Does Sunlight Kill Germs? Stock Market Listing and Workplace Safety

Online Appendix

TABLE A1: Univariate Comparison of Injury Rates between Public and Private Firms

Injury Rates: Public vs. Private (Univariate Comparison; Final Sample)				
Variable	Public Mean	Private Mean	Diff	P-value
TCR_HOURS	8.387	9.102	-0.715	0.000
DART_HOURS	5.165	5.483	-0.318	0.000
TCR_EMPLOYEE	0.079	0.084	-0.005	0.000
DART_EMPLOYEE	0.049	0.050	-0.001	0.001

TABLE A2: Descriptive Statistics of Violation and Penalty Data

Panel A reports the descriptive statistics of violations detected in OSHA inspections for the establishment-year-level sample; Panel B reports the descriptive statistics of penalties associated with each violation detected in OSHA inspections. Variables are defined in the Appendix of the paper.

Panel A: Violation Sample (Establishment-year Level)								
Variable	N	Mean	SD	Min	P25	P50	P75	Max
ln (VIOLATION_NUMBER)	11,387	1.080	0.968	0.000	0.000	1.099	1.792	3.784
VIOLATION	11,387	0.672	0.470	0.000	0.000	1.000	1.000	1.000
PUBLIC	11,387	0.373	0.484	0.000	0.000	0.000	1.000	1.000
STRIKE	11,387	0.007	0.084	0.000	0.000	0.000	0.000	1.000
SHUT	11,387	0.106	0.308	0.000	0.000	0.000	0.000	1.000
SEASONAL	11,387	0.036	0.185	0.000	0.000	0.000	0.000	1.000
DISASTER	11,387	0.007	0.086	0.000	0.000	0.000	0.000	1.000
ln(EMP)	11,387	5.604	0.883	4.605	4.934	5.352	6.023	8.743
ln(PLANT)	11,387	1.184	0.710	0.693	0.693	1.099	1.386	4.159

Panel B: Penalty Sample (Violation Level)								
Variable	N	Mean	SD	Min	P25	P50	P75	Max
ln(PENALTY_AMOUNT)	46,064	4.172	3.703	0.000	0.000	6.479	7.378	11.156
GRAVITY	46,064	2.015	2.761	0.000	0.000	1.000	3.000	10.000
PUBLIC	46,064	0.278	0.448	0.000	0.000	0.000	1.000	1.000
STRIKE	46,064	0.010	0.101	0.000	0.000	0.000	0.000	1.000
SHUT	46,064	0.111	0.314	0.000	0.000	0.000	0.000	1.000
SEASONAL	46,064	0.035	0.184	0.000	0.000	0.000	0.000	1.000
DISASTER	46,064	0.008	0.091	0.000	0.000	0.000	0.000	1.000
ln(EMP)	46,064	5.490	0.808	4.605	4.890	5.257	5.846	9.308
ln(PLANT)	46,064	1.059	0.525	0.693	0.693	1.099	1.099	4.159

TABLE A3: Covariate Balance Test of PSM Sample

This table reports the univariate test results of the differences in the mean values of observable covariates between public and private establishments of the propensity-score matched sample. We employ the Probit model to match private firms' establishments to public firms' establishments with the nearest propensity score of being public. The propensity score is estimated with establishment-level characteristics (i.e., STRIKE, SHUT, SEASONAL, DISASTER, ln(EMP), firm-level characteristics of the establishment's parent firm (i.e., ln(PLANT), SIZE, DEBT, CASH, PPE), industry fixed effects, establishment state fixed effects, and year fixed effects. These covariates are as described in the Appendix. The results indicate that there are no substantial differences between matched pairs.

