

Unpolluted Decisions: Air Pollution and Judicial Outcomes in China

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Abstract

Judicial outcomes should not be influenced by factors that have no bearing on legal decisions, but studies have shown that judges can be affected by extraneous variables such as weather, sports events, and food consumption. Employing the universe of drug offense court decisions in five major Chinese cities between 2014 and 2015, we study whether air pollution and temperature affect sentencing outcomes in China, where air pollution is severe and judges have considerable discretion in sentencing drug cases. We find that Chinese criminal judges are not at all affected by pollution or temperature changes. One standard deviation change in air pollutant $PM_{2.5}$ level may change the sentence length by no more than 2% of its standard deviation with over 95% probability. Further analysis shows that our results are robust to a variety of specifications and a battery of robustness checks. Our findings suggest that judicial rulings are not always swayed by extraneous factors, and we discuss conditions under which public officials are more likely to be shielded from these non-legal factors.

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1 Introduction

Judges and other public officials make high-stake decisions every day. Existing research suggests that even highly trained public officials in advanced democracies could be affected by various “extraneous factors” that should have no bearing on legal decisions such as weather (Heyes and Saberian 2019), food consumption (Danziger, Levav and Avnaim-Pesso 2011), and outcomes of home sporting events (Eren and Mocan 2018).

Public servants in developing countries like China may face even more difficulties at work compared with those working in advanced economies. They might have to serve a larger number of constituents, cater to the need of superiors, and work in more extreme (e.g., hot, cold or polluted) environment. Air pollution has been a particularly serious problem in China. In many Chinese cities the fine particulate matter (PM_{2.5}) level often exceeds what the World Health Organization (WHO) deems safe.

Studies have shown how pollution might affect people’s physical health and cognitive acuity. Exposure to air pollutant such as PM_{2.5} could result in changes in blood pressure, irritation in the ear, nose, and lungs as well as mild headaches (Chang et al. 2016). Recent studies also link air pollutants with cognition and ability to concentrate and make decisions. Heyes, Neidell and Saberian (2016) suggest that higher levels of PM_{2.5} hinders cognition and induces a fall in risk appetite among traders, resulting in lower return of the S&P 500. Exposure to pollutants is found to have negative effects on cognitive performance during high-stake exams in Israeli (Ebenstein, Lavy and Roth 2016) and Iranian high schools (Amanzadah, Vesal and Fatemi 2019). In an experimental study, office workers assigned to offices with higher air quality scored higher in “cognitive function” tests compared to workers assigned to the control condition with worse air quality (Allen et al. 2016).

Given existing works on air pollutants’ impact on cognitive capacity and how judges are affected by various extraneous factors in several contexts, one might expect to find that air pollution to have a strong impact on Chinese judges’ ruling. China has a system of “fragmented authoritarianism,” where authority and power is often fragmented along administrative and geographic lines (Lieberthal and Oksenberg 1988). In the criminal justice system, local judges have considerable discretion in making decisions (Hou and Truex 2019).

To test whether air pollution impacts judges' decisions, we employ the universe of drug offense cases in five major Chinese cities (i.e., Beijing, Chengdu, Guangzhou, Shanghai and Shenyang) between 2014 and 2015. We estimate the effect of air pollution (and temperature) on sentencing outcomes. Our results show that Chinese judges are not at all affected by pollution or temperature changes when ruling drug offense cases: a $50 \mu\text{g}/\text{m}^3$ change in the level of air pollutant $\text{PM}_{2.5}$ may change sentence lengths of drug cases by a statistically insignificant amount of no more than 0.55 months (about 17 days) with over 95% probability.

