A dragon eating its own tail: public control of air pollution information in China

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ONLINE APPENDIX

A. Derivation of labour market equilibrium

With only two locations, the expression for the supply of labour in location i is then

$$L_i = \frac{\theta}{b}[E(p_j) - E(p_i)] + L_j \tag{1}$$

So, competition between production units will cause two locations to have identical populations, unless the expected pollution in the two places differs, in which case there is an adjustment through migration to compensate for expected pollution costs. This can be generalized with multiple locations from the point of view of location i as

$$L_i + \sum_{j=1}^{N-1} L_j = \overline{L} \tag{2}$$

Therefore

$$L_i + \sum_{j=1}^{N-1} \frac{\theta}{b}[E(p_j) - E(p_i)] + L_j = \overline{L} \tag{3}$$

which can them be generalized to expression 4

A1. Derivation of optimal bias

We can express the effect of the bias on production (and revenues) and on the labour supply as follows:

$$\frac{\partial R}{\partial B} = a\frac{\partial L}{\partial B} - bL\frac{\partial L}{\partial B} \qquad with \qquad \frac{\partial L}{\partial B} = \frac{(N-1)}{N}\frac{\theta}{b}\frac{(1-\lambda)}{z} \tag{4}$$

The first order conditions for the optimal bias that maximizes the local government's value function in problem (5) is

$$\tau a\frac{\partial L}{\partial B}-\tau bL\frac{\partial L}{\partial B}=\phi\frac{\partial L}{\partial B} \tag{5}$$

which simplifies to

$$L=\frac{\tau a-\phi}{\tau b} \tag{6}$$

Substituting L with the labour equation (4) we obtain

$$\frac{\overline{L}}{N}-\frac{\theta}{bN}\left[(N-1)\frac{p+\lambda B}{z}-\sum_{j=1}^{N-1}E(p_j)\right]=\frac{\tau a-\phi}{\tau b} \tag{7}$$

and solving for B and simplifying yields the optimal bias in the main text.

A2. Derivation of expected pollution

The expected bias (posterior) is a precision-weighted average of the prior and the signals that people have received up to time T, according to Bayes' law (see Veldkamp, 2011, p.12). We keep calculations as simple as possible by making three assumptions: first of all, that the errors in the pollution process and the bias are independent; secondly, that announcement from the point of view of households are independently distributed; and finally, we assume that households consider the true bias time-invariant. When calculating expected pollution, we further assume that the fraction of uncritical people λ is independent of W and of the estimate of the bias $E(B)$. The precision weighted average of all announcements is

$$E(B_T|A_1,A_2...A_T)=\left(\frac{1}{\sigma_B^2}\overline{B}+\frac{1}{\sigma_p^2}T\overline{A}\right)/\left(\frac{1}{\sigma_B^2}+T\frac{1}{\sigma_p^2}\right) \tag{8}$$

where $\overline{A} = \sum_{t=1}^{T} A_t/T$ is the average of all past announcements up to T, the present moment, $\overline{B}$ is the mean of the bias in the prior, and the σ are the variance of the variables. The inverse of the variances gives the precision of the distribution of the priors. The higher the variance, the lower the weight that people assign to that variable in their updating process. Also, the more announcement they receive (higher T), the more weight they assign to announcements.

For those people who update their expectations as they get announcements from the government, the limit of the expected bias goes to the true value of the bias as people observe more announcements. This can be shown easily, simplifying eq. (8) and multiplying numerator and denominator by T:

$$\lim_{T\to\infty} E(B) = \frac{\sigma_p^2\overline{B}/T + \sigma_B^2\overline{A}}{\sigma_p^2/T + \sigma_B^2} \quad \Rightarrow \quad \overline{A} = \sum_{t=1}^{T} \frac{p_t + B_t}{T} \quad \Rightarrow \quad B \tag{9}$$

Both terms divided by T go to zero as time rises, and we are left just with the mean of an increasingly large sum of announcement. And since we assumed that the mean of emissions shocks p equals zero and we are ignoring natural pollution, p^N =0, this just converges to the average bias, which over an infinite number of announcements is the true bias. If agents can update their beliefs for a sufficiently long period of time, their expectations concerning announcements will converge to the true government bias. [1]

To obtain expected pollution conditional on the bias updating process of $(1-\lambda)$ of the population, we need to calculate the variance of the difference between the announcement and the expected bias from (8), so to get the precision-weighted value. Following DellaVigna and Kaplan (2007), we plug

[1]This set-up is analogous to an output-gap model of an economy with a central bank deciding on inflation targeting and announcements. Similarly, here the government has control over real variables - pollution shocks - and nominal ones - announcements. For an example of a similar model in the context of a central bank and inflation, see Moscarini (2007).

this result for $E(B)$ in the formula for expected pollution at one point in time

$$A_T - E(B_T) \;=\; A_T - \left(\frac{1}{\sigma_B^2}\overline{B} + \frac{1}{\sigma_p^2}T\overline{A}\right) / \left(\frac{1}{\sigma_B^2} + T\frac{1}{\sigma_p^2}\right) \tag{10}$$

$$= \; p_T + B - \frac{\sigma_p^2\overline{B} + \sigma_B^2\sum^T(p_t + B)}{\sigma_p^2 + T\sigma_B^2} \tag{11}$$

$$= \; \frac{p_T(\sigma_p^2 + T\sigma_B^2 - \sigma_B^2) + B(\sigma_p^2 + T\sigma_B^2 - T\sigma_B^2) - \sigma_B^2\overline{B} - \sigma_B^2\sum^{T-1}p_t}{\sigma_p^2 + T\sigma_B^2} \tag{12}$$

$$= \; \frac{\sigma_p^2 + (T-1)\sigma_B^2}{\sigma_p^2 + T\sigma_B^2}p_T + \frac{\sigma_p^2}{\sigma_p^2 + T\sigma_B^2}(B - \overline{B}) - \frac{\sigma_B^2}{\sigma_p^2 + T\sigma_B^2}\sum^{T-1}p_t \tag{13}$$

$$= \; \left(\frac{1}{\sigma_B^2}(B - \overline{B}) - \frac{1}{\sigma_p^2}\sum^{T-1}p_t\right) / \left(\frac{1}{\sigma_B^2} + \frac{1}{\sigma_p^2}T\right) \tag{14}$$

In the last step we divide numerator and denominator by $\sigma_B^2\sigma_p^2$, and leave out the first term because, since this is an estimate of contemporaneous $\hat{p}_T$, the variance does not depend on the p_T itself but only on previous values. The variance is then

$$W^2 \equiv Var(A - E(B)) = \left(\frac{1}{\sigma_B^2} - \frac{(T-1)}{\sigma_p^2}\right) / \left(\frac{1}{\sigma_B^2} + \frac{1}{\sigma_p^2}T\right)^2 \tag{15}$$

Now we can calculate the precision-weighted value for the expected value of pollution, given the announcements, the posterior about the bias, and its variance:

$$E[p|A_T - E(B_T)] = \left(\frac{1}{\sigma_p^2}E(p) + \frac{1}{W^2}(A_T - E(B_T))\right) / \left(\frac{1}{\sigma_p^2} + \frac{1}{W^2}\right) \tag{16}$$

$$= \left(\frac{A_T - E(B_T)}{W^2}\right) / \left(\frac{1}{\sigma_p^2} + \frac{1}{W^2}\right) \tag{17}$$

Combining it with the result of eq. (9), and discounting the fraction of the population which does not update expectations, this yield the expression for eq. (3) in the text.

$$E(p) = \left(\frac{A - (1-\lambda)B}{W^2}\right) / \left(\frac{1}{\sigma_p^2} + \frac{1}{W^2}\right) \tag{18}$$

B. Bibliography

DellaVigna S and Kaplan E (2007) The Fox News effect: media bias and voting. *Quarterly Journal of Economics* **122** (3)(12169), 1187–1234.