Covariate Balance Test of PSM (N = 8,564)				
Variable	Status	Treated	Control	P-value
STRIKE	Matched	0.015	0.017	0.547
SHUT	Matched	0.099	0.098	0.885
SEASONAL	Matched	0.040	0.038	0.696
DISASTER	Matched	0.008	0.007	0.802
ln(EMP)	Matched	5.543	5.527	0.301
ln(PLANT)	Matched	1.914	1.876	0.129
SIZE	Matched	6.502	6.538	0.455
DEBT	Matched	0.206	0.205	0.887
CASH	Matched	0.088	0.091	0.227
PPE	Matched	0.322	0.322	0.934

Table A4: Robustness Checks: Full Sample Test

This table presents the OLS estimates for the relationship between a stock market listing and workplace safety in the full sample. The dependent variables in Columns 1, 3, and 5 are the total work injury rate (TCR_HOURS), and the dependent variables in Columns 2, 4, and 6 are the rate of severe work injuries (DART_HOURS). PUBLIC is an indicator variable that equals one if the establishment's parent firm is publicly listed in the year, and zero otherwise. All regression models control for SIC 2-digit industry-year fixed effects and establishment state-year fixed effects. Columns 3 and 4 further control for firm fixed effects, and Columns 5 and 6 further control for establishment fixed effects. All other variables are described in the Appendix. Standard errors are clustered at both firm level and establishment state level. The t-statistics are reported in parentheses. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively, according to a two-tailed t-test.

	1 TCR_HOURS	2 DART_HOURS	3 TCR_HOURS	4 DART_HOURS	5 TCR_HOURS	6 DART_HOURS
PUBLIC	-1.3526***	-0.7488**	-1.6048**	-1.1373**	-1.8308**	-1.3789**
	(-2.873)	(-2.340)	(-2.584)	(-2.149)	(-2.260)	(-2.049)
STRIKE	4.1476***	2.5909***	2.7064***	1.5637***	1.7861***	0.9122**
	(3.443)	(2.890)	(3.821)	(2.997)	(2.973)	(2.112)
SHUT	0.3833***	0.2495***	0.1779**	0.1234**	-0.0838	-0.0075
	(2.849)	(2.881)	(2.038)	(2.226)	(-1.389)	(-0.207)
SEASONAL	0.3484	0.0421	0.2910**	0.1617**	0.1599	0.0612
	(1.631)	(0.290)	(2.102)	(2.090)	(1.348)	(0.803)
DISASTER	0.0818	-0.0049	0.1254	0.1153	0.2042*	0.1713
	(0.310)	(-0.026)	(0.722)	(0.962)	(1.756)	(1.554)
ln(EMP)	-0.6684***	-0.3313***	-0.5361***	-0.2566***	-0.6896***	-0.1897**
	(-4.294)	(-3.835)	(-5.017)	(-3.973)	(-4.963)	(-2.368)
ln(PLANT)	0.1632	0.2447	-0.7828***	-0.4202***	0.0132	0.1874**
	(0.649)	(1.447)	(-7.108)	(-4.949)	(0.137)	(2.323)
Adj. R-Squared	0.218	0.191	0.468	0.435	0.589	0.566
Number of Obs	193,948	193,948	188,181	188,181	179,500	179,500
Industry-year FE	YES	YES	YES	YES	YES	YES
State-year FE	YES	YES	YES	YES	YES	YES
Firm FE	NO	NO	YES	YES	NO	NO
Establishment FE	NO	NO	NO	NO	YES	YES

Table A5: Robustness Checks: Alternative Model Specification and Workplace Safety Measures

This table presents the OLS estimates for the relationship between a stock market listing and workplace safety with alternative model specifications and work injury measures. The dependent variables in Columns 1 and 2 are the total work injury rate (TCR_HOURS) and the rate of severe work injuries with days away, job restriction, or job transfer (DART_HOURS), respectively. The dependent variables of Columns 3 and 4 are total work injury cases scaled by the number of employees at the establishment (TCR_EMPLOYEE) and severe work injury cases resulting in days away, job restriction, or job transfer scaled by the number of employees (DART_EMPLOYEE), respectively. PUBLIC is an indicator variable that equals one if the establishment's firm is publicly listed in the year, and zero otherwise. All regression models control for SIC 2-digit industry-year fixed effects and establishment state-year fixed effects. Columns 1 and 2 further control for establishment fixed effects. All other variables are described in the Appendix. Standard errors are clustered at both the firm level and establishment state level. The t-statistics are reported in parentheses. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively, according to a two-tailed t-test.

