

4-12-2019

The Effect of Air Quality on US Labor Market Participation

Grant Taylor Miller
Hope College

Follow this and additional works at: https://digitalcommons.hope.edu/curca_18



Part of the [Economics Commons](#)

Recommended Citation

Repository citation: Miller, Grant Taylor, "The Effect of Air Quality on US Labor Market Participation" (2019). *18th Annual Celebration of Undergraduate Research and Creative Activity (2019)*. Paper 20.
https://digitalcommons.hope.edu/curca_18/20
April 12, 2019. Copyright © 2019 Hope College, Holland, Michigan.

This Poster is brought to you for free and open access by the Celebration of Undergraduate Research and Creative Activity at Hope College Digital Commons. It has been accepted for inclusion in 18th Annual Celebration of Undergraduate Research and Creative Activity (2019) by an authorized administrator of Hope College Digital Commons. For more information, please contact digitalcommons@hope.edu.

Abstract:

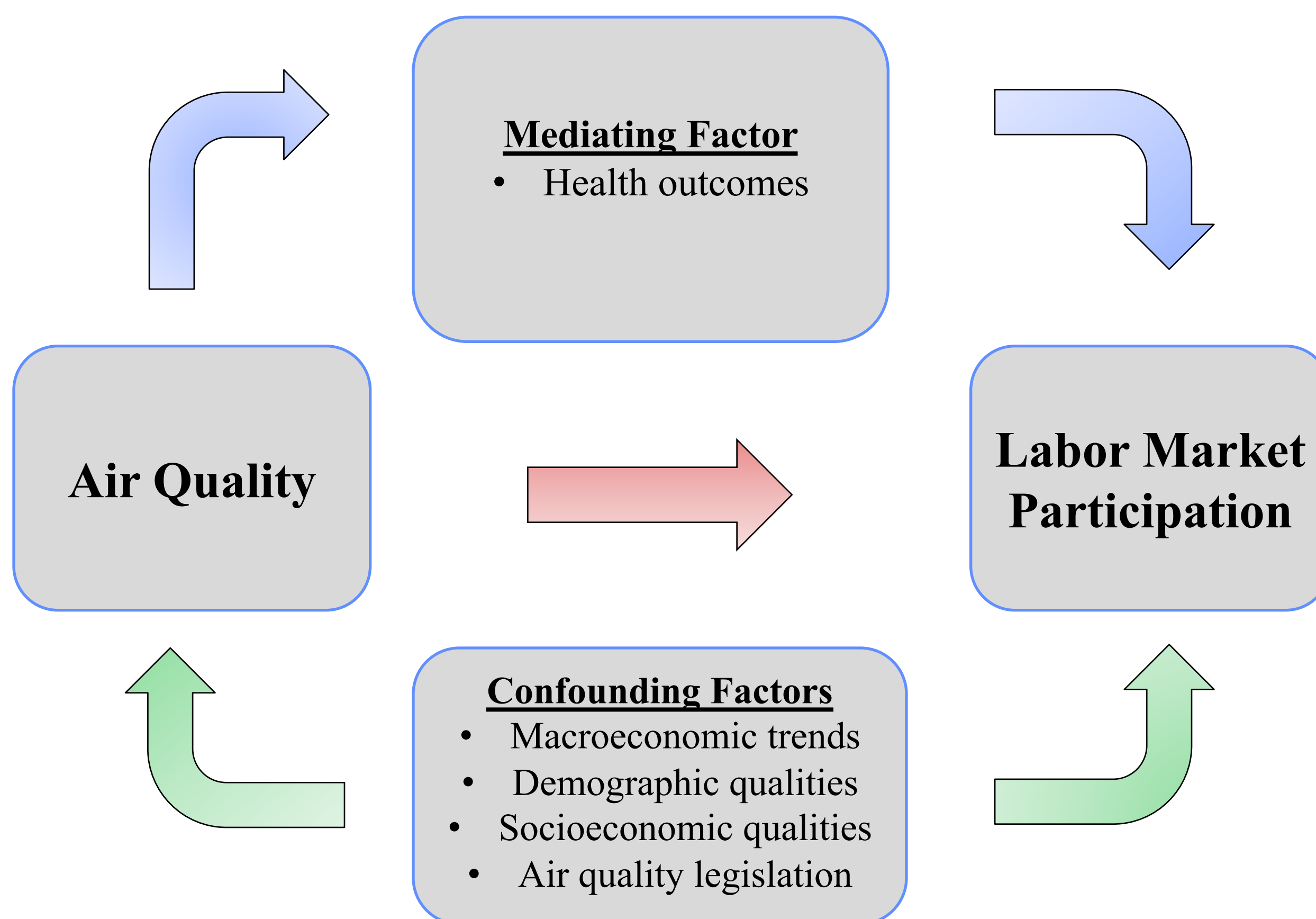
The adverse effects of deteriorating air quality on both human health and labor markets have become well-documented in epidemiological and economic literature. Health-conscious policymakers are presented with the challenge of implementing environmental regulations without causing substantial economic disturbance to industry employment, productivity, and wages. However, the social benefits of better health outcomes may correspond with economic benefits that outweigh the costs. Using data from the Current Population Survey and the Environmental Protection Agency's Air Quality Index, this study uses a multivariate fixed effects regression approach to estimate the relationship between air quality and various measures of labor market participation across 101 metropolitan areas in the United States between 1994–2017. Understanding the reflection of health outcomes in labor market participation may assist the quantification of economic benefits and contribute to a cost-benefit analysis of regulation policy. Empirical analysis suggests that variation in air quality has a negligible impact on US labor markets.