Moscarini G (2007) Competence implies credibility. *American Economic Review* **97**(1), 37–63.

Veldkamp LL (2011) *Information Choice in Macroeconomics and Finance*. Princeton, NJ: Princeton University Press.

C. Extra Figures and Tables

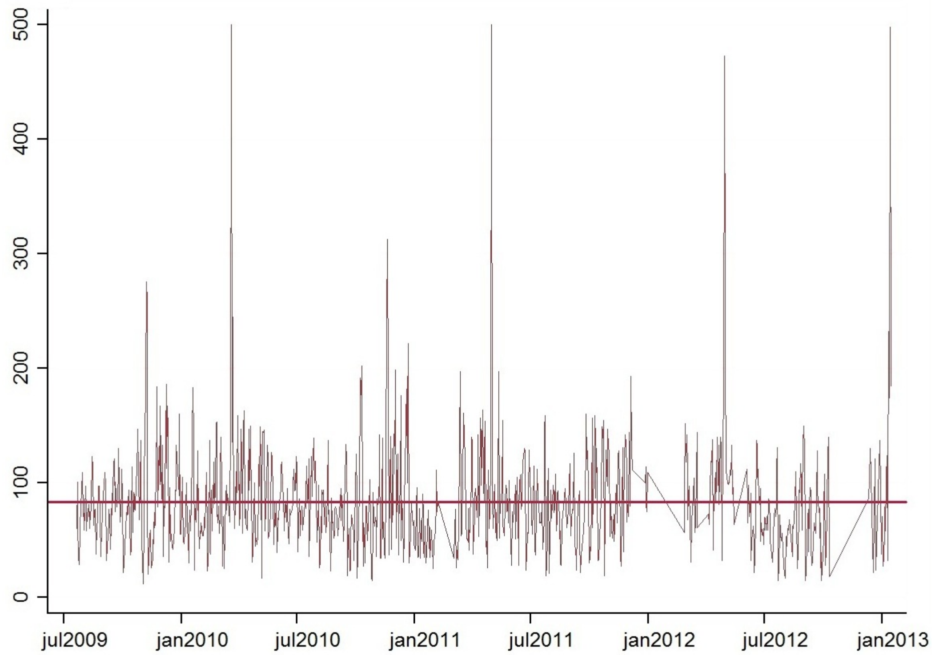


Figure A1: Chinese Daily Air Pollution Index

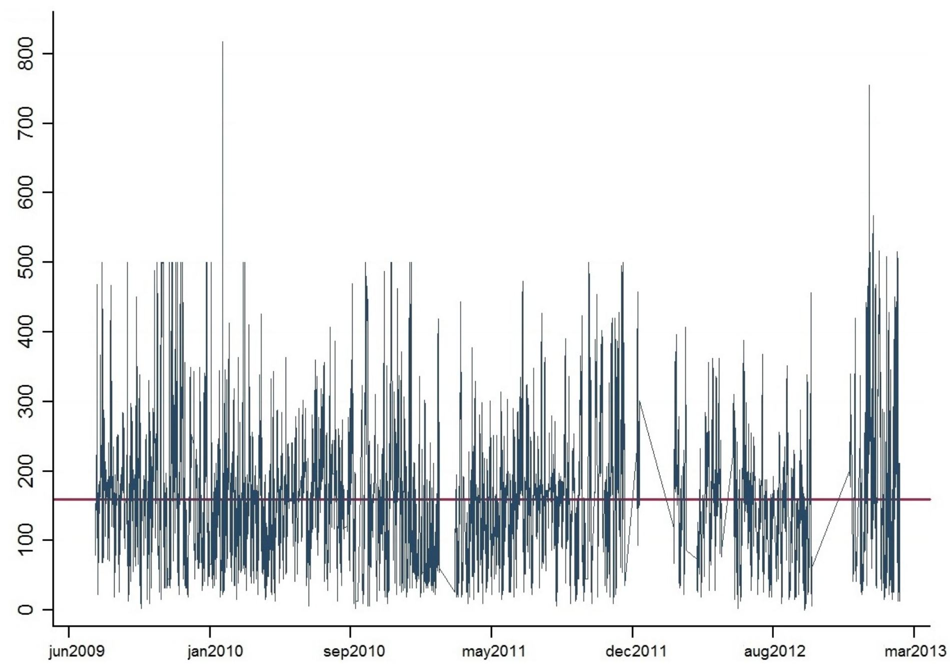
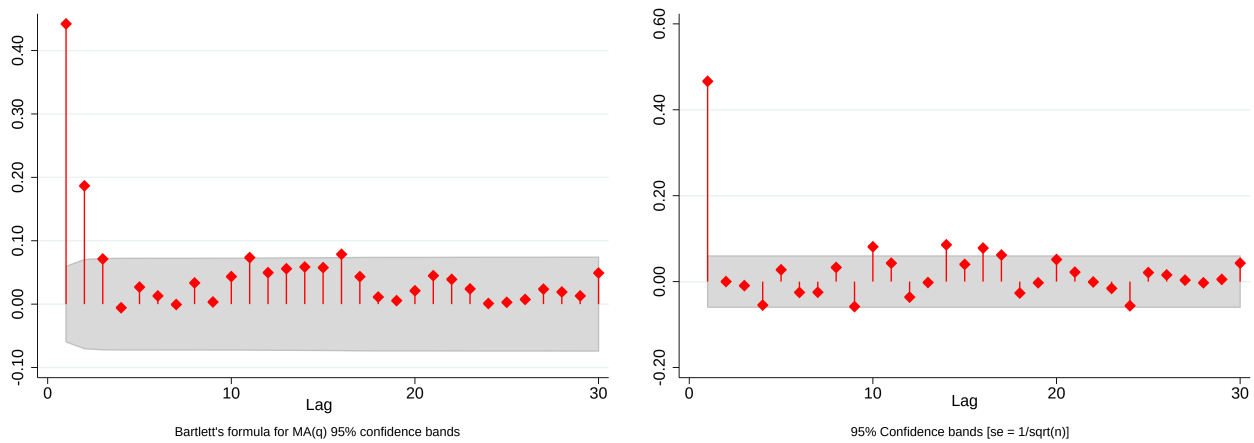