	1 TCR_HOURS	2 DART_HOURS	3 TCR_EMPLOYEE	4 DART_EMPLOYEE
PUBLIC	-1.3539**	-1.1718**	-0.0099**	-0.0058**
	(-2.368)	(-2.305)	(-2.407)	(-2.386)
STRIKE	1.7512***	0.9414**	0.0352***	0.0231***
	(2.874)	(2.054)	(4.917)	(4.177)
SHUT	0.0434	0.0311	0.0025*	0.0012
	(0.422)	(0.442)	(1.678)	(1.119)
SEASONAL	0.0805	0.0500	-0.0015	-0.0020
	(0.561)	(0.427)	(-0.600)	(-1.086)
DISASTER	0.3709	0.3412**	0.0037	0.0023
	(1.519)	(2.114)	(0.879)	(0.903)
ln(EMP)	-0.6560***	-0.2027*	-0.0044**	-0.0023**
	(-2.996)	(-1.701)	(-2.245)	(-2.018)
ln(PLANT)	0.0703	0.2351**	0.0027	0.0026**
	(0.621)	(2.024)	(1.368)	(2.132)
SIZE	-0.0337	0.0079	-0.0020**	-0.0009
	(-0.288)	(0.094)	(-2.157)	(-1.668)
DEBT	1.8157*	0.9818*	0.0309***	0.0178***
	(1.814)	(1.698)	(2.741)	(2.903)
CASH	0.8165	0.6768	0.0109	0.0085
	(1.430)	(1.509)	(1.109)	(1.327)
PPE	-1.4412	-0.5662	0.0061	0.0067
	(-1.299)	(-0.705)	(0.670)	(1.203)

Adj. R-Squared	0.653	0.631	0.256	0.246
Number of Obs	81,468	81,468	89,820	89,820
Industry-year FE	YES	YES	YES	YES
State-year FE	YES	YES	YES	YES
Establishment FE	YES	YES	NO	NO

TABLE A6: Heckman Two-stage Regression

Panel A reports the first-stage regression results of the Heckman selection model, where we estimate a firm's probability of being publicly listed using the Probit model. The dependent variable in Column 1 is an indicator variable that equals one if the firm is publicly listed in the stock market in the year, and zero otherwise. PARTICIPATION is the stock market participation level of the state where the firm's headquarters is located. EXTERNAL_DEPENDENCE is the external finance dependence level of the firm's industry. ROA is net income divided by total assets. SALES_GROWTH is total sales minus lagged total sales, divided by lagged total sales. PPE is the value of net property, plant, and equipment, divided by total assets. Standard errors are clustered at the firm level. Panel B presents the OLS estimates for the second stage regressions of Heckman model with the inverse mills ratio (IMR) included. All regression models control for SIC 2-digit industry-year fixed effects and establishment state-year fixed effects. Standard errors are clustered at both firm level and establishment state level. The t-statistics are reported in parentheses. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively, according to a two-tailed t-test.

Panel A: First-Stage Regression of Heckman Two-Stage Test	
	1
	PUBLIC
PARTICIPATION	2.1916***
	(7.400)
EXTERNAL_DEPENDENCE	0.4639***
	(10.315)
ROA	-1.6140***
	(-8.772)
SALES_GROWTH	0.2898***
	(6.414)
PPE	-0.7030***
	(-5.348)
Constant	0.3907***
	(5.240)
Pseudo R square	0.079
Number of Obs	13,695

Panel B: Second-Stage Regression of Heckman Two-Stage Test

	1 TCR_HOURS	2 DART_HOURS
PUBLIC	-5.6830**	-3.1528*
	(-2.367)	(-2.004)
IMR	2.7052**	1.447
	(2.058)	(1.676)
Adj. R-Squared	0.278	0.284
Number of Obs	77,585	77,585
Establishment and firm controls	YES	YES
Industry-year FE	YES	YES
State-year FE	YES	YES

