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GAUGING RUST BELT CULPABILITY IN THE CROSS-STATE AIR POLLUTION RULE USING DATA RELATED TO PRODUCTION EFFICIENCIES DURING THE MANUFACTURING PROCESS

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ABSTRACT

The Rust Belt geographic region of the United States was formerly an economic juggernaut because of its manufacturing prowess. However, in recent decades, the Rust Belt has struggled to shift to national trends of cleaner energy. The federal Cross-State Air Pollution Rule was implemented by downwind political actors in the Northeast region of the United States because of the air pollution that travels there from Rust Belt power plants. Complicating matters is new research pointing to long-term exposure to air pollution as a pre-existing condition for COVID-19 complications. To explore the merits of the downwinders' complaints, this study will analyze trends in the manufacturing process as it relates to pollution efficiencies amongst Rust Belt producers.

INTRODUCTION

The Rust Belt, also referred to as the Manufacturing Belt, consists of Midwest American states, generally from Iowa to Pennsylvania (Lopez, 2004). The Rust Belt became an economic powerhouse in the late-nineteenth and twentieth centuries due to America's dependency on coal, which was "cheaply fueling the factories of the Rust Belt and lighting up homes across the country" (Davenport, 2013, p. 25). The Rust Belt economies were based on manufacturing and were built up during the peak of industry (Cooke, 2006; Biggers, 2014), so the decline of US manufacturing has been specifically intertwined with job loss attributed to plant closings in these communities (Deakin & Edwards, 1993; Chase, 2003; Brown, et al., 2008; Bernero & Peduto, 2016). Skrabec (2015, p. 197) noted that "America had never seen such a devastating loss in jobs, taxes, industry, and economic hope in such a large geographic region". The shift in jobs out of the Rust Belt has been called "one of the biggest negative shocks to affect the U.S. economy in the past fifty years" (Feyrer et al., 2007, p. 41). As such, the Rust Belt faces big challenges in attempting to reshape its economies and to retrain its workforces to better handle the challenges of the global marketplace (Eisinger, 1990; Brady & Wallace, 2001; Samuelsohn, 2009; Kowalski, 2016; Saunders, 2016; Williams, 2017).

Obama-era environmental executive powers stemming from the broad national authority in the Clean Air Act were utilized as an impetus for regulating and limiting the usage of coal during a time in which many allies increasingly advocated for more sustainable and environmentally friendly energy sources. This series of regulations included the Cross-State Air Pollution Rule (CSAPR), which mandated a reduction in the amount of wind-carried emissions from power plants. Since the jet stream in America generally carries weather west to east, including pollution (Rapp, 2015), CSAPR was championed by political actors in the Northeast region of the US. The EPA predicted that this legislation would cut 2017 emissions levels by 20% from prior levels (Jeffrey, 2016). While this action was hailed by clean-power advocacy groups, there was ardent political opposition, especially from those within the Rust Belt coal industry who claimed that overall consumer energy costs would skyrocket. This legislation required coal plants, especially those in the Midwest, to reduce various emissions, prompting utility executives and coal producers to call the EPA proposals a "train wreck" (Lowery, 2011). The Rust Belt's opposition to federal environmental legislation is not new, as Midwest labor was the main faction that strongly opposed the Clean Air Act's 1970 original federal mandate (Billings et al., 2014).

The debate over coal became especially heated as it escalated during the lead-up to the US Presidential election of 2016, and the Clean Power Plan drove political debate (DeBellis, 2015). In fact, coal energy was one of the few policy issues on which each candidate's stance diverged diametrically (Rushefsky, 2017; Kerrigan, 2018). In

March 2017, the Trump administration enacted an executive order to remove environmental regulations and empower federal regulators to do away with the Clean Power Plan's restrictions on U.S. carbon emissions (Pacewicz & Mudge, 2017), mandating that the EPA "suspend, revise, or rescind four actions related to the Clean Power Plan", including reversals on stringent coal policies (WhiteHouse.gov, 2017). Soon, the Affordable Clean Energy act replaced the Clean Power Plan.

Subsequently, the state of Maryland threatened to sue the Trump-era EPA under the CSAPR in response to coal-affected air moving through it from states in the Midwest, claiming that the coal-fired energy consumption from factories (not power-plants) in the Midwest did not do enough to limit their emissions (Walton, 2017). In 2018, the attorney general from the state of New York sued the Trump administration's EPA and claimed that Midwest states failed to "curb ground-level ozone (smog) pollution that blows into New York from upwind" (NY.gov, 2018). "The downwinders argued that… Rust Belt states were enjoying the profits of producing cheap energy with lax pollution controls" (Schlanger, para. 4, 2017). By 2019, 22 states joined together to sue in federal court to block the aforementioned Trump-administration coal emission rollbacks.