Why do Chinese judges seem to perform more professionally compared with their peers in advanced democracies? We propose a few possible mechanisms that merit more systematic testing in the future. First, recent research shows that career incentive of reaching the top is a powerful determinant of bureaucrat performance (Bertrand et al. Forthcoming). Chinese judges face a unique set of career incentives that differ from other contexts. Chinese judges' primary career motivation is to move up the ladder, and promotion is granted to those who obtain high scores on a set of quantitative evaluations (Kinkel and Hurst 2015). Targets such as "low first-instance appeal rate," "low first-instance reversed and remanded rate," and "low rate of judgment corrected on cases at first-instance level" all incentivise judges not to deviate from the official sentencing guidelines.¹ Second, we posit that public sector jobs in China are more competitive than in other contexts. In the Chinese College Student Survey, Jia and Li (2019) find that government and public organizations positions are the most sought after jobs among Chinese college graduates (see their Table A3). Chinese public servants also report high level of meritocracy. Boittin, Distelhorst and Fukuyama (2017) compare attitudes between Chinese officials with U.S. federal employees. They find that Chinese bureaucrats are more likely to believe that promotions are based on merits and their work unit is more likely and able to recruit people with the right skills.

¹Judges in some other systems are elected locally and do not have the career trajectory to reach more senior-level positions. For instance, the only requirement to become justices in local courts in New York is that they are elected. Many do not have a law degree and they will not be able to move up. See Glaberson, William, "In Tiny Courts of N.Y., Abuses of Law and Power," *The New York Times*, September 25, 2006, <https://www.nytimes.com/2006/09/25/nyregion/25courts.html>, last accessed October 17, 2019.

2 Background

Particulate Matters and Air Quality in China

PM_{2.5} refers to Particulate Matter (PM) smaller than 2.5 micrometers (μm). Unlike many other pollutants, Particulate Matter 2.5 (PM_{2.5}) consists of solid and liquid particles, stays in the air longer, and readily penetrates buildings, indoors, and human nose and throat. Exposure to PM_{2.5} causes health risks including respiratory difficulties, changes in blood pressure, and elevated risks of heart disease, stroke and lung cancer (Chang et al. 2016; Ebenstein et al. 2017). Air pollution can also severely affect one’s cognition and decision making ability (Amanzadah, Vesal and Fatemi 2019; Ebenstein, Lavy and Roth 2016; Heyes, Neidell and Saberian 2016). According to Kahn and Li (2019), there was no air filtration system installed in China’s court rooms prior to 2019, and judges have been exposed to PM_{2.5} at work.

China’s PM concentration has been much higher than that of the developed economies. The average PM₁₀ level is more than five times the World Health Organization (WHO) standard between 2004 and 2012 (Ebenstein et al. 2017). Even though the Chinese government has started to implement many policies to combat air pollution in recent years, China’s air quality continues to worsen: the average PM_{2.5} reading in 28 cities in the key pollution control regions remains 10 times more than WHO’s safe level in early 2019.² In our paper, we focus on PM_{2.5} because the particles are much smaller than PM₁₀ and their negative effects on human health are more severe (Cao, Kostka and Xu Forthcoming).

Courts, the Criminal Law, and Drug Offense Cases

China’s legal system has four-levels: the Supreme People’s court (SPC), provincial high courts, intermediate courts (municipal-level), and basic courts (county and district-level). In our study, we focus on drug-related cases ruled by basic and intermediate courts.

²See “China’s air quality worsens as national PM2.5 level rises 5.2 per cent in January and February,” *South China Morning Post*, March 21, 2019, <https://www.scmp.com/news/china/politics/article/3002655/chinas-air-quality-worsens-national-pm25-level-rises-52pc>, last accessed February 2, 2020.

China has a serious drug problem: the recreational drug market is the second largest in the world, with a market size of \$82 billion.³ Drug cases constituted 10.54% of all criminal cases in 2016, and this number has grown four times faster than other criminal cases (Hou and Truex 2019).

