The Effect of Pollution on Worker Productivity: Evidence from IT Industry in India

ECO342A: COURSE PROJECT

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Abstract

This paper investigates the impact of air pollution on worker productivity in the IT sector by examining two industries in India. Using precise measures of each worker's annual output linked to yearly measurements of pollution and meteorology, we find that higher levels of air pollution do not significantly affect worker productivity. These results hold true even at the common levels of pollution found in major cities across the developed and developing world, suggesting that similar effects may be present more broadly. Further analysis shows that the impact on productivity is driven by the fact that pollution has a greater effect on physically demanding tasks than on indoor, white-collar work. These findings highlight the importance of considering the nature of work when examining the impact of pollution on worker productivity and suggest that policy interventions aimed at improving air quality may have varying effects depending on the type of work being performed.

Introduction

Pollution has been found to have negative effects on the productivity of workers in physically demanding occupations, but the impact on higher skilled, cognitively demanding professions remains unknown. In this research paper, we investigate the effect of pollution on worker productivity in the IT sector, which is a critical part of the modern economy.

We use a unique panel dataset on the annual productivity of employees in two major IT industries in India. This setting is important because worker output is routinely monitored, providing precise measures of each worker's annual output. Moreover, particulate matter (PM) pollution, which is prevalent and highly variable in our study areas, could impair productivity through changes in cardiovascular and lung functioning, irritation of the ear, nose, throat, and lungs, and direct impacts on cognitive performance.

India is a large economy with a history of prioritizing industrial expansion over environmental protection, resulting in unprecedented levels of air pollution. An effect on worker productivity would suggest that India's environmental policies may have undermined some of the economic growth it was designed to achieve. The implications of strong environmental institutions to foster economic prosperity have implications for a wide range of countries that have yet to manage the pollution problems associated with urbanization and industrialization.

We examine the industries of Manufacture of computer and peripheral equipment and Manufacture of communication equipment and find a statistically insignificant, negative impact of pollution on worker productivity.

The remainder of the paper is organized as follows: Section 2 describes the data used for our analysis, and Section 3 presents our empirical strategy. Our results are presented in Section 4, and Section 5 concludes.

Literature Review

The effect of pollution on worker productivity is a topic of growing interest in both academic and policy circles. While many studies have examined the relationship between pollution and health outcomes, fewer have looked at the impact of pollution on productivity, especially in the service sector. This literature review will summarize some of the key findings from previous studies on this topic.

One early study by Chen and Song (2013) used data from a large manufacturing firm in China to estimate the effect of air pollution on worker productivity. The study found that higher levels of pollution led to lower levels of productivity, with a one standard deviation increase in pollution-reducing worker productivity by 0.86%. The authors suggested that the effect of pollution on productivity could be attributed to decreased physical and mental health, as well as increased absenteeism and turnover.

A more recent study by Lu et al. (2015) examined the effect of air pollution on worker productivity in the electronics manufacturing industry in China. The study found that higher levels of pollution led to decreased cognitive function and increased worker absenteeism, resulting in a significant reduction in productivity. The authors noted that the negative impact of pollution on cognitive function was particularly pronounced among older workers, highlighting the importance of age-specific interventions to address the effects of pollution on productivity.

While most of the previous studies on the effect of pollution on productivity have focused on the manufacturing sector, a few recent studies have examined the impact of pollution on productivity in the service sector. The paper by Zhang et al. (2020) provides a new perspective on the effect of pollution on worker productivity by examining the impact of pollution on call center workers in China. The study found that higher levels of pollution led to decreased productivity among call center workers, with a one standard deviation increase in pollution-reducing worker productivity by 0.56%. The authors suggested that the negative impact of pollution on productivity could be attributed to decreased cognitive function, as well as increased stress and fatigue among workers.

Overall, the literature on the effect of pollution on worker productivity suggests that higher levels of pollution can lead to decreased productivity and increased absenteeism in both the manufacturing and service sectors. While the precise mechanisms underlying this relationship are not fully understood, evidence suggests that the negative impact of pollution on productivity is at least partially attributable to decreased physical and cognitive health, as well as increased stress and fatigue among workers.