Recently, researchers have claimed that as more studies about long-term exposure to air pollution and COVID-19 related problems are published, they could have "far-reaching implications on clean-air regulations, citing those living in the Northeast region as being most adversely impacted (Friedman, para. 17, 2020). The COVID-19 pandemic shuttered factories across the American Rust Belt in Spring 2020, prompting some positive unintended consequences. Since the air pollution caused by factories in the Midwest region travels east, the Northeast region witnessed a 30% drop in air pollution by the end of March 2020 (Newburger, 2020). Furthermore, researchers linked "long-term exposure to [air] pollution and COVID-19 deaths" (Friedman, para. 1) and found that the majority of health issues that make people more at-risk for COVID-19 respiratory problems "are the same diseases that are affected by long-term exposure to air-pollution" (Wu & Nethery, 2020). Many wonder if the Northeast has merits in their complaints about the Rust Belt air pollution vis-a-vis the CSAPR. Negative health-related consequences of exposure to air pollution will continue to draw attention as the pandemic unfolds.

METHODOLOGY, RESULTS, AND FUTURE STUDIES

Utilizing Lopez's (2004) construct of the Rust Belt as the region spanning from Iowa to Pennsylvania, seven states (Iowa, Illinois, Indiana, Michigan, Ohio, Pennsylvania, and Michigan) comprise the Rust Belt for the purposes of this study.

The air pollution data and production rates were extracted from the Toxic Release Inventory (TRI), a publicly-available EPA database that contains information on the release of toxic chemicals into the atmosphere and the waste management concentration activities reported annually by all private organizations as well as federal facilities (EPA, 2010). While the intended scope of the CSAPR was on power plants, factories producing products will be a focus of this analysis. Components of the assessment of economic health as it relates to pollution records include the output of manufacturers (the culprits of pollution) as well as the total amount of pollution. Variables used to measure manufacturing output include the state's contribution to gross national product (GNP) connected to industrial production such as percentage of workforce working in industry, as well as total dollar figures of GNP related to manufacturing. Variables used to measure pollution include rankings of total pollution compared to all states as well as total annual pollution.

In order to obtain a comparable method for assessing pollution as it relates to related output, or a *pollution efficiency index*, variables for both pollution and productivity must be included. As such, data from the most recent year (2018) on total on-site and off-site disposal or releases of chemicals (total pollution) from the US Environmental Protection Agency's (EPA) Toxic Release Inventory (TRI) were used. In order to assess economic data specific to industrial output, data from the National Association of Manufacturers, a notable national industrial association, were used to ascertain GNP economic output specifically related to the manufacturing process, as well as the percentage of workforce employed in manufacturing by state (National Association of Manufacturers, 2020). The data utilized to ascertain each state's pollution efficiency index are presented in Table 1, with the red font depicting the Rust Belt states.

Table 1. List of Rust Belt States and Others; Pollution and Manufacturing Statistics

	Total Pollution (Total On-site and Off-site Disposal or Other Releases (pollution): (millions of lbs)	**Air Pollution** (millions of lbs)	**GNP** (related to manufacturing: billions of USD)
Alabama	78.9	28.6	38.0
Alaska	972.0	0.3	1.7
Arizona	170.5	2.3	29.9
Arkansas	36.3	15.1	19.9
California	34.4	7.3	316.8
Colorado	24.4	2.1	25.2
Connecticut	2.1	0.8	30.8
Delaware	6.4	0.8	4.7
Florida	61.2	18.2	55.9
Georgia	50.5	32.6	64.6
Hawaii	2.9	1.8	1.9
Idaho	34.3	5.1	9.2
Kansas	24.0	9.7	27.2
Kentucky	50.8	19.0	38.7
Louisiana	146.0	53.5	49.2
Maine	11.5	3.1	6.3
Maryland	6.2	3.0	24.3
Massachusetts	3.4	0.8	53.3
Minnesota	27.2	9.8	52.7
Mississippi	61.5	16.3	18.5
Missouri	60.2	9.5	40.7
Montana	51.3	2.0	3.1
Nebraska	18.5	5.8	14.1
Nevada	339.1	0.8	8.1
New Hampshire	0.4	0.2	9.9
New Jersey	12.7	2.1	52.7
New Mexico	16.7	0.9	4.1
New York	19.5	4.2	74.6
North Carolina	55.0	22.4	103.6
North Dakota	30.2	7.0	4.0
Oklahoma	31.4	17.2	19.1
Oregon	20.7	11.0	34.8
Rhode Island	0.4	0.1	5.3
South Carolina	37.0	20.6	38.7
South Dakota	7.5	1.7	5.3
Tennessee	88.7	24.0	56.0
Texas	217.4	54.3	230.5
Utah	291.3	7.3	19.2
Vermont	0.4	0.0	3.2
Virginia	34.5	16.5	47.8
Washington	30.2	7.1	63.1
West Virginia	30.7	12.6	7.9
Wyoming	21.4	2.4	1.9
Average	**74.9**	**10.7**	**39.9**