The sentencing guidelines for drug-related offenses are clearly stipulated in China's Criminal Law.⁴ Article 347 maps different drug quantities clearly to sentencing outcomes. Defendants found with more than 50 grams of heroin, methamphetamine, and other types of drugs of similar severity are "to be punished by fifteen years of fixed-term imprisonment, life imprisonment or death sentence." Intermediate quantities (10 to 50 grams) yield a minimum sentence of seven years, and smaller quantities (less than 10 grams) are to be sentenced to no more than seven years. Other factors that should affect sentencing severity are: whether the defendant was involved in international drug trafficking, led or was involved in a criminal group, used arms or violence, or encouraged minors to participate in the crime. There are also special cases (e.g., defendant's pregnancy, mental illness, or assistance with local law enforcement in solving cases) where defendants could receive a lighter sentence. Besides the Criminal Law, judges and lawyers also frequently consult with several other relevant Supreme People's Court (SPC) documents and judicial interpretations of the Criminal Law. Finally, there can be provincial and other local legal regulations regarding drug crimes especially in regions that are heavily affected by the drug problem.

3 Data

All court decisions data come from the website "China Judgments Online" (中国裁判文书网), administered by the Supreme People's Court (SPC). As of September 28, 2019, over 77 million court documents are uploaded on the website, including over 7.6 million criminal cases. For this paper, we scraped all first-instance court drug cases on the smuggling,

³See Levin, Dan, "Despite a Crackdown, Use of Illegal Drugs in China Continues Unabated," *The New York Times*, January 24, 2015, <https://www.nytimes.com/2015/01/25/world/despite-a-crackdown-use-of-illegal-drugs-in-china-continues-unabated.html>, last accessed November 3, 2019.

⁴See National People's Congress website for full text, at http://http://www.npc.gov.cn/wxzl/wxzl/2000-12/17/content_4680.htm, last accessed February 2, 2020.

trafficking, transporting, or manufacturing of heroin or methamphetamine, and judged by basic and intermediate courts in five cities: Beijing, Chengdu, Guangzhou, Shanghai and Shenyang, resulting in 8,888 cases between 2014 and 2015.⁵ A U.S. consulate is located in each of the five cities and collects reliable daily data on air quality.

The primary outcome variable is sentencing severity. If a defendant receives a fixed-term sentence, we coded the length of the sentence in months. Following [Hou and Truex \(2019\)](#), we convert other punishments to months based on an existing standard from the literature: a life sentence equals to 264 months, a suspended death sentence to 288 months, and a death sentence to 360 months. We include a number of characteristics of the case, including the quantities of heroin and/or methamphetamine involved, whether the defendant had previous convictions, and whether he was viewed as having a “good attitude” during the trial.

PM_{2.5} concentration (measured in $\mu g/m^3$) level of Beijing, Chengdu, Guangzhou, Shanghai and Shenyang are collected by the US consulates and downloaded from [Liang et al. \(2016\)](#).⁶ We average hourly PM_{2.5} level between 7am and 7pm for each city each day between January 1st, 2014 and December 31st, 2015. Other meteorological data include temperature (in Celsius) and humidity (in percentage).

We match the environment data to the decision day of each drug case and summarize the data in Table 1. We present descriptive evidence for the relationship between judicial outcomes and air pollution in Figure 1. Figure 1 shows a scatter plot of the sentence length of each case against the quantity of drug involved in the case. Each case is represented with a dot with blue color if the case is decided on a day where the PM_{2.5} level is below the median level of that city during the time period we study, and red if it is above the median. The dashed lines that divide the plot into nine areas represent the literal interpretation of the Criminal Law described in the previous section. Specifically, the areas in the bottom left, middle, top right represent the recommended sentence lengths (below seven years, seven to fifteen years, and above fifteen years) for the corresponding drug quantities (below 10 grams,

⁵The 8,888 cases include single-defendant cases with positive heroin and/or methamphetamine quantities and exclude cases that only involve drug possession.

⁶Downloaded from <https://archive.ics.uci.edu/ml/datasets/PM2.5+Data+of+Five+Chinese+Cities>, last accessed August 28, 2019.

between 10 and 50 grams, and above 50 grams) in the Criminal Law.⁷ The fitted blue and red solid lines (with confidence intervals) then compare sentencing severity for different drug quantities on days with smaller or larger pollution. We cannot statistically discern any difference for any of the drug quantity ranges.

On the other hand, there are 305, or 3.4% of the cases that fall outside the recommended ranges. We further test if pollution affects when and how judges use discretion as a robustness check in the next section.