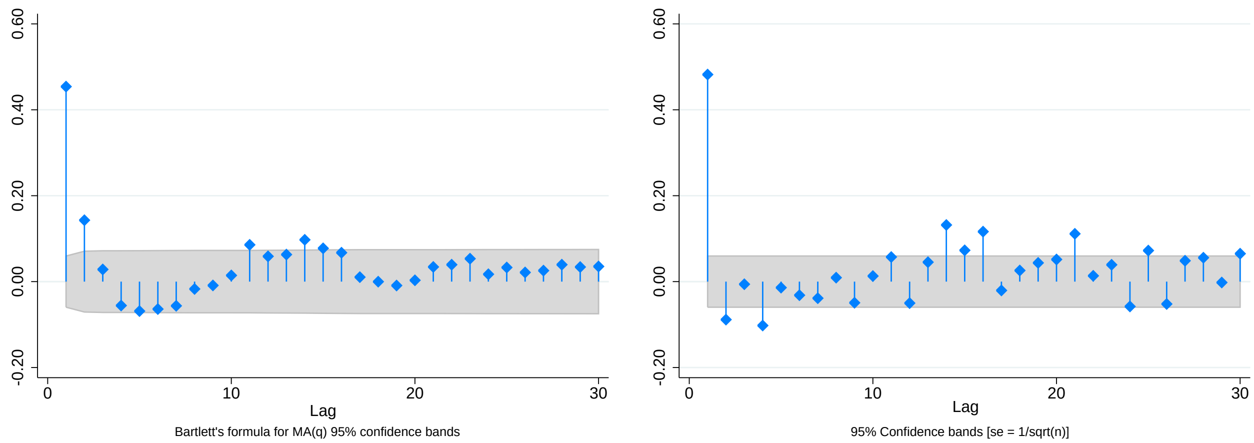
Figure A2: US Hourly Air Pollution Index



(a) AC

(b) PAC

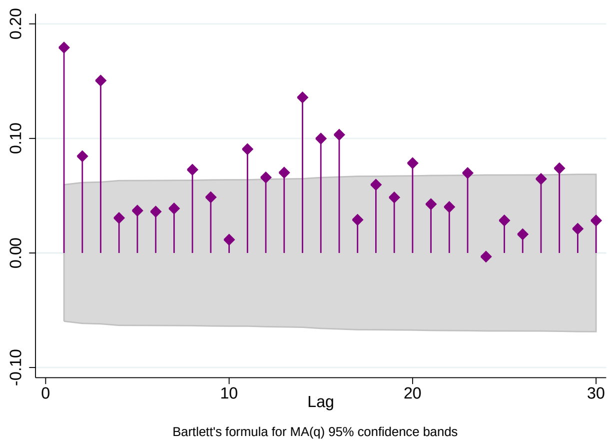
Figure A3: Autocorrelation and partial autocorrelation function Chinese API



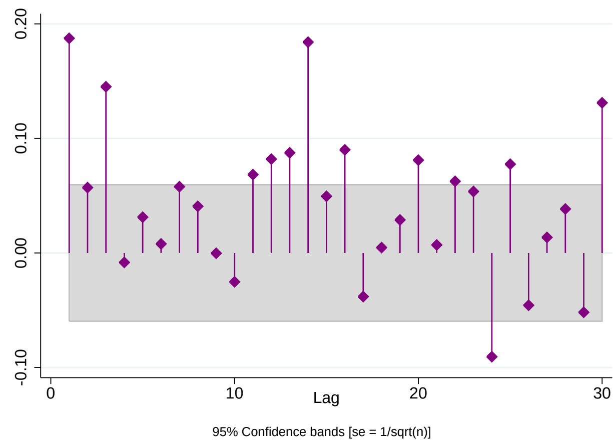
(a) AC

(b) PAC

Figure A4: Autocorrelation and partial autocorrelation function of US AQI



(a) AC



(b) PAC

Figure A5: Autocorrelation and partial autocorrelation function of dependent variable

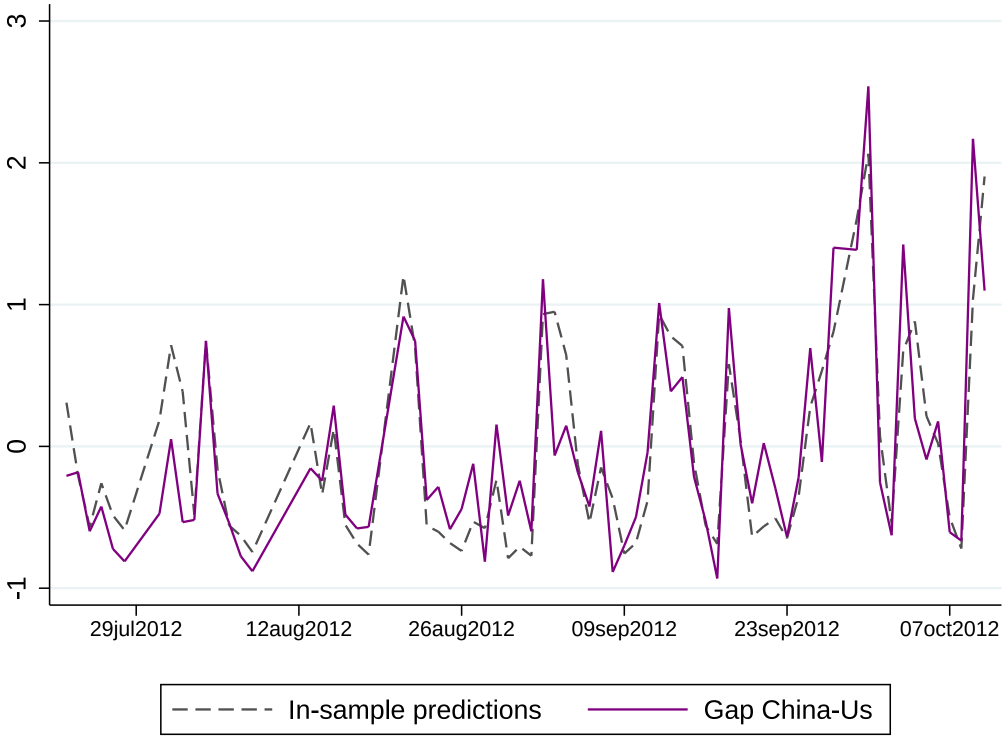


Figure A6: Model performance in predicting the bias

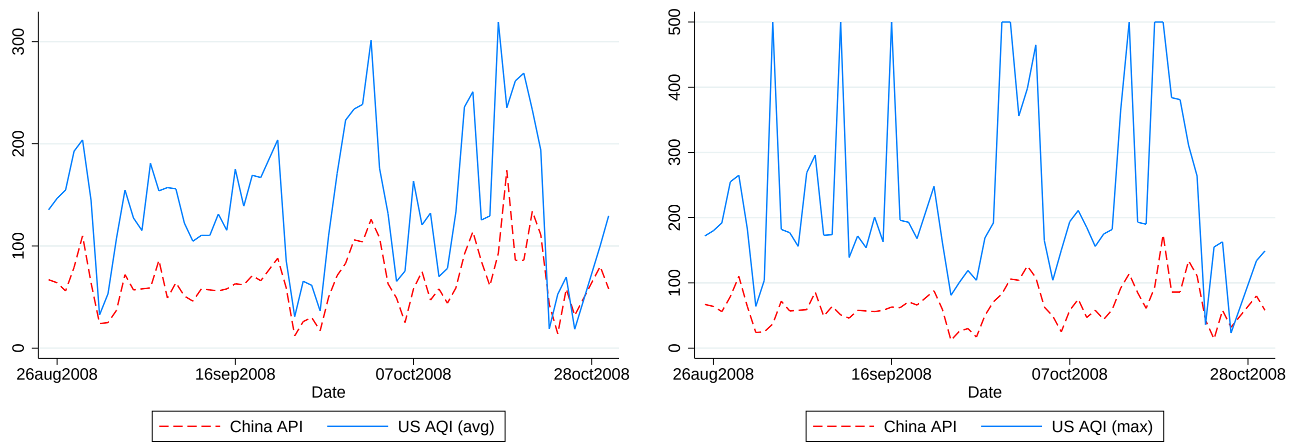


Figure A7: Difference of Chinese API from average and maximum daily values of US index

