *IC_Index* with each of the five different governance variables to create an interactive term, *Governance x IC_Index. ROA,* return on assets in the current period is used as the measure of performance. Only the coefficients and corresponding *p*-values for the *Governance* and *Governance x IC_Index* variables in equation (1a) are presented for conciseness. All other variables in equation (1a) are as defined in the text, and are included in the estimation but not shown in the Tables. Panel A presents the results during the pre-SOX period; Panel B presents the results during the post-SOX period; and, Panel C presents the results from the original equation (1a), excluding the *IC_Index* term, during the Duchin, Matsusaka, and Ozbas time period, 2000-2005. Standard errors are clustered by firm. Statistical significance at the 1%, 5%, and 10% levels is indicated by ***, ** and *, respectively.

Panel A: Information cost analysis, pre-SOX 1998-2001

	Dependent Variable: Return on Assets (ROA_t)				
	Independence$_t$	*DirectorOwn$_t$*	*CEO-Duality$_t$*	*G-Index$_t$*	*E-Index$_t$*
Governance$_t$	-0.866***	0.017**	-0.660**	-0.173**	-0.629**
	(0.01)	(0.03)	(0.02)	(0.02)	(0.03)
Governance x IC_Index$_t$	-0.771***	-0.009***	0.990***	0.149**	0.840**
	(0.00)	(0.01)	(0.00)	(0.01)	(0.03)

Panel B: Information cost analysis, post-SOX 2003-2007

	Dependent Variable: Return on Assets (ROA_t)				
	Independence$_t$	*DirectorOwn$_t$*	*CEO-Duality$_t$*	*G-Index$_t$*	*E-Index$_t$*
Governance$_t$	0.847***	0.002*	-0.017*	0.078	-0.094**
	(0.00)	(0.07)	(0.07)	(0.18)	(0.01)
Governance x IC_Index$_t$	-0.441***	-0.001	0.012	0.057***	0.123
	(0.00)	(0.13)	(0.86)	(0.00)	(0.12)

Panel C: Equation (1a), Duchin, Matsusaka and Ozbas (2010) period <u>2000-2005</u>

	Dependent Variable: Return on Assets (ROA$_t$)				
	$Independence_t$	$DirectorOwn_t$	$CEO\text{-}Duality_t$	$G\text{-}Index_t$	$E\text{-}Index_t$
$Governance_t$	0.3164	0.024***	-0.519***	-0.022	-0.673***
	(0.28)	(0.00)	(0.00)	(0.36)	(0.00)

APPENDIX H TABLE
R&D Heterogeneity and the Performance-Governance Relation

This table presents the results from estimating equation (1a), the performance equation, on two sub-samples based on R&D intensity, measured by R&D expense divided by assets. Specifications are presented with the five different governance variables. *ROA,* return on assets in the current period is used as the measure of performance. Only the coefficient and corresponding *p*-value for the *Governance* variable in equation (1a) is presented for conciseness. All other variables in equation (1a) are as defined in the text, and are included in the estimation but not shown in the Tables. Panels A presents the results for firms with R&D intensity below the sample median for both pre-SOX and post-SOX periods; Panel B presents the results for firms with R&D intensity above the sample median for both pre-SOX and post-SOX periods; and Panel C compares the coefficient value across the two R&D intensity sub-samples for just the *Board Independence* regression. In Panels A and B, the governance coefficients are compared pre-SOX to post-SOX. *** indicates different from pre-SOX to post-SOX at the 1% level, ** indicates different at the 5% level and * indicates different at the 10% level.

Panel A: R&D intensity, below median

Governance	Pre-SOX: 1998-2001	Post-SOX: 2003-2007
Independence	-0.455	0.617***
	(0.000)	(0.004)
DirectorOwn	0.036	0.008*
	(0.000)	(0.068)
CEO-Duality	-0.113	-0.067
	(0.000)	(0.001)
GIM G-Index	-0.018	-0.012
	(0.068)	(0.072)
BCF E-Index	-0.225	-0.196
	(0.000)	(0.150)

Panel B: R&D intensity, above median

Governance	Pre-SOX: 1998-2001	Post-SOX: 2003-2007
Independence	-0.516	0.179***
	(0.064)	(0.114)
DirectorOwn	0.038	0.007
	(0.011)	(0.039)
CEO-Duality	-0.147	-0.104
	(0.071)	(0.215)
GIM G-Index	-0.020	0.015***
	(0.506)	(0.355)
BCF E-Index	-0.130	0.039***
	(0.247)	(0.303)

Panel C: Comparison of *Board Independence* coefficients, below median vs. above median

Board Independence	Pre-SOX: 1998-2001	Post-SOX: 2003-2007
Below Median	-0.455	0.617
	(0.000)	(0.004)
Above Median	-0.516*	0.179***
	(0.064)	(0.114)