Table 1: Summary Statistics: Main Variables

	Mean	Standard deviation	No. Obs.
Drug quantity (gram)	37.19	701.8	8,888
Sentence length (month)	24.95	47.17	8,888
Defendant is recidivist (%)	33.24	47.11	8,888
Defendant exhibits good attitude (%)	95.17	21.43	8,888
PM _{2.5} level ($\mu g/m^3$)	61.05	50.48	8,788
Humidity (%)	60.34	18.25	8,879
Temperature (Celsius)	18.51	9.516	8,888

Notes: Summary statistics of the main variables. Drug quantity, sentence length and defendant characteristics are downloaded from “China Judgments Online” and parsed from raw court ruling documents. Air pollution, temperature and humidity data come from [Liang et al. \(2016\)](#).

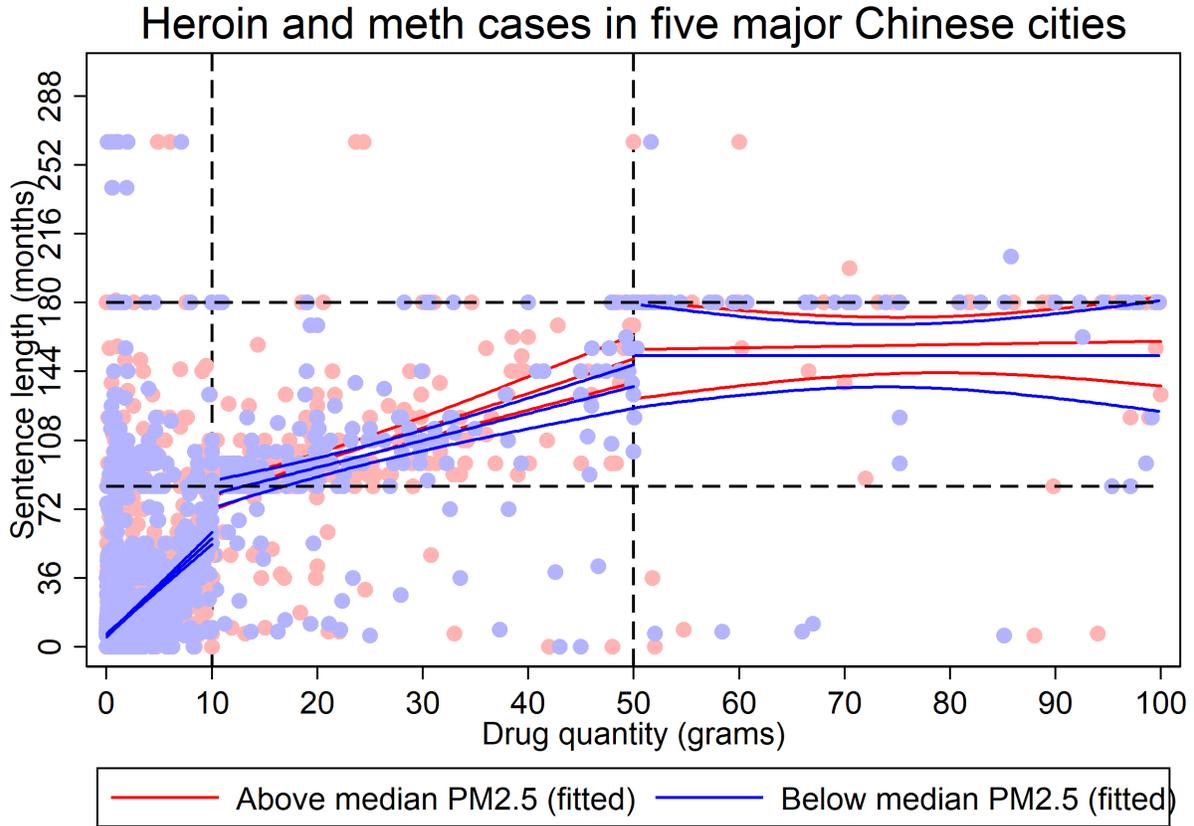
4 Specification and Results

We aim to explore whether judicial outcomes are affected by changes in weather and pollution conditions. Weather and pollution conditions are not affected by judicial decisions and are therefore exogenous to the outcome. Further, selections of which cases to be judged on which day in Chinese courts typically occur well in advance and thus are not plausibly related to the weather and pollution conditions of the day of decision. Our preferred specification thus is a simple OLS regression:

$$SentenceLength_{ijct} = \beta X_i + \gamma Z_{ct} + \lambda_j + \eta_t + \epsilon_{ijct}$$