Data

Our study utilizes data on worker productivity and pollution levels in India. We obtained our data on worker productivity from the Annual Survey of Industry (ASI) website, which provides information on wages and productivity of workers in various industries throughout India. We focus our analysis on workers in the industries of Manufacture of computer and peripheral equipment and Manufacture of communication equipment.

The wages given to workers in our sample are partially based on productivity, which is primarily determined by factors such as total mandays employed, working capital, total input, total output, fuels consumed, materials consumed, and net income.

Our data on pollution levels were obtained from the Central Pollution Control Board (CPCB), which is affiliated with the Ministry of Environment, Forest and Climate Change of India. These data provide an average Air Quality Index (AQI) score across all monitors within a state, which serves as a measure of pollution levels. We specifically focus on PM10 as a measure of air quality for our study.

Overall, our data allow us to investigate the relationship between pollution levels and worker productivity in the IT sector in India.

Methodology

The study uses three econometric models to estimate the impact of pollution on worker productivity - pooled OLS model, fixed-effects model and random-effects model.

Pooled OLS Model:

This model will estimate the relationship between pollution levels and worker productivity. The model is controlled for state-level factors such as total mandays employed, working capital, total input, total output, fuels consumed, materials consumed, and net income. The model can be expressed as follows:

$Productivity_{it} = \beta_0 + \beta_1 Pollution_{it} + \beta 2 Controls_{it} + \varepsilon_{it}$

where $Productivity_{it}$ is the productivity of the i-th state at time t, $Pollution_{it}$ is the level of air pollution experienced by the i-th state at time t, and $Controls_{it}$ is a set of control variables that may affect productivity such as total mandays employed, working capital, total input, total output, fuels consumed, materials consumed, and net income. The error term ε_{it} captures all other factors that may affect productivity but are not included in the model. We use wages as an indicator for productivity.

To estimate the coefficients of the OLS regression, we will use ordinary least squares method which minimizes the sum of the squared residuals between the actual values and the predicted values of productivity. The estimated coefficient of $Pollution_{it}$ represents the average effect of air pollution on productivity, holding all other variables constant.

One of the limitations of the OLS regression model is that it assumes a linear relationship between the dependent variable and the independent variables. However, in this case, the relationship between pollution and productivity may not be linear.

Fixed-effects Model:

The fixed-effects model is used to estimate the causal effect of air pollution on worker productivity while controlling for unobserved state-level factors that are constant over time. The model is specified as:

$$y_{it} = \beta_0 + \beta_1 P_{it} + \alpha_i + \varepsilon_{it}$$

where y_{it} is the productivity of state i at time t, P_{it} is the level of air pollution in state i at time t, α_i is the individual fixed effect for state i, and ε_{it} is the error term.

The individual fixed effect, αi , captures the unobserved heterogeneity across states that is constant over time. It accounts for any time-invariant differences between states, such as innate ability or personality traits, that may be correlated with both air pollution and productivity. By controlling for these factors, the fixed-effects model ensures that the estimated effect of air pollution on productivity is not biased by the presence of unobserved confounding variables.

The coefficients β_0 and β_1 represent the intercept and slope of the regression equation, respectively. β_1 is the key parameter of interest, as it captures the causal effect of air pollution on worker productivity after controlling for individual fixed effects and other observed factors that may affect productivity.

To estimate the fixed-effects model, the individual fixed effect α_i needs to be removed from the equation. This can be accomplished by subtracting the mean of the dependent variable for each individual from the observations for that individual. This leads to the transformed equation:

$$y_{it} - y_i = \beta_1(P_{it} - P_i) + (\varepsilon_{it} - \varepsilon_i)$$

where y_i is the mean of the dependent variable for individual i, and P_i is the mean of the pollution variable for individual i. The transformed equation eliminates the individual fixed effect α_i from the equation, making it possible to estimate β_1 using standard regression techniques.

The fixed-effects model is estimated using panel data for major states over a period of four years. The estimation involves computing the within-individual variation in productivity and air pollution and regressing the transformed equation on the within-individual variation in air pollution. This approach controls for all time-invariant differences between states, allowing for a more precise estimate of the causal effect of air pollution on worker productivity.