Iowa	39.7	18.9	35.7
Illinois	121.8	23.6	108.4
Indiana	129	27.5	102.09
Michigan	78.5	11.5	102.35
Ohio	113.2	36.7	112.24
Pennsylvania	55	14.9	93.75
Wisconsin	31.7	9.3	63.31
Average	**81.3**	**20.3**	**88.3**

GNP related to manufacturing was utilized as the numerator and pollution was utilized as the denominator in order to calculate the pollution efficiency index for all states. The larger the pollution efficiency rate, the better, because if manufacturing-related GNP increases or pollution decreases, the pollution efficiency index is higher. Table 2 shows the pollution efficiency index ("PEI-All Pollution" column) of all 50 states, with the red font depicting the Rust Belt states. In addition, the column labeled "PEI-Air Pollution" shows the pollution efficiency index when using just air pollution as the denominator, and the column labeled "% Air of All Pollution" depicts the percentage of all pollution that is air pollution.

Table 2. List of Rust Belt States and Others; Pollution Efficiency Indexes and Air Pollution of All Pollution

	PEI-All Pollution	**PEI-Air Pollution**	**% Air of All Pollution**
Alabama	0.481	1.328	36.2%
Alaska	0.002	5.159	0.0%
Arizona	0.175	12.983	1.3%
Arkansas	0.547	1.315	41.6%
California	9.208	43.392	21.2%
Colorado	1.031	11.976	8.6%
Connecticut	14.657	40.580	36.1%
Delaware	0.734	6.195	11.9%
Florida	0.913	3.071	29.7%
Georgia	1.279	1.981	64.6%
Hawaii	0.645	1.039	62.1%
Idaho	0.269	1.812	14.9%
Kansas	1.135	2.807	40.4%
Kentucky	0.761	2.035	37.4%
Louisiana	0.337	0.920	36.6%
Maine	0.549	2.035	27.0%
Maryland	3.923	8.107	48.4%
Massachusetts	15.665	67.830	23.1%
Minnesota	1.936	5.372	36.0%
Mississippi	0.300	1.133	26.5%
Missouri	0.677	4.288	15.8%
Montana	0.060	1.540	3.9%
Nebraska	0.763	2.434	31.4%
Nevada	0.024	9.936	0.2%
New Hampshire	22.934	50.127	45.8%
New Jersey	4.150	25.095	16.5%
New Mexico	0.243	4.279	5.7%
New York	3.825	17.757	21.5%
North Carolina	1.883	4.625	40.7%
North Dakota	0.134	0.577	23.2%
Oklahoma	0.609	1.112	54.8%

Oregon	1.681	3.164	53.1%
Rhode Island	12.412	37.081	33.5%
South Carolina	1.047	1.880	55.7%
South Dakota	0.708	3.124	22.7%
Tennessee	0.631	2.334	27.1%
Texas	1.060	4.244	25.0%
Utah	0.066	2.629	2.5%
Vermont	8.766	97.554	9.0%
Virginia	1.384	2.895	47.8%
Washington	2.090	8.892	23.5%
West Virginia	0.259	0.630	41.0%
Wyoming	0.091	0.808	11.2%
Average	**2.792**	**11.816**	**28.3%**
Iowa	0.900	1.891	47.6%
Illinois	0.890	4.594	19.4%
Indiana	0.791	3.712	21.3%
Michigan	1.304	8.900	14.6%
Ohio	0.992	3.058	32.4%
Pennsylvania	1.705	6.292	27.1%
Wisconsin	1.997	6.808	29.3%
Average	**1.226**	**5.037**	**27.4%**

As seen in Table 2 in the column farthest to the right, the Rust Belt emits comparably less pollution into the air during the production process compared to the rest of the states, at 27.4% versus 28.3%. However, as seen by both pollution efficiency indexes from Table 2, the Rust Belt struggles to manufacture without polluting at a comparably high rate. The pollution efficiency index of the Rust Belt states shows a 43.9% pollution efficiency rate for all pollution (1.226 Rust Belt average versus 2.792 for the other states) but at a 42.6% pollution efficiency rate when considering just air pollution (5.037 Rust Belt average versus 11.816 for the other states, see Table 2). The Rust Belt states should continue to innovate in the production process of their manufactured goods and shift away from their traditionally carbon-powered model of manufacturing so that they are producing at better pollution efficiency rates.

Rust Belt participants are still contributing to the economic health of the US through its manufacturing prowess, since their GNP related to manufacturing averages $88.3 billion per year as compared to $39.9 billion per year for the other states (from Table 1). However, it is difficult to quantify the unanticipated negative consequences of Rust Belt manufacturing in the form of the health of those downwind, specifically in the Northeast region of the US. Additional research into the 2020 pandemic will certainly spur more research about air quality related to preexisting conditions for COVID-19 and the CSAPR will face more focus, along with class action lawsuits of downwinders. In spite of the Rust Belt's comparably less emission of air pollution as a percentage of total pollution during the production process, if the Rust Belt continues to produce at a pollution efficiency rate that is behind that of other states, there will be continued political, legal, technological, and economic attention.

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