⁷We follow [Hou and Truex \(2019\)](#) to interpret the recommended sentence to be between seven and fifteen years for drug quantities between 10 and 50 grams.

Figure 1: Summary statistics: Drug cases and PM_{2.5} levels



Notes: This figure presents descriptive evidence for the relationship between judicial outcomes and air pollution. Each case is represented with a dot with blue color if the case is decided on a day where the PM_{2.5} level is below the median of that city, and red if it is above the median. The areas (divided by dashed lines) in the bottom left, middle, and top right represent the recommended sentence lengths (below seven years, seven to fifteen years, and above fifteen years) for the corresponding drug quantities (below 10 grams, between 10 and 50 grams, and above 50 grams) in the Criminal Law. Lines are linear fits for each drug quantity range with confidence intervals.

where $SentenceLength_{ijct}$ represents judge j 's decision on case i at time t (day) in city c . X_i are characteristics of the case including the amount of drugs involved, whether the defendant is a recidivist, and whether the defendant exhibits "good attitude" during the judicial process. Z_{ct} are the weather and pollution variables of interest. These variables include PM_{2.5} level, humidity and temperature at the city-day level. λ_j and η_t are a full set of judge fixed effects (using judge names) and year fixed effects. Note that city fixed effects are not identified after controlling for judge fixed effects.

Table 2 presents our results from various specifications. Because case selections are plausibly unrelated to daily pollution and weather conditions, we first simply regress sentence lengths of each case on the PM_{2.5} level, humidity and temperature. Without controlling for case characteristics, we find a relatively precise zero estimate for the effect of pollution on judge decisions—the 95% confidence interval for the coefficient (reported in brackets) on PM_{2.5} level indicates a -0.0068 to 0.02 months change in sentence length for 1 unit change of PM_{2.5} level. In other words, for a 50-unit change in PM_{2.5} level, or roughly one standard deviation in our sample, one would expect the change in sentence length to be within -0.34 to 1 months with 95% probability.

We then control for characteristics of the cases as well as fixed effects at the year, city and judge level in columns 2-5. Coefficients on case characteristics show expected signs and are consistent across different specifications. In our preferred specification in column 5, we find that a one standard deviation change ($50 \mu g/m^3$) in PM_{2.5} may change sentence lengths of drug cases by no more than 0.55 (0.011×50) months with over 95% probability. Coefficients for other weather variables such as humidity and temperature are also statistically and substantively insignificant.

4.1 Extreme pollution does not affect judgments

One might posit that, rather than air pollution level linearly affecting judges' decision making, only extreme pollution affects judges' decision. We test this hypothesis by including an indicator variable for days when PM_{2.5} level is greater than $100 \mu g/m^3$. It is also possible that judges' experience of pollution anchors only on recent levels of pollution in the city. In other words, a relatively more/less polluted day within a certain period of time might affect