Introduction/Motivation:

- The effects of environmental degradation and climate change are cited as "the defining issue[s] of our time" according to the Secretary General of the United Nations (Guterres, 2018)
- Industrial processes are the backbone of modern economies
- Many developing countries are rapidly industrializing (i.e. China, India)
- Industrial activity is associated with compromised air quality
- The adverse effect of poor air quality on health outcomes is well-documented
- The health of labor market participants is a limiting factor in their participation
- Is the air quality in the United States affecting our labor markets?**

Theoretical Framework:

- Strong associations between air quality and health outcomes, and health outcomes and labor market participation
- Neoclassical theories of labor supply and demand



Literature:

Relevant economic literature focuses on the relationship between air quality and labor markets in developing countries where air quality issues are more extreme/exogenous changes are frequent:

- Pollution and labor supply in Mexico City (Hanna and Olivia, 2015)
 - A refinery closure led to a 19.7% decrease in sulfur dioxide air pollution and a 3.5% increase in work hours per week
- Negative impact of pollution on office productivity in China (Chang *et. al.*, 2019)
 - First significant evidence showing negative labor outcomes in non-physical jobs

But also has had a broader focus:

- Negative impact of pollution on educational achievements (Roth, 2017)
- Negative impact of pollution on work loss and morbidity in the US (Ostro, 1983)
- Social benefits of better health outcomes outweigh private costs of air quality regulation (Deschenes, 2018)



Data:

- Panel data from the Current Population Survey between 1994–2017
 - Collected by the United States Census Bureau
 - Includes socioeconomic and demographic data for various metropolitan statistical areas (MSA's)
- Panel data from the Air Quality Index (AQI) between 1994–2017 for 101 MSA's
 - Collected by the Environmental Protection Agency
 - Annual measures of days per year per MSA in which AQI >100
 - AQI integrates data on 6 major pollutants to provide a single measure of air quality
 - AQI > 100 if at least one pollutant exceeded air quality standards on a given day
- All data is aggregated and merged so that each observation is a given MSA in a given year

Summary Statistics			
Variable	Obs	Mean	Std. Dev.
Days/year in which AQI > 100	1647	28.08	38.77
Demographic Controls			
Size of adult population	1647	544.76	646.84
Size of labor force	1647	441.31	522.62
% adult population	1647	0.49	0.03
% in labor force	1647	0.39	0.03
% Female	1647	0.52	0.02
% White	1647	0.79	0.13
% Black	1647	0.14	0.10
% Hispanic	1647	0.18	0.19
% Asian	1647	0.04	0.07
% Native American	1647	0.02	0.03
% Multi-racial	1647	0.00	0.02
Education Controls			
% some HS completed	1647	0.61	0.06
% HS diploma attained	1647	0.22	0.04
% some college completed	1647	0.20	0.03
% bachelor's degree attained	1647	0.13	0.03
% graduate degree attained	1647	0.07	0.03
Outcome Variables			
Labor force participation rate	1647	0.81	0.04
Hrs of work missed/worker	1647	0.49	0.55
% health-related absence	1647	0.01	0.01

Empirical Model:

This model uses an ordinary least squares (OLS) regression to estimate the effect of air quality on three measures of labor market participation. This relationship is further isolated with the inclusion of MSA and year fixed effects (FE) to address any endogeneity issues in the panel data. The general equation is constructed such that:

$$Y_{it} = \beta_1 \text{days}_{it} + \beta_2 X_{it} + \beta_3 C_{it} + \delta_i + \varphi_t + \varepsilon_{it}$$

where Y_{it} is either (1) labor force participation rate (LFPR), (2) hours of work missed per worker, or (3) a percent of the labor force that was absent from work for health reasons. β_1 estimates the impact of one additional day in which AQI > 100. β_2 represents the impact of a variety of demographic and socioeconomic controls, and β_3 represents the impact of MSA-level controls. δ_i and φ_t are MSA and year fixed effects, respectively. ε_{it} is a stochastic error-term.

Results:

Technique Dependent Var	(1) LFPR	(2) Ordinary Least Squares HrsMissed/Wrkr	(3) %HealthAbsence	(4) LFPR	(5) Fixed Effects HrsMissed/Wrkr	(6) %HealthAbsence
Days/year in which AQI > 100	0.000 (1.23)	0.000 (0.80)	0.000 (0.24)	0.00006* (2.27)	0.000 (0.56)	0.000 (0.93)
% Female	-0.062 (1.51)	-1.641* (2.11)	0.013 (1.37)	0.024 (0.7)	-0.922 (1.14)	0.018 (1.77)
% Black	-0.0746*** (9.35)	0.330* (2.17)	-0.003 (1.80)	-0.027 (1.67)	-0.304 (0.79)	-0.002 (0.31)
% Hispanic	-0.0537*** (9.40)	0.116 (1.07)	-0.00630*** (4.78)	-0.025 (1.55)	0.346 (0.88)	-0.002 (0.34)
% Asian	-0.0731*** (3.90)	-0.386 (1.08)	0.004 (1.02)	-0.0517* (2.07)	0.680 (1.13)	-0.007 (0.88)
% Native American	-0.0883** (2.97)	0.797 (1.4)	-0.003 (0.39)	0.024 (0.59)	0.073 (0.07)	0.008 (0.67)
% Multi-racial	0.046 (0.73)	2.577* (2.17)	-0.004 (0.28)	0.222** (2.88)	0.114 (0.06)	0.021 (0.89)
% HS diploma	0.008 (0.34)	-0.553 (1.26)	0.0121* (2.27)	0.016 (0.61)	-0.832 (1.31)	-0.001 (0.13)
% Some college	0.023 (0.86)	0.072 (0.14)	-0.010 (1.64)	0.0596* (2.3)	0.336 (0.54)	0.000 (0.03)
% Bachelor's degree	0.250*** (7.67)	0.791 (1.28)	-0.0262*** (3.49)	0.060 (1.82)	-0.515 (0.65)	-0.0211* (2.13)
% Graduate degree	-0.0860* (2.27)	0.672 (0.93)	-0.012 (1.38)	-0.077 (1.87)	0.119 (0.12)	-0.023 (1.86)
Size of labor force	0.00100*** (26.69)	0.001 (1.68)	0.000 (0.03)	0.00159*** (33.43)	0.001 (0.5)	0.000 (0.69)
Size of adult pop.	-0.000802*** (26.50)	-0.001 (1.69)	0.000 (0.05)	-0.00131*** (33.27)	0.000 (0.48)	0.000 (0.80)
Constant term	0.826*** (34.1)	1.240** (2.68)	0.006 (1.04)	0.795*** (36.73)	1.078* (2.07)	0.004 (0.57)
Observations	1647	1647	1647	1647	1647	1647

t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Conclusion:

- This empirical analysis suggests that air quality variation in major US MSA's over this 24 year period has not affected labor market participation in any meaningful way
- It is likely that the air quality in the US is not poor enough to affect labor market outcomes like it has been suggested to in similar empirical studies in developing countries (Hanna and Olivia, 2015; Chang *et. al.* 2019), and has improved dramatically since Ostro's study (1983)
- This study attempted to observe an underlying relationship between trends in air quality and labor market participation across the entire US economy
- Future studies should perhaps (1) continue to focus on developing countries where environmental regulations are far less stringent and policy intervention could have the largest impact, or (2) estimate the economic impact of other measures of environmental quality in developed countries