TABLE A7: CEO Risk Attitude and Workplace Safety

Panel A compares the mean value of CEO risk attitude between public and private firms. FOUNDER_CEO is an indicator variable that equals one if the CEO is the founder, and zero otherwise. FEMALE_CEO is an indicator variable that equals one if the CEO is female, and zero otherwise. CEO_RISK_SCORE is CEO risk preferences based on country of origin. Using a machine-learning algorithm provided by a commercial platform Namsor.com, we infer CEOs' country of origin based on their names. We then employ Hofstede's uncertainty avoidance index (UAI) to capture attitudes toward risks and uncertainty associated with the CEO's country of origin. Panel B presents the OLS estimates for the relationship between a stock market listing and work injury rates, controlling for CEO risk attitude measures. The dependent variables of Columns 1-3 are total work injury rate (TCR_HOURS), and the dependent variables of Columns 4-6 are the rate of severe work injuries (DART_HOURS). PUBLIC is an indicator variable that equals one if the firm is publicly listed in a stock exchange in the year, and zero otherwise. All regression models control for SIC 2-digit industry-year fixed effects and establishment state-year fixed effects. All other variables are described in the Appendix. Standard errors are clustered at both the firm level and establishment state level. The t-statistics are reported in parentheses. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively, according to a two-tailed t-test.

Panel A: CEO Risk Attitude: Public vs. Private				
CEO Risk Attitude	PUBLIC (N = 50,789)	PRIVATE (N = 3,869)	Diff.	P-value
FOUNDER_CEO	0.029	0.080	-0.051	0.000
FEMALE_CEO	0.013	0.033	-0.020	0.000
CEO_RISK_SCORE	34.544	34.224	0.320	0.209

Panel B: Multivariate Regression

	TCR_HOURS			DART_HOURS		
	1	2	3	4	5	6
PUBLIC	-0.973**	-0.986**	-0.965**	-0.526*	-0.531*	-0.523*
	(-2.122)	(-2.142)	(-2.102)	(-1.919)	(-1.926)	(-1.904)
STRIKE	2.258***	2.267***	2.248***	1.025*	1.031*	1.025*
	(2.703)	(2.685)	(2.694)	(1.907)	(1.907)	(1.911)
SHUT	0.612***	0.615***	0.621***	0.379***	0.379***	0.384***
	(3.425)	(3.449)	(3.509)	(2.849)	(2.857)	(2.909)
SEASONAL	-0.684	-0.688	-0.670	-0.615**	-0.615**	-0.602**
	(-1.633)	(-1.633)	(-1.646)	(-2.021)	(-2.016)	(-2.034)
DISASTER	0.849	0.856	0.836	0.586*	0.588*	0.576*
	(1.366)	(1.381)	(1.351)	(1.744)	(1.751)	(1.757)
ln(EMP)	-0.279	-0.281	-0.285	-0.138	-0.139	-0.143
	(-1.112)	(-1.123)	(-1.142)	(-1.002)	(-1.009)	(-1.039)
ln(PLANT)	0.310	0.300	0.298	0.293**	0.292**	0.290**
	(1.552)	(1.520)	(1.512)	(2.432)	(2.455)	(2.444)
SIZE	-0.251**	-0.254**	-0.244*	-0.143**	-0.143**	-0.135*
	(-2.145)	(-2.179)	(-2.006)	(-2.110)	(-2.119)	(-1.940)
DEBT	4.266***	4.242***	4.165***	2.520***	2.513***	2.446***
	(2.930)	(2.915)	(2.987)	(3.163)	(3.151)	(3.206)
CASH	1.085	1.186	1.166	0.999	1.019	1.027
	(0.779)	(0.847)	(0.828)	(1.169)	(1.182)	(1.189)
PPE	-0.026	-0.032	-0.074	0.493	0.488	0.447
	(-0.019)	(-0.024)	(-0.057)	(0.632)	(0.625)	(0.591)
FOUNDER_CEO	0.419			0.036		
	(0.894)			(0.111)		
FEMALE_CEO		-1.196*			-0.380	
		(-1.877)			(-0.750)	
CEO_RISK_SCORE			-0.008			-0.006
			(-0.813)			(-0.922)
Adjusted R-squared	0.293	0.293	0.293	0.289	0.289	0.289
Number of Obs	54,658	54,658	54,658	54,658	54,658	54,658
Industry-year FE	YES	YES	YES	YES	YES	YES
State-year FE	YES	YES	YES	YES	YES	YES

