Racial disparities in pollution exposure and employment at U.S. industrial facilities: Supporting Information

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Abstract

Proximity to industrial facilities can have positive employment effects as well as negative pollution exposure impacts on surrounding communities. Although racial disparities in exposure to industrial air pollution in the US are well documented, there has been little empirical investigation of whether these disparities are mirrored by employment benefits. We use facility-level data from the US EPA Toxics Release Inventory (TRI) and the US Equal Employment Opportunity Commission EEO-1 database to assess the extent to which the racial and ethnic distribution of industrial employment corresponds to the distribution of exposure to air toxics emitted by the same facilities. We find that the share of pollution risk accruing to minority groups generally exceeds their share of employment, and exceeds their share of higher-paying jobs by a wide margin. We also find no evidence that facilities that create higher pollution risk for surrounding communities provide more jobs in aggregate.

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Relationship between total employment and pollution risk. Though the 712 facilities analyzed here rank among the top 1000 nationwide in overall human health risk from air toxics releases, as measured by RSEI scores, their scores vary by up to three orders of magnitude. It is possible, therefore, to examine the relationship between employment and pollution risk among these facilities — a universe of special importance since together these facilities account for more than two-thirds of the total human health risk from air toxics releases from all TRI facilities nationwide.

Relationship between total employment and pollution risk. In Table S.1 we present estimates of the elasticity of total employment in better-paid occupations with respect to pollution risk, derived from linear regressions with logarithmically transformed variables, which accompanies the results for total employment in all jobs. The first two columns report national estimates, with and without state and industrial sector dummies. In both specifications, the elasticity is very close to zero. The inclusion of industry dummies in column 2 in particular indicates that there is essentially no relationship between facility jobs and population pollution risk even within narrowly defined industrial categories. The third and fourth columns report estimates for the South Central and Great Lakes regions, respectively. We find that a ten percent increase in pollution risk is associated in the South Central region with a 2.4% increase in the number of jobs, and in the Great Lakes region with a 2.2% decrease in the number of jobs. These are the only two EPA regions for which the estimated elasticities were statistically significantly different from zero.

The relationship between a facility's total pollution risk and total number of jobs for all regions and for most large industries are reported in supplementary Figures S.1 and S.2.

Methods: Supplementary Information Due to our interest in assessing trade-offs between pollution and employment in facilities whose air emissions have substantial human health impacts, our target sample was the 1,000 facilities with the highest RSEI air pollution

scores. In cases where facilities revised their 2010 TRI reports to show a lower mass of release of one or more chemicals, we adjusted the RSEI data by assuming a linear relation between mass and score for the release in question. Two facilities were dropped from the original sample for this reason. We successfully matched 712 of the top TRI facilities ranked by RSEI score to EEO-1 data.

Supplementary tables S.2, S.3, and S.4 present summary statistics and distributions for 712 EEO-matched and 288 unmatched facilities in the top 1,000 polluting RSEI facilities. The matched sample closely resembles the unmatched sample in terms of regional and sectoral distribution as well as means and variation of RSEI scores. Together the 712 facilities account for 72.2% of the RSEI score of the top 1,000 facilities, and 68.2% of the total RSEI score for all 14,815 TRI facilities nationwide reporting air releases in 2010.

Table S.1: Better Jobs and Pollution Risk: Elasticity Estimates

	National		South Central	Great Lakes
log(RSEI Score)	−0.02	0.02	0.24**	−0.22**
	(0.04)	(0.04)	(0.09)	(0.08)
Intercept	4.99***	5.13***	2.19*	7.34***
	(0.47)	(1.24)	(1.05)	(0.91)
State Dummies		Yes		
Industry Dummies		Yes		
Adj. R^2	0.00	0.14	0.04	0.04
Num. obs.	712	712	147	195

Each column shows the coefficients from a linear regression of log of better employment on the log total population risk for each facility. In column 3, the sample is limited to facilities in the South Central states (EPA Region 6), which comprises Arkansas, Louisiana, New Mexico, Oklahoma, and Texas. In column 4, the sample is limited to facilities in the Great Lakes (EPA Region 5), which comprises Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin. Standard errors are in parentheses. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.

Table S.2: Unmatched and Matched TRI Facilities, Distribution across EPA Regions

	Unmatched	Matched
New England (1)	0.025	0.032
NY/NJ (2)	0.050	0.041
Mid-Atlantic (3)	0.121	0.130
Southeast (4)	0.160	0.153
Great Lakes (5)	0.281	0.273
South Central (6)	0.164	0.209
Midwest (7)	0.046	0.057
Mountains and Plains (8)	0.036	0.018
Pacific Southwest (9)	0.060	0.057
Pacific Northwest (10)	0.057	0.029

The table shows the distribution of facilities across US EPA Regions. The first column shows the distribution of TRI facilities that were not matched to the EEO-1 data and the second column shows the distribution of TRI facilities that were matched to EEO-1 data. Source: Authors' computations with EEO-1 and RSEI data.