Table A1: Tests for stationarity of air pollution data

Dickey-Fuller test for unit root - Chinese API				Number of obs=1039
	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-19.062	-3.43	-2.86	-2.57
MacKinnon approximate p-value for Z(t) = 0.0000				
Phillips-Perron test for unit root - Chinese API				Number of obs=1039
Newey-West lags = 6				
	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(rho)	-546.299	-20.7	-14.1	-11.3
Z(t)	-18.964	-3.43	-2.86	-2.57
MacKinnon approximate p-value for Z(t) = 0.0000				
Dickey-Fuller test for unit root - US AQI				Number of obs=1039
	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-16.045	-3.43	-2.86	-2.57
MacKinnon approximate p-value for Z(t) = 0.0000				
Phillips-Perron test for unit root - US AQI				Number of obs=1039
Newey-West lags = 6				
	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(rho)	-405.843	-20.7	-14.1	-11.3
Z(t)	-15.786	-3.43	-2.86	-2.57
MacKinnon approximate p-value for Z(t) = 0.0000				

The tests yield similar results when adding a trend

Table A2: Air pollution Indexes

Index and Definition			Health Implications	PM10 ($\mu g/m3$)		NOx ($\mu g/m3$)	
AQI US	API China			US	China	US	China
0-50 Good	0-50 Excellent		Air quality is considered satisfactory and air pollution poses little or no risk.	0-50	0-50	0-0.03	0-50
51-100 Moderate	51-100 Good		Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a small number of people who are unusually sensitive to air pollution.	50-150	50-150	0.03 - 0.14	50-150
101-150 Unhealthy for sensitive groups	100-200	Slightly polluted	Members of sensitive groups may experience health effects. The general public is not likely to be affected.	150-250	150-350	0.14 - 0.22	150-800
151-200 Unhealthy		Light polluted	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.	250-350		0.22 - 0.30	
201-300 Very Unhealthy	200-300	Moderately polluted Moderate-heavy polluted	Health warnings of emergency conditions. The entire population is more likely to be affected.	350 - 420	350-420	0.30 - 0.60	800-1600
300+ Hazardous	300-400	Heavy polluted	Health alert: everyone may experience more serious health effects.	420-600	420-500	0.60 - 1.0	1600-2100
	400-500				500-600		2100-2620
	500				600		2620

Source: own elaboration from US Environmental Protection Agency and China's Ministry of Environmental Protection.

Table A3: Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Chinese Index	1083	82.9	45.9	12	500
US index (daily minimum)	1083	103.3	69.9	0	500
US index (daily average)	1083	158.6	78.2	9.1	528.1
US index (daily maximum)	1083	230.5	109.9	13	817
Log Chinese Index	1083	4.3	0.5	2.5	6.2
Log US index (daily min)	1082	4.3	0.8	1.1	6.2
Log US index (daily avg)	1083	4.9	0.6	2.2	6.3
Log US index (daily max)	1083	5.3	0.5	2.6	6.7
DEPENDENT VARIABLE - GAP					
Log Chinese - Log US (min)	1082	-0.1	0.7	-1.3	2.9
Log Chinese - Log US (avg)	1083	-0.6	0.4	-1.8	1.7
Log Chinese - Log US (max)	1083	-1	0.4	-2.6	1.7

THRESHOLD DUMMIES

Threshold T	Obs	Mean	Mean T*AQI	Min	Max
Threshold 100 points - min	1083	.0.42	51.5	0	1
- avg	1083	0.5	80	0	1
- max	1083	.43	71.8	0	1
Threshold 200 points - min	1083	0.05	13.4	0	1
- avg	1083	0.2	46.3	0	1
- max	1083	0.2	63.2	0	1
Threshold 300 points - min	1083	0.01	3.8	0	1
- avg	1083	0.05	17.3	0	1
- max	1083	0.2	89.8	0	1

Table A4: Construction of categorical dependent variable

Gap	Signals			
-3	Chinese Green, US Red			
-2	Chinese Green, US Orange	Chinese Yellow, US Red		
-1	Chinese Green, US Yellow	Chinese Yellow, US Orange	Chinese Orange, US Red	
0	Chinese and US Green	Chinese and US Yellow	Chinese and US Orange	Chinese and US Red
1	US Green, Chinese Yellow	US Yellow, Chinese Orange	US Orange, Chinese Red	
2	US Green, Chinese Orange	US Yellow, Chinse Red		
3	US Green, Chinese Red			

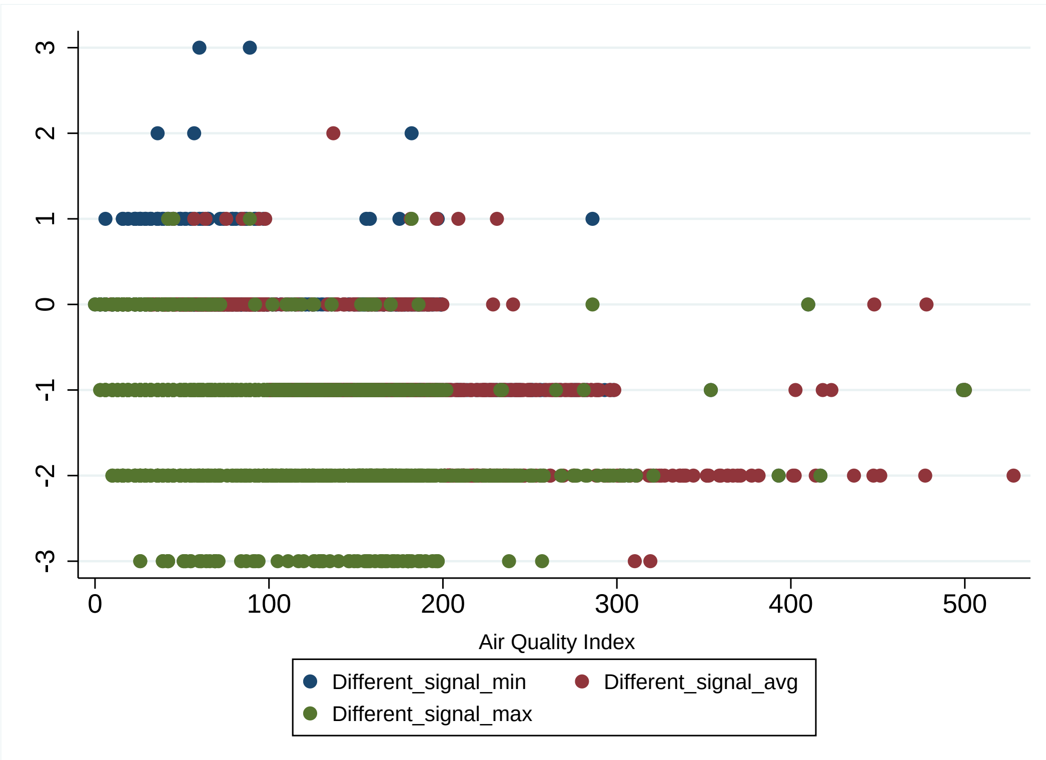


Figure A8: Distribution of the categorical gap relative to values of air pollution