TABLE A8. Employee Quality and Workplace Safety

Panel A compares the mean value of employee quality between public and private firms. COGNITIVE is the percentage of job postings that require cognitive skills. EDUCATION is the percentage of job postings that require education level. EXPERIENCE is the percentage of job postings that require at least 3-year experience. Panel B presents the OLS estimates for the relationship between a stock market listing and workplace injury rates, controlling for employee quality measures. The dependent variables of Columns 1-4 are total work injury rate (TCR_HOURS), and the dependent variables of Columns 5-8 are the rate of severe work injuries (DART_HOURS). PUBLIC is an indicator variable that equals one if the firm is publicly listed in a stock exchange in the year, and zero otherwise. Panel C presents the OLS estimates for the relationship between a stock market listing and work injury rates, controlling for employee quality measures and financial controls. All regression models control for SIC 2-digit industry-year fixed effects and establishment state-year fixed effects. All other variables are described in the Appendix. Standard errors are clustered at both the firm level and establishment state level. The t-statistics are reported in parentheses. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively, according to a two-tailed t-test.

Panel A: Employee Quality: Public vs. Private				
Employee Quality	PUBLIC (N = 2,329)	PRIVATE (N = 1,285)	Diff.	P-value
COGNITIVE	0.411	0.196	0.214	0.000
EDUCATION	0.348	0.267	0.081	0.000
EXPERIENCE	0.321	0.287	0.034	0.000

Panel B: Multivariate Regression without Financial Controls

	TCR_HOURS				DART_HOURS			
	1	2	3	4	5	6	7	8
PUBLIC	-1.1172**	-1.0876**	-1.0513**	-1.1086**	-0.6257**	-0.6077*	-0.5838*	-0.6208*
	(-2.540)	(-2.482)	(-2.389)	(-2.478)	(-2.052)	(-1.963)	(-1.908)	(-2.014)
STRIKE	5.9118	5.8562	5.4442	5.9160	2.9347	2.9010	2.6374	2.9371
	(1.360)	(1.346)	(1.244)	(1.409)	(0.781)	(0.773)	(0.703)	(0.800)
SHUT	0.4671	0.4648	0.5045	0.4878	0.1126	0.1112	0.1363	0.1243
	(1.585)	(1.574)	(1.672)	(1.669)	(0.488)	(0.483)	(0.571)	(0.536)
SEASONAL	0.2899	0.3031	0.3529	0.3083	0.4493	0.4573	0.4893	0.4596
	(0.536)	(0.562)	(0.669)	(0.593)	(1.078)	(1.101)	(1.210)	(1.131)
DISASTER	-0.9171	-0.8641	-0.8379	-0.8451	-0.5908	-0.5586	-0.5404	-0.5501
	(-0.663)	(-0.635)	(-0.625)	(-0.616)	(-0.598)	(-0.577)	(-0.564)	(-0.563)
ln(EMP)	-0.5916***	-0.5888***	-0.5560***	-0.5717***	-0.3842***	-0.3826***	-0.3616***	-0.3730***
	(-3.720)	(-3.700)	(-3.496)	(-3.629)	(-4.220)	(-4.248)	(-4.037)	(-4.219)
ln(PLANT)	0.0972	0.1081	0.1490	0.1018	0.2073	0.2139	0.2403	0.2099
	(0.458)	(0.510)	(0.704)	(0.480)	(1.401)	(1.457)	(1.636)	(1.420)
COGNITIVE		-0.3669				-0.2226		
		(-0.656)				(-0.522)		
EDUCATION			-1.7060***				-1.0847***	
			(-4.451)				(-3.538)	
EXPERIENCE				-1.3671**				-0.7724**
				(-2.525)				(-2.043)
Adj. R-squared	0.363	0.363	0.367	0.366	0.435	0.435	0.438	0.436
Number of Obs	3,614	3,614	3,614	3,614	3,614	3,614	3,614	3,614
Industry-year FE	YES	YES	YES	YES	YES	YES	YES	YES
State-year FE	YES	YES	YES	YES	YES	YES	YES	YES