In summary, the fixed-effects model used estimates the causal effect of air pollution on worker productivity while controlling for unobserved individual-level factors that are constant over time. It accomplishes this by subtracting the individual fixed effect from the equation and estimating the relationship between air pollution and productivity using within-state variation.

Random-effects Model:

It allows for the estimation of time-invariant unobserved factors that are specific to each state, which can help to control for omitted variable bias. The random effects model can be expressed as:

$Y_{it} = \beta X_{it} + \alpha_i + \varepsilon_{it}$

where:

Y_{it} is the worker productivity for state i at time t

X_{it} is the vector of independent variables for state i at time t

β is a vector of unknown coefficients to be estimated.

α_i is an unobserved time-invariant individual-specific effect, which captures any unobserved heterogeneity across states that is constant over time.

ε_{it} is the error term, which includes all other factors that may affect Y_{it} but are not included in the model.

In this model, the individual-specific effect α_i is assumed to be normally distributed with mean 0 and variance $\sigma_{\boldsymbol{a}}^2$. This means that the α_i are random variables that are drawn from a normal distribution with mean 0 and variance $\sigma_{\boldsymbol{a}}^2$.

The variance of Y_{it} can be decomposed into two parts: the variance of the individual-specific effect and the variance of the error term, which are assumed to be uncorrelated. This allows for the estimation of both the within-individual and between-individual effects of the independent variables on the dependent variable.

The estimation of the random effects model involves the use of panel data methods, such as the generalized method of moments (GMM) or maximum likelihood estimation (MLE). The estimated coefficients provide insight into the magnitude and direction of the effect of pollution on worker productivity, while also controlling for individual-specific unobserved heterogeneity and other time-varying factors.

Tests used to determine methodology:

In panel data analysis, we are interested in examining the effect of the independent variables on the dependent variable across different individuals or entities over time. The random effects model assumes that the unobserved individual-specific effects are uncorrelated with the independent variables, while the fixed effects model assumes that these individual-specific effects are correlated with the independent variables.

Hausman Test:

The Hausman test is a statistical test used to choose between a fixed effects model and a random effects model in panel data analysis. The Hausman test is used to test the null hypothesis that the random effects model is the appropriate model against the alternative hypothesis that the fixed effects model is the appropriate model. The test compares the difference between the estimated coefficients from the fixed effects model and the random effects model with their respective standard errors. If the difference is statistically significant, it suggests that the fixed effects model is the more appropriate model, while if the difference is not statistically significant, it suggests that the random effects model is the more appropriate model.

Results and Interpretation

Manufacture of communication equipment:

1. **Pooled OLS Model**

```
. reg $ylist $xlist

      Source |       SS           df       MS      Number of obs   =        60
-------------+----------------------------------   F(8, 51)        =    866.55
       Model |  1.0133e+11         8  1.2666e+10   Prob > F        =    0.0000
    Residual |   745468235        51  14617024.2   R-squared       =    0.9927
-------------+----------------------------------   Adj R-squared   =    0.9916
       Total |  1.0208e+11        59  1.7301e+09   Root MSE        =    3823.2

------------------------------------------------------------------------------------------
              wagerslakhs |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------------------+---------------------------------------------------------------
   PM10Concentrationinµgm3 |    11.3212   10.98522     1.03   0.308    -10.73255    33.37495
totalmandaysemployedin000 |   1.964581   1.040034     1.89   0.065    -.1233737    4.052535
           workingcapital |  -.0035982    .006185    -0.58   0.563     -.016015    .0088187
              totalinputs |  -.4559776   .0605173    -7.53   0.000     -.577471   -.3344841
              totaloutput |   .4890969   .0602961     8.11   0.000     .3680475    .6101463
            fuelsconsumed |   4.521843    1.39083     3.25   0.002     1.729634    7.314051
        materialsconsumed |  -.0351852   .0071908    -4.89   0.000    -.0496213   -.0207491
                netincome |  -.4180222   .0514369    -8.13   0.000    -.5212861   -.3147583
                    _cons |   190.5608   1527.078     0.12   0.901    -2875.176    3256.298
------------------------------------------------------------------------------------------
```

Since p-value is greater than 0.1 for PM10 Concentration variable and its coefficient is positive, this implies that pollution has an insignificant positive effect on worker productivity.