Table S.3: Unmatched and Matched TRI Facilities, Distribution across Industrial Sectors

	Unmatched	Matched
Administrative and Support Services	0.014	0.000
Chemical Manufacturing	0.160	0.211
Computer and Electronic Product Manufacturing	0.000	0.013
Electrical Equipment, Appliance, and Component Manufacturing	0.010	0.011
Fabricated Metal Product Manufacturing	0.265	0.171
Food Manufacturing	0.007	0.011
Furniture and Related Product Manufacturing	0.003	0.003
Leather and Allied Product Manufacturing	0.007	0.000
Machinery Manufacturing	0.066	0.073
Merchant Wholesalers, Durable Goods	0.003	0.000
Merchant Wholesalers, Nondurable Goods	0.010	0.003
Mining (except Oil and Gas)	0.010	0.006
Miscellaneous Manufacturing	0.014	0.020
National Security and International Affairs	0.021	0.000
Nonmetallic Mineral Product Manufacturing	0.031	0.034
Paper Manufacturing	0.000	0.027
Petroleum and Coal Products Manufacturing	0.084	0.064
Plastics and Rubber Products Manufacturing	0.014	0.011
Primary Metal Manufacturing	0.164	0.165
Professional, Scientific, and Technical Services	0.007	0.001
Repair and Maintenance	0.000	0.001
Textile Product Mills	0.000	0.004
Transportation Equipment Manufacturing	0.042	0.095
Utilities	0.045	0.063
Waste Management and Remediation Services	0.010	0.006
Wood Product Manufacturing	0.010	0.007

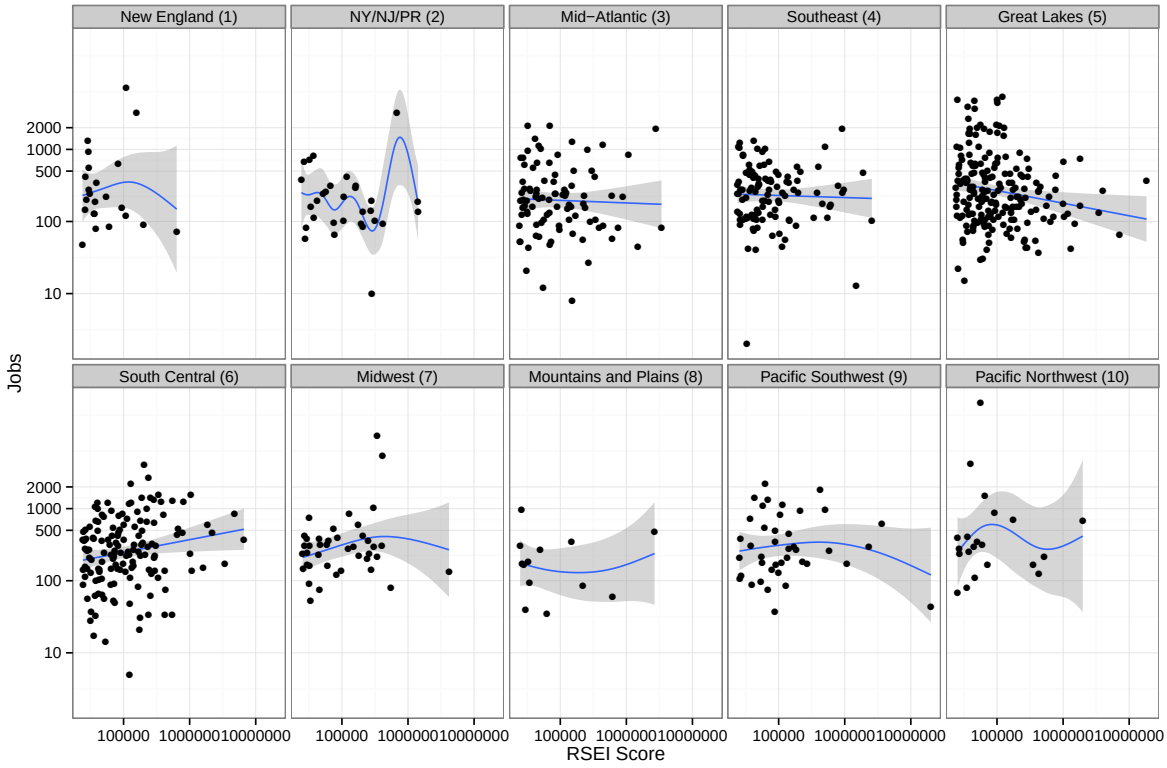
The table shows the distribution of facilities across 3-Digit NAICS Codes. The first column shows the distribution of TRI facilities that were not matched to the EEO-1 data and the second column shows the distribution of TRI facilities that were matched to EEO-1 data. Source: Authors' computations with EEO-1 and RSEI data.