D. Further Results and Robustness

The results of the previous ARMA model are robust to these different specifications of the US index, as shown below: we still find that, as pollution raises, the gap increases more or less by the same magnitude, and that the effect of the 100 points threshold is still downward, with an opposite effect given by the interaction term.However also the 200 and 300 thresholds start playing a role. Considering the daily average of the US index (Table A5 in the Online Appendix), crossing the 200 threshold has an effect that cancels out with the one of crossing the 100 point threshold.[2] However, once we reach the 300 points threshold, the negative impact becomes substantial again, with a 40% decrease for crossing the 300 points threshold.[3] Similar effects occur with the daily maximum of the US index (Table A6), with an insignificant 200 threshold, but significant 100 and 300 points thresholds.

[2]The combined effect of crossing a level of 200 (and thus also the level of 100) is $-0.28+0.38+(0.003-0.001)\text{x}ln(AQI)$, which is close to zero (for instance when AQI is exactly 100, it takes the value of 0.1).

[3]This is again calculated as $-0.28+0.38-0.53+(0.003-0.001+0.002)$ x $ln(AQI)$

Table A5: Discrepancy between the Chinese and US Index (daily average)

	Dependent variable: Gap China - US average signal		
	(1)	(2)	(3)
US AQI (daily average)	−1.666*	−1.662*	−1.658*
	(0.94)	(0.94)	(0.95)
Avg. AQI above T100	−0.164	−0.168	−0.180
	(0.15)	(0.15)	(0.15)
Avg. AQI above T200	0.186	0.182	0.179
	(0.19)	(0.19)	(0.20)
Avg. AQI above T300	−0.425*	−0.435*	−0.451*
	(0.26)	(0.26)	(0.26)
T100 * Avg. AQI	0.001	0.001	0.001
	(0.00)	(0.00)	(0.00)
T200 * Avg. AQI	0.000	0.000	0.000
	(0.00)	(0.00)	(0.00)
T300 * Avg. AQI	0.002	0.002	0.002
	(0.00)	(0.00)	(0.00)
Constant	5.162***	5.150***	5.140***
	(1.88)	(1.87)	(1.89)
ARMA			
L.ar	0.148***		−0.338*
	(0.03)		(0.20)
L.ma		0.145***	0.476**
		(0.03)	(0.19)
sigma			
Constant	0.244***	0.244***	0.244***
	(0.00)	(0.00)	(0.00)
Observations	876	876	876
AIC	73.650	74.214	76.454
BIC	202.585	203.149	210.164

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The lower panel shows the autoregressive moving average lags (ARMA) components.

Table A6: Discrepancy between the Chinese and US Index (daily maximum)

	Dependent variable: Gap China - US maximum signal		
	(1)	(2)	(3)
US AQI (daily maximum)	−0.738	−0.703	−0.676
	(3.10)	(3.05)	(3.25)
Max. AQI above T100	−1.298**	−1.305**	−1.313**
	(0.51)	(0.51)	(0.52)
Max. AQI above T200	−2.568***	−2.568***	−2.585***
	(0.46)	(0.46)	(0.48)
Max. AQI above T300	−3.113***	−3.117***	−3.103***
	(0.32)	(0.32)	(0.33)
T100 * Max. AQI	0.001	0.002	0.002
	(0.00)	(0.00)	(0.00)
T200 * Max. AQI	0.002	0.002	0.003
	(0.00)	(0.00)	(0.00)
T300 * Max. AQI	0.001	0.001	0.001
	(0.00)	(0.00)	(0.00)
Constant	1.239	1.181	1.129
	(6.62)	(6.52)	(6.97)
ARMA			
L.ar	0.143***		0.462**
	(0.03)		(0.20)
L.ma		0.131***	−0.327
		(0.03)	(0.22)
sigma			
Constant	0.401***	0.401***	0.400***
	(0.01)	(0.01)	(0.01)
Observations	876	876	876
AIC	940.815	942.332	940.960
BIC	1069.749	1071.267	1074.670

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The lower panel shows the autoregressive moving average lags (ARMA) components.

Categorical Dependent Variable

Table A7: Discrepancy between the Chinese and US Index (daily average)

Dependent variable: Categorical Gap China - US average signal			
	(1)	(2)	(3)
US AQI (daily average)	−1.074	−1.059	−1.115
	(6.33)	(6.34)	(6.31)
Avg. AQI above T100	−0.999	−1.006	−0.994
	(0.79)	(0.79)	(0.78)
Avg. AQI above T200	−2.515***	−2.519***	−2.510***
	(0.78)	(0.78)	(0.78)
Avg. AQI above T300	−3.660***	−3.661***	−3.668***
	(0.52)	(0.52)	(0.52)
T100 * Avg. AQI	−0.000	−0.000	−0.000
	(0.01)	(0.01)	(0.01)
T200 * Avg. AQI	0.003	0.003	0.003
	(0.01)	(0.01)	(0.01)
T300 * Avg. AQI	0.003	0.003	0.003
	(0.01)	(0.01)	(0.01)
Constant	1.957	1.932	2.030
	(13.26)	(13.26)	(13.21)
ARMA			
L.ar	0.103***		0.595***
	(0.03)		(0.21)
L.ma		0.094***	−0.502**
		(0.03)	(0.22)
sigma			
Constant	0.402***	0.402***	0.401***
	(0.01)	(0.01)	(0.01)
Observations	876	876	876
AIC	944.419	945.159	943.784
BIC	1073.353	1074.094	1077.494

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The lower panel shows the autoregressive moving average lags (ARMA) components.

Table A8: Discrepancy between the Chinese and US Index (daily maximum)

	Dependent variable: Categorical Gap China - US maximum signal		
	(1)	(2)	(3)
US AQI (daily maximum)	−0.984	−0.906	−0.954
	(0.91)	(0.90)	(0.91)
Max. AQI above T100	−0.530**	−0.545***	−0.544***
	(0.21)	(0.21)	(0.21)
Max. AQI above T200	−0.301*	−0.313*	−0.302*
	(0.18)	(0.18)	(0.18)
Max. AQI above T300	0.093	0.089	0.101
	(0.14)	(0.14)	(0.14)
T100 * Max. AQI	0.004*	0.004**	0.004**
	(0.00)	(0.00)	(0.00)
T200 * Max. AQI	0.003*	0.003*	0.003*
	(0.00)	(0.00)	(0.00)
T300 * Max. AQI	0.002	0.002	0.002
	(0.00)	(0.00)	(0.00)
Constant	3.957**	3.824**	3.915**
	(1.77)	(1.75)	(1.79)
ARMA			
L.ar	0.237***		0.449***
	(0.03)		(0.13)
L.ma		0.210***	−0.228
		(0.03)	(0.14)
sigma			
Constant	0.240***	0.241***	0.240***
	(0.00)	(0.00)	(0.00)
Observations	876	876	876
AIC	51.324	56.787	51.095
BIC	180.259	185.722	184.805

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The lower panel shows the autoregressive moving average lags (ARMA) components.

