

APPENDIX TABLE A.3: FIXED EFFECTS MODELS

<i>Specification:</i>	Baseline (Hours Worked)		Employees		Tonnage	
<i>Mine/Controller Size Units:</i>	100 Quarterly FTEs		100 Employees		Millions of Tons	
<i>Version:</i>	Public-Fields Version	Confid.-Fields Version	Public-Fields Version	Confid.-Fields Version	Public-Fields Version	Confid.-Fields Version
Nontraumatic Injury Model	1.377*** (0.14)	1.098 (0.15)	1.387*** (0.14)	1.109 (0.15)	1.444*** (0.13)	1.110 (0.13)
Total Injury Model	1.208** (0.09)	1.061 (0.11)	1.206** (0.09)	1.072 (0.12)	1.259*** (0.09)	1.068 (0.09)
Traumatic Injury Model	0.896 (0.09)	1.039 (0.13)	0.882 (0.09)	1.062 (0.14)	0.968 (0.08)	1.036 (0.10)
# of Observations	4,075	1,558	4,075	1,558	4,075	1,558
# of Union Mines / # of Total Mines	164 / 164	79 / 79	164 / 164	79 / 79	164 / 164	79 / 79
Fatality Model	0.381** (0.17)	. ^a .	0.386** (0.17)	. ^a .	0.423** (0.18)	. ^a .
# of Observations	1,082	412	1,082	412	1,082	412
# of Union Mines / # of Total Mines	151 / 151	71 / 71	151 / 151	71 / 71	151 / 151	71 / 71

*Significance levels: *** 1%, ** 5%, * 10%. Standard errors, clustered at the mine level, are shown in parentheses.*

Limitations of Fixed Effects Model: Only a small proportion of underground coal mines (6.2%) changed union status during the period examined (1993-2010), and those that did change status seem to be highly unrepresentative of the population as a whole (see footnote 21). Any analysis predicated upon this idiosyncratic subgroup is likely to yield biased estimates of unionization's true effect, which is why I place this table in an appendix.

Results Presented: The table reports IRR (incidence rate ratio)^b coefficients on the union indicator variables in negative binomial regression models. Hours worked is the exposure term.

Definitions: A quarterly FTE is defined as 500 hours worked.

Unit of Observation: The unit of observation is the mine-quarter for the nontraumatic, total, and traumatic injuries regressions. The unit of observation is the mine-year for fatality regressions.

Dependent Variables: The dependent variables are counts of injuries of each type (specified in the top row) that occur underground. *Traumatic injuries* are defined to include the following: amputations; enucleations; fractures; chips; dislocations; foreign bodies in eyes; cuts and lacerations; punctures; burns/scalds; crushings; chemical, electrical, and laser burns; and fatalities. (See footnote 13 for more details on the definition on traumatic injuries.) The sum of traumatic and nontraumatic injuries comprises *total injuries*.

Independent Variables: All models include the following regressors: union dummy, mine size (a continuous variable whose units are specified in column header), union X mine size, logged controller size (a continuous variable whose units are specified in column header), mine age, mine productivity, total lost-work injuries (in hundreds) during previous calendar year (for fatality models) or previous four quarters (for non-fatality models), total penalty points (in thousands) during previous calendar year (for fatality models) or previous four quarters (for

non-fatality models), dummies indicating presence of each respective mine subunit, quarter/year dummies, district dummies, and a constant term. Public-fields versions also include a longwall indicator. Confidential-fields versions also include the number of coal beds, mean coal bed thickness (in yards), subsidiary indicator, captive production as a percentage of total production, recoverable coal reserves, and mining method percentages. See Appendix C for complete variable definitions. An expanded version of this table, including a full covariate report, is available at <http://amorantz.stanford.edu/companions/union-coal-mine-safety/>.

Sample: The sample consists of underground bituminous coal mines from 1993–2010 with positive coal production, positive hours worked, and non-missing controller size data that switched union status at some point during the sample period. The public-fields versions contain mine-quarters from 1993–2010, whereas the confidential-fields versions are restricted to 1998–2010. Because the historical variables (lost-work injuries and penalty points) are summed up over the previous four *quarters* in the nontraumatic, total, and traumatic injuries regressions but are summed up over the previous *calendar year* in the fatality regressions, some mines excluded from the fatality models are included in the other models. For example, if a mine is open for all of only one calendar year, it will have no historical data at the *yearly* level, but it will have historical data for three of the four *quarters* it was open. Note that the confidential-fields versions of all models exclude any observations that lack information on confidential covariates.

^a Because of the small sample sizes and paucity of identifying variation, the confidential-fields versions of all three fatality models failed to converge.

^b A coefficient of 1 indicates no change at all in predicted injuries; coefficients between 0 and 1 represent a predicted fall in injuries (e.g. a coefficient of 0.97 represents a 3% decline); and coefficients greater than one represent predicted increases (e.g. a coefficient of 1.03 represents a 3% rise).