Table S.4: Unmatched and Matched TRI Facilities, RSEI Scores

	Unmatched	Matched
Mean RSEI Score	278,767	293,898
S.E. of RSEI Score	43,560	43,914
SD log(RSEI Score)	1.20	1.17
Rank among Top 1,000	502	501
Mean Black RSEI Score	51,533	44,325
S.E. of Black RSEI Score	12,587	6,740
Mean Hispanic RSEI Score	47,994	62,747
S.E. of Hispanic RSEI Score	9,533	16,060

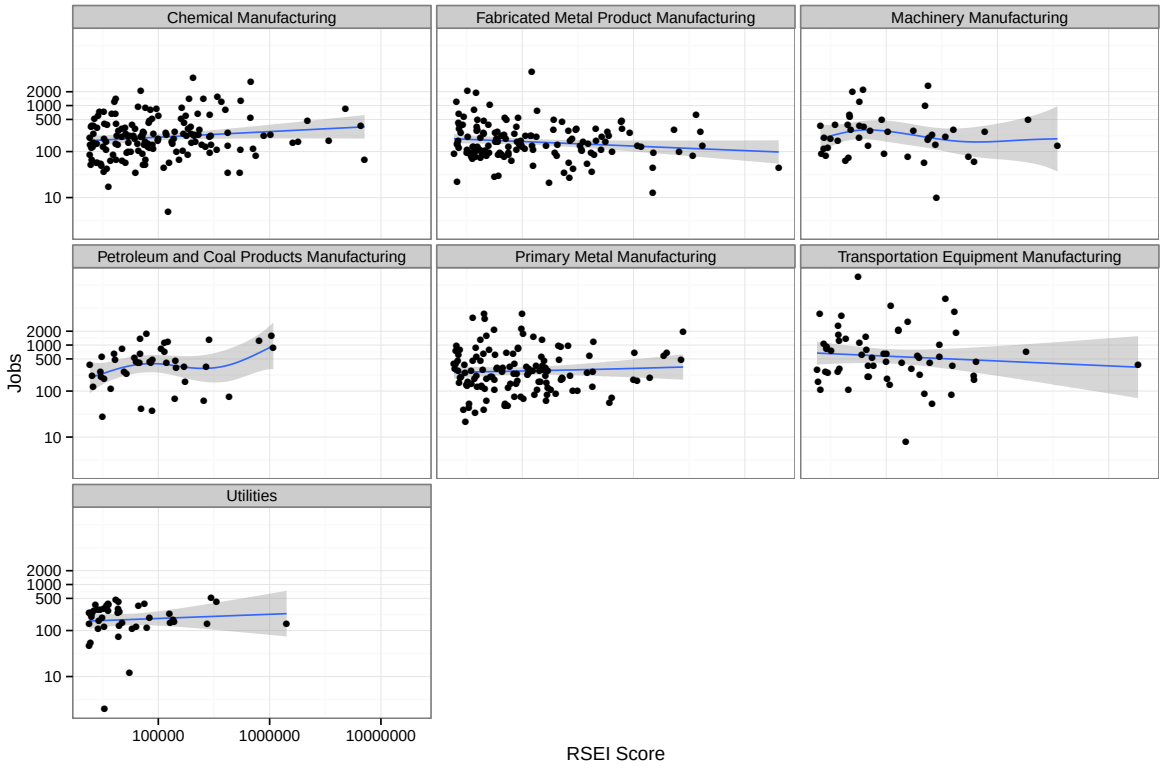
The first column shows RSEI Scores of TRI facilities that were not matched to the EEO-1 data and the second column shows RSEI Scores of TRI facilities that were matched to EEO-1 data. Source: Authors' computations with EEO-1 and RSEI data.

Figure S.1: Jobs versus Pollution Risk, by EPA Region



$N = 712$ facilities stratified by 10 EPA Regions. The horizontal axis shows the log of RSEI Score, a measure of the potential chronic human health risk from industrial toxic air releases. The vertical axis shows the log of total employment. The locally smoothed regression function is estimated with the general additive model with integrated smoothness estimation using the `mgcv` package in R. The smoothing parameter is selected with the default cross-validation method. Source: Authors' computations with EEO-1 and RSEI data.

Figure S.2: Jobs versus Pollution Risk, by Industry



Facilities stratified by 3-digit NAICS code for industries having at least 40 establishments in the data. The horizontal axis shows the log of RSEI Score, a measure of the potential chronic human health risk from industrial toxic air releases. The vertical axis shows the log of total employment. The locally smoothed regression function is estimated with the general additive model with integrated smoothness estimation using the `mgcv` package in R. The smoothing parameter is selected with the default cross-validation method. Source: Authors' computations with EEO-1 and RSEI data.