Table 2: Main Specifications: Effect of Pollution on Judicial Outcomes

	1	2	3	4	5
PM _{2.5} level	0.0068 (0.0069)	0.0096* (0.0057)	0.010* (0.0057)	-0.0044 (0.0059)	0.000094 (0.0053)
Humidity	[-0.0068,0.020] -0.023 (0.019)	[-0.0016,0.021] -0.018 (0.016)	[-0.0012,0.021] -0.022 (0.016)	[-0.016,0.0073] 0.044** (0.017)	[-0.010,0.011] 0.024 (0.016)
Temperature	[-0.060,0.014] -0.072* (0.038)	[-0.048,0.013] -0.067** (0.031)	[-0.052,0.0088] -0.067** (0.031)	[0.0099,0.078] -0.051 (0.032)	[-0.0063,0.054] 0.0050 (0.029)
Log(Drug quantity)	[-0.15,0.0017] 0.001	[-0.13,-0.0055] 11.6***	[-0.13,-0.0060] 11.6***	[-0.11,0.012] 11.7***	[-0.052,0.062] 10.7***
Defendant is recidivist		(0.22)	(0.22)	(0.22)	(0.20)
Defendant exhibits good attitude	[11.1,12.1] 5.35***	[11.2,12.1] 5.35***	[11.1,12.0] 5.36***	[11.3,12.1] 5.32***	[10.3,11.1] 5.23***
	(0.58)	(0.58)	(0.58)	(0.58)	(0.51)
	[4.20,6.49] -35.7***	[4.20,6.49] -35.7***	[4.21,6.50] -35.6***	[4.18,6.45] -34.7***	[4.22,6.24] -28.0***
	(1.43)	(1.43)	(1.43)	(1.42)	(1.30)
Adjusted R^2	[-38.5,-32.9]	[-38.5,-32.9]	[-38.4,-32.8]	[-37.5,-31.9]	[-30.5,-25.4]
No. Obs.	0.001	0.320	0.321	0.335	0.530
Year fixed effects	8429	8429	8429	8429	8427
City fixed effects		Yes	Yes	Yes	Yes
Judge fixed effects		Yes	Yes	Yes	Yes

Notes: This table reports OLS estimates of the effect of air pollution on judicial outcomes. Outcome variable is measured by sentence length in number of months. PM_{2.5} level is averaged across hourly data between 7am and 7pm each day. Drug quantity is measured in grams. All regressions exclude cases where drug quantity exceeds 50 grams. Standard errors are in parentheses. 95% confidence intervals are in brackets. *** p<0.01, ** p<0.05, * p<0.1

judges' decision more than the variation of pollution level over the year. To further test this hypothesis, we residualize $PM_{2.5}$ levels by de-meaning within city-months and include the residualized $PM_{2.5}$ levels in our preferred specification.

We report these results in Table 3. In the first specification (column 1), we find that coefficients for weather and pollution variables all remain statistically insignificant. Having an extremely polluted day with $PM_{2.5}$ level greater than $100\mu g/m^3$ may only affect sentence lengths of drug cases by no more than 1.5 months with over 95% probability (column 1). In the second specification (column 2), we again find the coefficient for “surprisingly” high pollution within a city-month to be statistically insignificant. A one standard deviation increase ($44\mu g/m^3$) in within-city-month $PM_{2.5}$ level may only affect sentence lengths of drug cases by no more than 0.57 (0.013×44) months with over 95% probability.

4.2 Neither light nor severe cases are affected by pollution

According to the Criminal Law, cases involving drug amount fewer than 10 grams are less severe cases, and defendants should be sentenced to seven-year fixed term or lower. It is possible that cases with lower stake can be affected more by judges' mood and other extraneous factors. On the other hand, cases involving drug amount larger than 50 grams are serious cases and defendants should be sentenced to 15 years of fixed term or more. In our main specifications, these cases are excluded because cases of higher salience are under more scrutiny by the court leadership and media. It is also possible that more discretion are exerted at these more salient cases, leading to more exposure to extraneous factors.

Table 4 presents evidence that including cases of either lower or higher salience does not change our finding that air pollution and temperature do not affect drug case sentencing outcomes. In the first column, we re-estimate our preferred model but restrict sample to cases with drug quantities less than 10 grams. In the second column, the same model is estimated on the full sample including cases with drug quantities greater than 50 grams. In both specifications, we again report statistically and substantively insignificant coefficients for pollution and weather. A 50-unit change in $PM_{2.5}$ may only change the sentencing outcome by no more than 0.45 months and 0.7 months with over 95% probability, respectively, for each sample.