Panel C: Multivariate Regression with Financial Controls[1]

	TCR_HOURS				DART_HOURS			
	1	2	3	4	5	6	7	8
PUBLIC	-1.8263**	-1.8106**	-1.8752**	-1.8129**	-0.6183	-0.5757	-0.6541	-0.6120
	(-2.321)	(-2.297)	(-2.392)	(-2.348)	(-1.453)	(-1.391)	(-1.559)	(-1.462)
SHUT	0.4392	0.4392	0.4504	0.4449	0.2632	0.2632	0.2714	0.2659
	(1.292)	(1.287)	(1.325)	(1.307)	(1.166)	(1.151)	(1.200)	(1.180)
SEASONAL	0.6265	0.6289	0.6432	0.6163	0.4347	0.4411	0.4469	0.4299
	(0.796)	(0.794)	(0.828)	(0.783)	(0.676)	(0.681)	(0.704)	(0.667)
DISASTER	-1.8103	-1.7936	-1.8396	-1.8169	-1.4992	-1.4539	-1.5206	-1.5023
	(-0.852)	(-0.858)	(-0.871)	(-0.858)	(-1.088)	(-1.090)	(-1.113)	(-1.093)
ln(EMP)	-0.4528***	-0.4541***	-0.4464**	-0.4545***	-0.3227***	-0.3262***	-0.3181***	-0.3236***
	(-2.713)	(-2.745)	(-2.691)	(-2.766)	(-2.890)	(-2.942)	(-2.872)	(-2.912)
ln(PLANT)	-0.1145	-0.1163	-0.1123	-0.1186	-0.0057	-0.0103	-0.0040	-0.0076
	(-0.365)	(-0.369)	(-0.359)	(-0.381)	(-0.025)	(-0.044)	(-0.017)	(-0.033)
SIZE	-0.1233	-0.1199	-0.0888	-0.1178	-0.0767	-0.0675	-0.0514	-0.0741
	(-1.501)	(-1.418)	(-1.083)	(-1.423)	(-1.390)	(-1.137)	(-0.971)	(-1.387)
LEVERAGE	4.0463**	3.9939**	4.0105**	3.9592**	1.2662	1.1240	1.2400	1.2249
	(2.095)	(2.088)	(2.059)	(2.089)	(1.179)	(1.134)	(1.131)	(1.129)
CASH	1.8701	1.8377	1.9437	1.8934	1.1442	1.0562	1.1979	1.1552
	(1.024)	(0.970)	(1.050)	(1.036)	(0.922)	(0.812)	(0.952)	(0.934)
PPE	2.8881	2.8852	2.7586	2.9238	3.1372**	3.1295**	3.0426**	3.1542**
	(1.527)	(1.517)	(1.469)	(1.582)	(2.381)	(2.355)	(2.341)	(2.437)
COGNITIVE		-0.1783				-0.4838		
		(-0.179)				(-0.691)		
EDUCATION			-1.3124*				-0.9595*	
			(-1.773)				(-1.821)	
EXPERIENCE				-0.5753				-0.2729
				(-0.542)				(-0.442)
Adj. R-squared	0.468	0.468	0.469	0.468	0.543	0.543	0.544	0.543
Number of Obs	2,520	2,520	2,520	2,520	2,520	2,520	2,520	2,520
Industry-year FE	YES	YES	YES	YES	YES	YES	YES	YES
State-year FE	YES	YES	YES	YES	YES	YES	YES	YES

[1] Please note that, in Panel C, the variable STRIKE is dropped in the regressions because it does not have variation.