Disguised Pollution: Industrial Activities in the Dark

Dr Qin Yu, assistant professor of the Department of Real Estate Industrial, National University of Singapore, presented her collaborative research on China’s air pollution during nighttime. Illegal industrial activities polluting the air are hard to detect and inspect by local authorities at night, one of the major air pollution sources in China. These activities motivated Dr Qin’s study.

Dr Qin first distinguished $\text{SO}_2$, the yellow gas with pungent odour, from products of atmospheric effects. According to air pollution readings, a significant rise of $\text{SO}_2$ immediately after sunset on average characterised time patterns of pollution level. In the seasonal pattern of pollution level, there is a negative association between $\text{SO}_2$ and latitude during summer, while it becomes a positive association in winter.

Dr Qin also observed that illegal activities at night become more frequent given that it is largely invisible and inspectors may not be present at this late hour. For firms, regulatory compliance is costly; they will always go to great lengths to circumvent regulatory oversight.

In their empirical analysis, Dr Qin and her colleagues collected hourly pollution data and hourly air quality index (AQI) across 1,583 monitoring stations from 2015 to 2017. Her second data source was high-frequency monitoring data of 147 factories in the three cities of Hebei province and 178 factories in Zhejiang province, both in 2015. For the third source, Dr Qin assessed daily hospital visits on respiratory diseases of 50 hospitals in 33 cities in 2017.

On station-level analysis, Dr Qin and her colleagues adopted difference-in-differences setting with high-dimensional fixed effects. They found that $\text{SO}_2$ increased by 6.5% per hour after sunset in treated stations’ observation monitoring readings. $\text{PM}_{10}$, $\text{PM}_{2.5}$ (contributed by an increase in $\text{SO}_2$ due to secondary effect) and Air quality index (AQI) increased by 3.9%, 2.9% and 4% per hour after sunset in the aforementioned treated stations, respectively. On firm-level analysis, Dr Qin found that disguised pollution is driven by unmonitored small firms. On city-level heterogeneity, city-level disguised pollution is positively correlated with mortality rate.

Further findings show first that the effects of the Ministry of Environmental Protection’s (MEP) site inspection of air pollution do not last long: $\text{SO}_2$ pollution level that was reduced during inspection bounced back to normal after the inspection. Second, there is a tradeoff between economic growth pressure and air pollution reduction as indicated by the lower GDP growth (than previous year) with the higher pollution level. Third, disguised pollution is more intense in areas with high residential density, and tapering off in magnitude after complaints by residents. The two correlations are insignificant in the empirical studies.

Dr Qin also found that $\text{SO}_2$ led to an upsurge in hospital visits for the treatment of respiratory diseases, while there was no effect on visits for diabetes. Cities with disguised pollution witnessed a higher drop in visits for respiratory diseases during inspection time.

Dr Qin’s research uncovered that firms near monitoring stations (targeting heavily polluted industrial areas in cities) continue to engage in disguised pollution at night when the MEP has ceased its monitoring activities. Thus, Dr Qin suggested that instituting a more comprehensive environmental monitoring system in China that not only covers large firms in the key sectors, but also small firms in these $\text{SO}_2$ intensive industries is helpful to generate significant benefits to the whole country.

This summary reflects the personal opinion(s) of the seminar speaker(s) and should in no way be attributed to the East Asian Institute.