Table 3: Robustness: Extreme Pollution

	1	2
PM _{2.5} > 100	0.025 (0.75) [-1.45,1.50]	
Residualized PM _{2.5}		-0.0023 (0.0057) [-0.013,0.0088]
Humidity	0.024 (0.015) [-0.0062,0.054]	0.025 (0.016) [-0.0053,0.056]
Temperature	0.0051 (0.029) [-0.051,0.061]	0.0054 (0.028) [-0.049,0.060]
Log(Drug quantity)	10.7*** (0.20) [10.3,11.1]	10.7*** (0.20) [10.3,11.1]
Defendant is recidivist	5.23*** (0.51) [4.22,6.24]	5.23*** (0.51) [4.22,6.24]
Defendant exhibits good attitude	-28.0*** (1.30) [-30.5,-25.4]	-28.0*** (1.30) [-30.5,-25.4]
Adjusted R^2	0.530	0.530
No. Obs.	8427	8427
Year fixed effects	Yes	Yes
Judge fixed effects	Yes	Yes

Notes: This table reports robustness checks of the effect of extreme air pollution on judicial outcomes. Outcome variable is measured by sentence length in number of months. PM_{2.5} level is averaged across hourly data between 7am and 7pm each day. “PM_{2.5} > 100” is an indicator for whether the daily average PM_{2.5} level is greater than 100 $\mu\text{g}/\text{m}^3$. “Residualized PM_{2.5}” is the residual after de-meaning PM_{2.5} levels within city-months. Drug quantity is measured in grams. All regressions exclude cases where drug quantity exceeds 50 grams. Standard errors are in parentheses. 95% confidence intervals are in brackets. *** p<0.01, ** p<0.05, * p<0.1

Table 4: Robustness: Drug Cases of Different Severity

	Quantity<10g	Incl. quantity>50g
PM _{2.5} level	0.00012 (0.0045) [-0.0087,0.0090]	0.0021 (0.0059) [-0.0095,0.014]
Humidity	0.011 (0.013) [-0.015,0.037]	0.021 (0.017) [-0.013,0.055]
Temperature	0.027 (0.025) [-0.021,0.076]	-0.012 (0.032) [-0.076,0.052]
Log(Drug quantity)	5.18*** (0.20) [4.79,5.57]	13.0*** (0.20) [12.6,13.4]
Defendant is recidivist	4.71*** (0.44) [3.85,5.56]	4.80*** (0.57) [3.68,5.93]
Defendant exhibits good attitude	-22.4*** (1.27) [-24.9,-19.9]	-29.6*** (1.35) [-32.2,-26.9]
Adjusted R^2	0.440	0.746
No. Obs.	7973	8777
Year fixed effects	Yes	Yes
Judge fixed effects	Yes	Yes

Notes: This table reports robustness checks of the effect of air pollution on judicial outcomes with low and high drug quantities. Column 1 includes only cases with drug quantities less than 10 grams. Column 2 includes all drug cases. Outcome variable is measured by sentence length in number of months. PM_{2.5} level is averaged across hourly data between 7am and 7pm each day. Drug quantity is measured in grams. Standard errors are in parentheses. 95% confidence intervals are in brackets. *** p<0.01, ** p<0.05, * p<0.1

4.3 Judge exercises discretion but unaffected by pollution

As a final robustness check, we exploit the variation in sentencing outcomes that are outside the ranges recommended by the Criminal Law, as illustrated in Figure 1. In 3.4% of the cases, we find that the sentence lengths fall outside the recommended ranges by the Criminal Law. While such differences can be attributed to many factors (e.g., characteristics of the defendant, local legal regulations regarding drug crimes, differences in legal representation), we are interested in exploring whether judges' decisions that depart from the Criminal Law recommendation might be affected by pollution and weather.

Here, we define discretion as when a judge's decision falls outside of the Criminal Law recommendation. In our first specification, we ask whether the $PM_{2.5}$ level affects when a judge uses discretion. Specifically, we define the outcome variable as an indicator for whether the sentence length is above 84 months or 180 months when the drug quantity is below 10 grams or 50 grams, or the sentence length is below 84 months or 180 months when the drug quantity is above 10 grams or 50 grams. Column 1 in Table 5 presents the results. Coefficients for pollution and weather are again statistically insignificant. A 50-unit change in the level of $PM_{2.5}$ may only change the probability of the judge using discretion by no more than 0.5 percentage point with over 95% probability.