Table A9: Discrepancy between the Chinese and US Index (daily minimum)

Dependent variable: Categorical Gap China - US minimum signal			
	(1)	(2)	(3)
US AQI (daily minimum)	−0.424	−0.439*	−0.417
	(0.26)	(0.26)	(0.26)
US AQI (min)^2	0.077**	0.079**	0.075**
	(0.03)	(0.03)	(0.03)
Min. AQI above T100	−1.061***	−1.062***	−1.056***
	(0.07)	(0.07)	(0.07)
Min. AQI above T200	−2.458***	−2.450***	−2.450***
	(0.57)	(0.57)	(0.58)
Min. AQI above T300	−3.946**	−3.935**	−3.917**
	(1.74)	(1.82)	(1.72)
T100 * Min. AQI	−0.002***	−0.002***	−0.002***
	(0.00)	(0.00)	(0.00)
T200 * Min. AQI	0.002	0.002	0.002
	(0.00)	(0.00)	(0.00)
T300 * Min. AQI	0.004	0.004	0.004
	(0.00)	(0.00)	(0.00)
Constant	0.680	0.704	0.680
	(0.51)	(0.52)	(0.51)
ARMA			
L.ar	0.135***		0.526***
	(0.03)		(0.18)
L.ma		0.122***	−0.401**
		(0.04)	(0.20)
sigma			
Constant	0.424***	0.424***	0.423***
	(0.01)	(0.01)	(0.01)
Observations	876	876	876
AIC	1038.826	1040.113	1038.277
BIC	1167.761	1169.048	1171.987

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The lower panel shows the autoregressive moving average lags (ARMA) components.

Table A10: Discrepancy between the Chinese and US Index (daily average)

	Dependent variable: Gap China - US average signal		
	(1)	(2)	(3)
US AQI (daily average)	−1.074	−1.059	−1.115
	(6.33)	(6.34)	(6.31)
US AQI (avg)²	0.144	0.142	0.150
	(0.76)	(0.76)	(0.75)
Avg. AQI above T100	−0.999	−1.006	−0.994
	(0.79)	(0.79)	(0.78)
Avg. AQI above T200	−2.515***	−2.519***	−2.510***
	(0.78)	(0.78)	(0.78)
Avg. AQI above T300	−3.660***	−3.661***	−3.668***
	(0.52)	(0.52)	(0.52)
T100 * Avg. AQI	−0.000	−0.000	−0.000
	(0.01)	(0.01)	(0.01)
T200 * Avg. AQI	0.003	0.003	0.003
	(0.01)	(0.01)	(0.01)
T300 * Avg. AQI	0.003	0.003	0.003
	(0.01)	(0.01)	(0.01)
Constant	1.957	1.932	2.030
	(13.26)	(13.26)	(13.21)
ARMA			
L.ar	0.103***		0.595***
	(0.03)		(0.21)
L.ma		0.094***	−0.502**
		(0.03)	(0.22)
sigma			
Constant	0.402***	0.402***	0.401***
	(0.01)	(0.01)	(0.01)
Observations	876	876	876
AIC	944.419	945.159	943.784
BIC	1073.353	1074.094	1077.494

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The lower panel shows the autoregressive moving average lags (ARMA) components.

Table A11: Discrepancy between the Chinese and US Index (daily maximum)

Dependent variable: Gap China - US maximum signal			
	(1)	(2)	(3)
US AQI (daily maximum)	−0.984	−0.906	−0.954
	(0.91)	(0.90)	(0.91)
US AQI (max)^2	−0.006	−0.017	−0.011
	(0.12)	(0.12)	(0.12)
Max. AQI above T100	−0.530**	−0.545***	−0.544***
	(0.21)	(0.21)	(0.21)
Max. AQI above T200	−0.301*	−0.313*	−0.302*
	(0.18)	(0.18)	(0.18)
Max. AQI above T300	0.093	0.089	0.101
	(0.14)	(0.14)	(0.14)
T100 * Max. AQI	0.004*	0.004**	0.004**
	(0.00)	(0.00)	(0.00)
T200 * Max. AQI	0.003*	0.003*	0.003*
	(0.00)	(0.00)	(0.00)
T300 * Max. AQI	0.002	0.002	0.002
	(0.00)	(0.00)	(0.00)
Constant	3.957**	3.824**	3.915**
	(1.77)	(1.75)	(1.79)
ARMA			
L.ar	0.237***		0.449***
	(0.03)		(0.13)
L.ma		0.210***	−0.228
		(0.03)	(0.14)
sigma			
Constant	0.240***	0.241***	0.240***
	(0.00)	(0.00)	(0.00)
Observations	876	876	876
AIC	51.324	56.787	51.095
BIC	180.259	185.722	184.805

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The lower panel shows the autoregressive moving average lags (ARMA) components.

Bandwidths around the T100 threshold

50-150

Table A12: Discrepancy between the Chinese and US Index (daily minimum)

Dependent variable: Gap China - US minimum signal			
	(1)	(2)	(3)
US AQI (daily minimum)	−0.180**	−0.180**	−0.180**
	(0.09)	(0.09)	(0.09)
Min. AQI above T100	−1.014***	−1.015***	−1.014***
	(0.11)	(0.11)	(0.11)
T100 * Min. AQI	0.003**	0.003**	0.003**
	(0.00)	(0.00)	(0.00)
Constant	0.617	0.616	0.617
	(0.52)	(0.52)	(0.52)
ARMA			
L.ar	0.100		0.023
	(0.07)		(0.97)
L.ma		0.101	0.078
		(0.08)	(0.98)
sigma			
Constant	0.331***	0.331***	0.331***
	(0.01)	(0.01)	(0.01)
Observations	287	287	287
AIC	216.251	216.244	218.243
BIC	278.462	278.455	284.114

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The lower panel shows the autoregressive moving average lags (ARMA) components.

Table A13: Discrepancy between the Chinese and US Index (daily average)

Dependent variable: Gap China - US average signal			
	(1)	(2)	(3)
US AQI (daily average)	0.205	0.203	0.220
	(0.25)	(0.25)	(0.25)
Avg. AQI above T100	−1.033***	−1.034***	−1.034***
	(0.29)	(0.29)	(0.29)
T100 * Avg. AQI	0.000	0.000	0.000
	(0.00)	(0.00)	(0.00)
Constant	−0.910	−0.903	−0.971
	(1.12)	(1.13)	(1.14)
ARMA			
L.ar	0.078		0.845***
	(0.08)		(0.21)
L.ma		0.072	−0.776***
		(0.09)	(0.26)
sigma			
Constant	0.332***	0.332***	0.330***
	(0.01)	(0.01)	(0.01)
Observations	287	287	287
AIC	216.470	216.499	217.417
BIC	278.681	278.711	283.288

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The lower panel shows the autoregressive moving average lags (ARMA) components.