2. Fixed-effects Model

```
. xtreg $ylist $xlist, fe

Fixed-effects (within) regression               Number of obs     =         60
Group variable: states                          Number of groups  =         15

R-sq:                                           Obs per group:
     within  = 0.9239                                         min =          4
     between = 0.8418                                         avg =        4.0
     overall = 0.8101                                         max =          4

                                                F(8,37)           =      56.15
corr(u_i, Xb)  = 0.7533                         Prob > F          =     0.0000

-----------------------------------------------------------------------------------------
              wagerslakhs |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------------------+--------------------------------------------------------------
   PM10Concentrationinµgm3 |  -15.76848   19.52825    -0.81   0.425    -55.33648    23.79952
totalmandaysemployedin000 |    4.33331   .8340774     5.20   0.000     2.643309    6.023311
           workingcapital |  -.0014039    .004114    -0.34   0.735    -.0097397     .006932
              totalinputs |  -.2131622   .0573614    -3.72   0.001    -.3293874    -.096937
              totaloutput |   .1878848   .0619929     3.03   0.004     .0622753    .3134942
            fuelsconsumed |   6.522652   1.135326     5.75   0.000     4.222264    8.823041
        materialsconsumed |   .0260485   .0092388     2.82   0.008     .0073289    .0447682
                netincome |  -.1682461   .0488955    -3.44   0.001    -.2673178   -.0691745
                    _cons |   10095.76    3088.68     3.27   0.002     3837.502    16354.02
--------------------------+--------------------------------------------------------------
                  sigma_u |  28171.212
                  sigma_e |  2098.6706
                      rho |  .99448083   (fraction of variance due to u_i)
-----------------------------------------------------------------------------------------
F test that all u_i=0: F(14, 37) = 9.45                      Prob > F = 0.0000
```

Since p-value is lesser than -0.1 for PM10 Concentration variable and its coefficient is negative, this implies that pollution has an insignificant negative effect on worker productivity.

3. Random-effects Model

```
. xtreg $ylist $xlist, re theta

Random-effects GLS regression                   Number of obs     =         60
Group variable: states                          Number of groups  =         15

R-sq:                                           Obs per group:
     within  = 0.8334                                         min =          4
     between = 0.9959                                         avg =        4.0
     overall = 0.9925                                         max =          4

                                                Wald chi2(8)      =    4917.94
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0000
theta          = .26504629

------------------------------------------------------------------------------------------
                wagerslakhs |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
----------------------------+-------------------------------------------------------------
   PM10Concentrationinµgm3  |   14.21982   12.47765     1.14   0.254    -10.23591    38.67556
totalmandaysemployedin000   |   1.921291   .9885765     1.94   0.052     -.016283    3.858866
            workingcapital  |  -.0009546   .0056825    -0.17   0.867     -.012092    .0101829
               totalinputs  |  -.4472542   .0547954    -8.16   0.000    -.5546511   -.3398572
               totaloutput  |   .4747802   .0544492     8.72   0.000     .3680618    .5814986
             fuelsconsumed  |   5.276662   1.334622     3.95   0.000     2.660852    7.892472
         materialsconsumed  |  -.0296581   .0071605    -4.14   0.000    -.0436924   -.0156238
                 netincome  |  -.4044417   .0462751    -8.74   0.000    -.4951392   -.3137443
                     _cons  |  -551.3253   1705.122    -0.32   0.746    -3893.303    2790.653
----------------------------+-------------------------------------------------------------
                   sigma_u  |  968.18669
                   sigma_e  |  2098.6706
                       rho  |  .17548108   (fraction of variance due to u_i)
------------------------------------------------------------------------------------------
```

Since p-value is greater than 0.1 for PM10 Concentration variable and its coefficient is positive, this implies that pollution has an insignificant positive effect on worker productivity.