Finally, we ask whether the $PM_{2.5}$ level affects how much judicial outcomes deviate from the recommended level in the Criminal Law. Specifically, we define the amount of judge discretion as the difference between the actual sentence length and the closest recommended level. For example, if a case with less than 10 grams of drug is sentenced 100 months of imprisonment while the Law recommends at most 84 months, we define the amount of judge discretion to be 16 months, and we do not differentiate between the direction of deviation. We treat the amount as zero if there is no discretion. Results in column 2 show that judges' discretion amount are not affected by pollution or weather. A 50-unit change in the level of $PM_{2.5}$ may only change the amount of discretion by no more than 0.37 months with over 95% probability.

Table 5: Robustness: Judge Discretion

	1	2
PM _{2.5} level	-0.000012 (0.000043) [-0.000096,0.000073]	0.0018 (0.0028) [-0.0037,0.0074]
Humidity	0.000098 (0.00013) [-0.00015,0.00034]	-0.00050 (0.0083) [-0.017,0.016]
Temperature	0.00028 (0.00024) [-0.00019,0.00074]	-0.00088 (0.016) [-0.031,0.030]
Log(Drug quantity)	0.016*** (0.0015) [0.013,0.019]	1.35*** (0.098) [1.16,1.54]
Defendant is recidivist	0.0090** (0.0042) [0.00077,0.017]	0.10 (0.28) [-0.44,0.65]
Defendant exhibits good attitude	-0.081*** (0.0098) [-0.10,-0.062]	-1.44** (0.65) [-2.71,-0.17]
Adjusted R^2	0.097	0.097
No. Obs.	8777	8777
Year fixed effects	Yes	Yes
Judge fixed effects	Yes	Yes

Notes: This table reports robustness checks of the effect of air pollution on when and how judges use discretion in determining sentence. Dependent variable in column 1 is an indicator for whether the sentence length is above 84 months or 180 months when the drug quantity is below 10 grams or 50 grams, or the sentence length is below 84 months or 180 months when the drug quantity is above 10 grams or 50 grams. Dependent variable in column 2 is the amount of judge discretion defined as the difference between the actual sentence length and the closest recommended level. PM_{2.5} level is averaged across hourly data between 7am and 7pm each day. Drug quantity is measured in grams. Standard errors are in parentheses. 95% confidence intervals are in brackets. *** p<0.01, ** p<0.05, * p<0.1

5 Discussion and Conclusion

In this paper, we find that, unlike previous studies in other contexts, Chinese local judges are not at all affected by air pollution and temperature changes when judging drug cases in five major cities. By no means do we suggest that air pollution does not affect governance and individual well-being. Air pollution in China shortens life expectancy (Ebenstein et al. 2017; Chen, Greenstone and Li 2013), induces insomnia (Heyes and Zhu 2019), and lowers support for regime (Alkon and Wang 2018). In other contexts, it is well documented that pollution hurts student performance (Ebenstein, Lavy and Roth 2016), labor supply and worker productivity (Chang et al. 2016; Hausman, Ostro and Wise 1983; Hanna and Oliva 2015; Zivin and Neidell 2012).

What we show in this paper is that when a highly educated group of individuals (judges) making decisions that involve high stakes (jail time), they *can* shield themselves from unfavorable external conditions. A most relevant contrast is to a recent finding in the United States that juvenile judges (who are also judging drug offense cases) in Louisiana can be affected by local football team's unexpected losses (Eren and Mocan 2018). A most similar research design is in Heyes and Saberian (2019), which shows that hot outdoor temperature in Texas reduces immigration judges' decisions favorable to the applicant.

Why are county-level criminal judges in China less likely to be affected by hostile environment compared to local judges in the US? How to best shield judges from unfavorable external conditions and to avoid capricious judicial decisions? These are areas that can benefit from future research.

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