Table A14: Discrepancy between the Chinese and US Index (daily maximum)

	Dependent variable: Gap China - US maximum signal		
	(1)	(2)	(3)
US AQI (daily maximum)	−1.232***	−1.240***	−1.192***
	(0.31)	(0.31)	(0.32)
Max. AQI above T100	−0.581***	−0.582***	−0.571***
	(0.22)	(0.22)	(0.22)
Max. AQI above T200	−0.360	−0.363	−0.341
	(0.44)	(0.44)	(0.45)
Max. AQI above T300	0.649**	0.653**	0.609*
	(0.30)	(0.30)	(0.31)
T100 * Max. AQI	0.005**	0.005**	0.005**
	(0.00)	(0.00)	(0.00)
T200 * Max. AQI	0.004	0.004	0.003
	(0.00)	(0.00)	(0.00)
T300 * Max. AQI	0.001	0.001	0.001
	(0.00)	(0.00)	(0.00)
Constant	5.091***	5.127***	4.915***
	(1.35)	(1.35)	(1.38)
ARMA			
L.ar	0.079		0.701
	(0.09)		(0.64)
L.ma		0.074	−0.639
		(0.09)	(0.69)
sigma			
Constant	0.243***	0.243***	0.243***
	(0.01)	(0.01)	(0.01)
Observations	287	287	287
AIC	45.547	45.597	47.291
BIC	122.397	122.446	127.800

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The lower panel shows the autoregressive moving average lags (ARMA) components.

80-120

Table A15: Discrepancy between the Chinese and US Index (daily minimum)

Dependent variable: Gap China - US minimum signal			
	(1)	(2)	(3)
US AQI (daily minimum)	−0.172**	−0.164*	−0.166*
	(0.09)	(0.09)	(0.09)
Min. AQI above T100	−0.909***	−0.936***	−0.930***
	(0.15)	(0.16)	(0.16)
T100 * Min. AQI	0.002	0.002	0.002
	(0.00)	(0.00)	(0.00)
Constant	0.589	0.558	0.566
	(0.79)	(0.78)	(0.80)
ARMA			
L.ar	0.506***		0.219
	(0.09)		(0.14)
L.ma		1.000	1.000
		(1247.38)	(.)
sigma			
Constant	0.240***	0.194	0.174***
	(0.01)	(120.86)	(0.01)
Observations	154	154	154
AIC	66.513	63.983	63.426
BIC	118.141	115.611	115.054

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The lower panel shows the autoregressive moving average lags (ARMA) components.

Table A16: Discrepancy between the Chinese and US Index (daily average)

Dependent variable: Gap China - US average signal			
	(1)	(2)	(3)
US AQI (daily average)	0.192	0.210	0.187
	(0.54)	(0.51)	(0.53)
Avg. AQI above T100	−0.422	−0.388	−0.398
	(0.60)	(0.54)	(0.59)
T100 * Avg. AQI	−0.005	−0.005	−0.005
	(0.01)	(0.01)	(0.01)
Constant	−0.881	−0.960	−0.858
	(2.45)	(2.31)	(2.39)
ARMA			
L.ar	0.483***		0.172
	(0.10)		(0.16)
L.ma		1.000	1.000
		(.)	(.)
sigma			
Constant	0.246***	0.196***	0.181***
	(0.02)	(0.01)	(0.01)
Observations	154	154	154
AIC	71.192	65.699	67.424
BIC	122.820	114.290	119.052

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The lower panel shows the autoregressive moving average lags (ARMA) components.

Table A17: Discrepancy between the Chinese and US Index (daily maximum)

Dependent variable: Gap China - US maximum signal			
	(1)	(2)	(3)
US AQI (daily maximum)	−0.488	−0.466	−0.528
	(2.06)	(2.05)	(2.01)
Max. AQI above T100	−0.065	−0.032	−0.014
	(1.87)	(2.43)	(1.94)
Max. AQI above T200	−1.127	−1.144	−1.168
	(1.82)	(2.39)	(1.89)
Max. AQI above T300	0.945	0.907	0.934
	(2.17)	(2.67)	(2.22)
T100 * Max. AQI	−0.001	−0.002	−0.001
	(0.01)	(0.01)	(0.01)
T200 * Max. AQI	0.004	0.003	0.004
	(0.01)	(0.01)	(0.01)
T300 * Max. AQI	−0.003	−0.003	−0.003
	(0.01)	(0.01)	(0.01)
Constant	1.746	1.646	1.922
	(9.21)	(9.29)	(9.01)
ARMA			
L.ar	−0.154		0.234
	(0.22)		(0.59)
L.ma		−0.307	−0.781
		(0.27)	(1.54)
sigma			
Constant	0.202***	0.197***	0.180**
	(0.01)	(0.02)	(0.09)
Observations	154	154	154
AIC	−10.067	−10.309	−8.536
BIC	53.709	53.467	58.276

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The lower panel shows the autoregressive moving average lags (ARMA) components.

D1. After the Beijing Olympics (August 2008)

Table A18: Discrepancy between the Chinese and US Index (daily minimum)

Dependent variable: Gap China - US minimum signal			
	(1)	(2)	(3)
US AQI (daily minimum)	−0.028	−0.042	−0.014
	(0.08)	(0.07)	(0.09)
Min. AQI above T100	−0.780***	−0.745***	−0.798***
	(0.20)	(0.16)	(0.20)
T100 * Min. AQI	−0.004**	−0.004***	−0.004*
	(0.00)	(0.00)	(0.00)
T200 * Min. AQI	−0.004*	−0.000	−0.006
	(0.00)	(0.00)	(0.04)
Constant	0.468*	0.554**	0.394
	(0.28)	(0.24)	(0.32)
ARMA			
L.ar	−0.214*		−0.956
	(0.13)		(2.26)
L.ma		−1.000	0.967
		(.)	(2.26)
sigma			
Constant	0.308***	0.247***	0.315***
	(0.04)	(0.02)	(0.04)
Observations	56	56	56
AIC	47.764	40.677	51.443
BIC	68.017	58.905	73.721

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The lower panel shows the autoregressive moving average lags (ARMA) components.

Table A19: Discrepancy between the Chinese and US Index (daily average)

	Dependent variable: Gap China - US average signal		
	(1)	(2)	(3)
US AQI (daily average)	−0.497	−1.979	−1.400
	(3.85)	(3.63)	(4.30)
Avg. AQI above T100	−1.597	−1.989	−1.848
	(1.60)	(1.47)	(1.92)
Avg. AQI above T200	−1.973**	−1.373	−1.574*
	(0.88)	(0.87)	(0.88)
Avg. AQI above T300	16.129	34.885***	31.372***
	(46.10)	(5.39)	(6.62)
T100 * Avg. AQI	0.007	0.017	0.013
	(0.03)	(0.02)	(0.03)
T200 * Avg. AQI	0.005	0.009	0.008
	(0.02)	(0.01)	(0.02)
T300 * Avg. AQI	−0.058	−0.110***	−0.102***
	(0.15)	(0.02)	(0.03)
Constant	2.069	8.467	5.937
	(16.86)	(15.90)	(18.97)
ARMA			
L.ar	−0.068		0.307
	(0.12)		(0.19)
L.ma		−1.000	−1.000
		(.)	(.)
sigma			
Constant	0.290***	0.233***	0.243***
	(0.04)	(0.02)	(0.03)
Observations	56	56	56
AIC	46.296	40.307	40.769
BIC	72.626	64.611	67.099

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The lower panel shows the autoregressive moving average lags (ARMA) components.