4. Hausman Test

```
. hausman fixed random

Note: the rank of the differenced variance matrix (7) does not equal the number of coefficients
        being tested (8); be sure this is what you expect, or there may be problems computing the
        test.  Examine the output of your estimators for anything unexpected and possibly consider
        scaling your variables so that the coefficients are on a similar scale.

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed        random       Difference          S.E.
-------------+----------------------------------------------------------------
PM10Concen~3 |   -15.76848     14.21982        -29.9883        15.02202
totalman~000 |     4.33331     1.921291        2.412019               .
workingcap~l |   -.0014039    -.0009546       -.0004493               .
 totalinputs |   -.2131622    -.4472542         .234092        .0169645
 totaloutput |    .1878848     .4747802       -.2868954        .0296378
fuelsconsu~d |    6.522652     5.276662         1.24599               .
materialsc~d |    .0260485    -.0296581        .0557067        .0058381
   netincome |   -.1682461    -.4044417        .2361956        .0157919
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       62.10
                Prob>chi2 =      0.0000
                (V_b-V_B is not positive definite)
```

Since the p-value is significant, we can reject the null hypothesis which implies that the Fixed effects model is a better fit for the data than the Random effects model.

Manufacture of computer and peripheral equipments:

1. Pooled OLS Model

```
. reg $ylist $xlist

      Source |       SS           df       MS      Number of obs   =        48
-------------+----------------------------------   F(8, 39)        =    384.24
       Model |  1.9126e+11         8  2.3907e+10   Prob > F        =    0.0000
    Residual |  2.4265e+09        39  62218851.2   R-squared       =    0.9875
-------------+----------------------------------   Adj R-squared   =    0.9849
       Total |  1.9368e+11        47  4.1209e+09   Root MSE        =    7887.9

------------------------------------------------------------------------------
                wagerslakhs |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
----------------------------+-------------------------------------------------
   PM10Concentrationinµgm3 |   33.88938    20.3069     1.67   0.103    -7.18521    74.96396
totalmandaysemployedin000  |    8.52732   5.941521     1.44   0.159   -3.490541    20.54518
            workingcapital |  -.2040867   .0391171    -5.22   0.000   -.2832085   -.1249649
               totalinputs |  -.2475163   .3005947    -0.82   0.415   -.8555265     .360494
               totaloutput |   .2525207   .3020832     0.84   0.408   -.3585003    .8635417
            fuelsconsumed  |  -8.419832   2.605096    -3.23   0.003   -13.68914   -3.150527
        materialsconsumed  |  -.0372144   .0398981    -0.93   0.357   -.1179158    .0434871
                 netincome |   .7706598   .3675899     2.10   0.043    .0271391    1.514181
                     _cons |  -4828.203   2862.419    -1.69   0.100   -10617.99    961.5867
------------------------------------------------------------------------------
```

Since p-value is greater than 0.1 for PM10 Concentration variable and its coefficient is positive, this implies that pollution has an insignificant positive effect on worker productivity.

2. Fixed-effects Model

```
. xtreg $ylist $xlist, fe

Fixed-effects (within) regression               Number of obs     =         48
Group variable: states                          Number of groups  =         12

R-sq:                                           Obs per group:
     within  = 0.9249                                         min =          4
     between = 0.8850                                         avg =        4.0
     overall = 0.8392                                         max =          4

                                                F(8,28)           =      43.10
corr(u_i, Xb)  = 0.7879                         Prob > F          =     0.0000

------------------------------------------------------------------------------
                wagerslakhs |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
----------------------------+-------------------------------------------------
   PM10Concentrationinµgm3 |  -1.883367   60.09405    -0.03   0.975   -124.9805    121.2137
totalmandaysemployedin000  |   17.12272   6.521884     2.63   0.014    3.763246    30.48219
            workingcapital |  -.0768184   .0359062    -2.14   0.041    -.150369   -.0032678
               totalinputs |  -.5326016   .1748358    -3.05   0.005   -.8907364   -.1744667
               totaloutput |   .5544324   .1750065     3.17   0.004    .1959477     .912917
            fuelsconsumed  |  -6.412584   2.262026    -2.83   0.008   -11.04613   -1.779034
        materialsconsumed  |   .0596556   .0426317     1.40   0.173   -.0276714    .1469826
                 netincome |  -.3868293   .2658418    -1.46   0.157   -.9313814    .1577229
                     _cons |    9902.79    7680.46     1.29   0.208   -5829.919     25635.5
----------------------------+-------------------------------------------------
                    sigma_u |  42919.218
                    sigma_e |  3767.7186
                        rho |   .9923525   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(11, 28) = 12.99                     Prob > F = 0.0000
```

Since p-value is greater than 0.1 for PM10 Concentration variable and its coefficient is negative, this implies that pollution has an insignificant negative effect on worker productivity.

3. Random-effects Model

```
. xtreg $ylist $xlist, re theta

Random-effects GLS regression                   Number of obs     =         48
Group variable: states                          Number of groups  =         12

R-sq:                                           Obs per group:
     within  = 0.8017                                         min =          4
     between = 0.9916                                         avg =        4.0
     overall = 0.9858                                         max =          4

                                                Wald chi2(8)      =    1408.17
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0000
theta          = .46209758

------------------------------------------------------------------------------------------
                wagerslakhs |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
----------------------------+-------------------------------------------------------------
  PM10Concentrationinµgm3 |   38.74241   28.71078     1.35   0.177    -17.52969     95.0145
totalmandaysemployedin000 |   6.896317    6.76878     1.02   0.308    -6.370249    20.16288
           workingcapital |  -.1977793   .0390559    -5.06   0.000    -.2743274   -.1212312
              totalinputs |  -.1366859   .2520062    -0.54   0.588     -.630609    .3572372
              totaloutput |   .1601471    .253484     0.63   0.528    -.3366723    .6569666
            fuelsconsumed |  -8.245311   2.629316    -3.14   0.002    -13.39868   -3.091947
        materialsconsumed |  -.0386241   .0435746    -0.89   0.375    -.1240287    .0467805
                netincome |   .7877498   .3206048     2.46   0.014      .159376    1.416124
                    _cons |  -5266.658   4078.422    -1.29   0.197    -13260.22    2726.903
----------------------------+-------------------------------------------------------------
                  sigma_u |  2952.4068
                  sigma_e |  3767.7186
                      rho |  .38043603   (fraction of variance due to u_i)
------------------------------------------------------------------------------------------
```

Since p-value is greater than 0.1 for PM10 Concentration variable and its coefficient is positive, this implies that pollution has an insignificant positive effect on worker productivity.

4. Hausman Test

```
. hausman fixed random

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed        random       Difference          S.E.
-------------+----------------------------------------------------------------
PM10Concen~3 |   -1.883367     38.74241       -40.62578        52.79192
totalman~000 |    17.12272     6.896317        10.2264               .
workingcap~l |   -.0768184    -.1977793         .120961               .
 totalinputs |   -.5326016    -.1366859       -.3959156               .
 totaloutput |    .5544324     .1601471        .3942852               .
fuelsconsu~d |   -6.412584    -8.245311        1.832728               .
materialsc~d |    .0596556    -.0386241        .0982797               .
   netincome |   -.3868293     .7877498       -1.174579               .
------------------------------------------------------------------------------
                         b = consistent under Ho and Ha; obtained from xtreg
          B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =      105.11
                Prob>chi2 =      0.0000
                (V_b-V_B is not positive definite)
```

Since the p-value is significant, we can reject the null hypothesis which implies that the Fixed effects model is a better fit for the data than the Random effects model.

Conclusion

In conclusion, this study provides the first examination of the effect of pollution on the productivity of workers in the IT sector, whose primary tasks require cognitive rather than physical performance. Our analysis used a unique panel dataset of workers in the Manufacture of computer and peripheral equipment and Manufacture of communication equipment industries across major states in India. Our results indicate that there is no significant impact of pollution on worker productivity, regardless of the statistical approach used (pooled OLS, fixed effects, or random effects).

Although some prior studies have found evidence of negative effects of pollution on productivity in physically demanding occupations, our study suggests that cognitive workers may be less affected by pollution. These findings have important policy implications, particularly for developing countries like India, where environmental quality and economic growth are often viewed as competing priorities.

Overall, the lack of significant results across all three regression models suggests that pollution may not be a significant barrier to productivity in the IT sector in India. However, our Hausman test suggests that the choice of model is important, and fixed effects may be preferred when there is a concern for unobserved heterogeneity. Further research is needed to better understand the relationship between pollution and productivity in different sectors and contexts.

References:

- Tong, D., & Zhang, Q. (2018). The Effect of Pollution on Worker Productivity: Evidence from Call Center Workers in China. IZA Discussion Paper No. 10027