Table A20: Discrepancy between the Chinese and US Index (daily maximum)

	Dependent variable: Gap China - US maximum signal		
	(1)	(2)	(3)
US AQI (daily maximum)	−5.066	−1.432	−1.665
	(4.74)	(3.71)	(4.02)
Max. AQI above T200	0.835	−0.526	−0.427
	(2.07)	(1.52)	(1.73)
Max. AQI above T300	4.358	1.270	1.492
	(4.45)	(3.47)	(3.81)
T100 * Max. AQI	0.026	0.004	0.006
	(0.03)	(0.02)	(0.02)
T200 * Max. AQI	0.021	0.006	0.007
	(0.02)	(0.02)	(0.02)
T300 * Max. AQI	0.010	0.001	0.001
	(0.01)	(0.01)	(0.01)
Constant	20.623	5.626	6.578
	(19.58)	(15.32)	(16.54)
ARMA			
L.ar	−0.201		0.068
	(0.28)		(0.32)
L.ma		−1.000	−1.000
		(.)	(.)
sigma			
Constant	0.171***	0.138***	0.139***
	(0.02)	(0.02)	(0.02)
Observations	56	56	56
AIC	−14.628	−20.568	−18.701
BIC	9.676	1.711	5.603

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The lower panel shows the autoregressive moving average lags (ARMA) components.

Table A21: Private cost of illness

	Direct costs	Days of work lost	Paid sick leave	Days of inactivity	Indirect costs[4]	Total
Airborne diseases	2514 yuan	1.4	0.5	9	812 yuan	3326 yuan
All illnesses	5184 yuan	18	13	53	305 yuan	5489 yuan

[4]Non-medical costs (wage loss) are computed multiplying the wage by the days at home, net of those covered by sick-leave: wage $\times$ (days lost - sick leave).

Table A22: Characteristics of averting behaviours

	Frequency	Observations
Everyday's life		
Cancel outdoor activities	58%	1621
Change means of transportation	6%	1602
Wear a mask	11%	1618
Peak pollution times		
Cancel outdoor activities	77%	1240
Change means of transportation	12%	1231
Wear a mask	18%	1245
Change of behaviour		
Reduce time outdoor	23%	1239
Transport change	5%	1224
Mask	9%	1238
Other behaviours		
Preventive health checks	73%	1626
Air purifier	23%	1639

Table A23: Information about air pollution

What is the main source of information about air pollution you use?		What did you do after the peak pollution days last year?	
Government sources (TV, radio, newspapers)	77 %	Nothing	39%
Internet (PC or mobile device)	6 %	I started worrying more about air pollution	25%
Self-perception, other people	17 %	I look for more information	9%
Doesn't care	0.1 %	I worry more about air pollution and look for more information about it	27%

Table A24: Sources of Information

	Government media	Govt vs. Internet	Govt vs. Self-perception	Internet[5]
Age	0.01***	0.04***	0.00	−0.03***
	(0.00)	(0.01)	(0.00)	(0.01)
Male	0.06	0.13	0.03	−0.15
	(0.10)	(0.17)	(0.11)	(0.15)
Education	0.15**	−0.08	0.22***	0.13
	(0.06)	(0.12)	(0.07)	(0.11)
Smoker	−0.48***	−0.69***	−0.41*	0.56**
	(0.18)	(0.27)	(0.21)	(0.25)
Migrant	−0.46	0.16	−0.61	−0.30
	(0.35)	(0.89)	(0.37)	(0.80)
Household size	0.25**	0.69**	0.12	−0.67**
	(0.11)	(0.32)	(0.12)	(0.29)
Household Income	−2.13	−5.66***	−0.10	5.45***
	(1.45)	(1.93)	(1.90)	(1.63)
Constant	−0.76	−0.51	−0.04	−0.13
	(0.50)	(0.96)	(0.57)	(0.84)
Observations	1490	1260	1408	1490

Clustered standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

[5]For the first three columns we use a logit specification. For the determinants of internet, since the occurrence of a positive value is quite rare, we use a complementary log-log specification to account for the asymmetric nature of the dependent variable.

Table A25: Self-protective Behaviours and Information (IV-Probit)

	Outdoor Δ	Mask Δ	Transport Δ
Government media	−2.12**	−2.61***	−2.14**
	(1.01)	(0.57)	(1.03)
Respondent	0.04	−0.08	0.18
	(0.14)	(0.10)	(0.22)
Age	0.01	−0.00	−0.00
	(0.00)	(0.01)	(0.01)
Male	−0.04	−0.09	−0.00
	(0.07)	(0.08)	(0.10)
Education	−0.07	−0.02	−0.02
	(0.05)	(0.06)	(0.07)
Smoker	−0.21*	−0.44**	−0.01
	(0.12)	(0.19)	(0.14)
Worker	−0.04	0.29	0.23
	(0.14)	(0.19)	(0.22)
Children	0.10	0.09	−0.17
	(0.26)	(0.26)	(0.34)
Household Income	0.23	0.06	−0.81
	(1.11)	(0.88)	(1.22)
Migrant	0.05	0.10	−0.25
	(0.18)	(0.19)	(0.25)
Car			0.56***
			(0.18)
Constant	1.16	1.33	0.42
	(1.04)	(0.83)	(1.36)
Government media			
Sufficient info	0.07*	0.08*	0.08**
	(0.04)	(0.04)	(0.04)
Respondent	−0.06***	−0.06***	−0.06***
	(0.02)	(0.02)	(0.02)
Age	0.00*	0.00*	0.00**
	(0.00)	(0.00)	(0.00)
Male	−0.01	−0.01	−0.01
	(0.02)	(0.02)	(0.02)
Education	−0.00	−0.00	−0.01
	(0.01)	(0.01)	(0.01)
Smoker	−0.05*	−0.05*	−0.05*
	(0.03)	(0.03)	(0.03)
Worker	0.03	0.03	0.03
	(0.03)	(0.03)	(0.03)
Child	0.00	0.00	−0.02
	(0.07)	(0.07)	(0.07)
Migrant	−0.04	−0.04	−0.05
	(0.06)	(0.06)	(0.06)
Household Income	−0.21	−0.21	−0.40
	(0.26)	(0.26)	(0.28)
Car			0.10***
			(0.04)
Constant	0.70***	0.70***	0.67***
	(0.09)	(0.09)	(0.09)
Athrho Constant	0.75	1.09*	0.85
	(0.59)	(0.58)	(0.65)
Lnsigma Constant	−1.11***	−1.11***	−1.12***
	(0.05)	(0.05)	(0.05)
Observations	1103	1103	1093

Clustered standard errors (household) in brackets. * (p<0.10), ** (p<0.05), *** (p<0.01).
District dummies for Chaoyang and Dongchen omitted.

Table A26: Air purifiers and Preventive health checks

	Bi-Probit		IV- Probit	
	Health checks	Air Purifier	Health checks	Air Purifier
Government media	1.63***	−0.90	−0.96	2.13**
	(0.46)	(5.07)	(1.48)	(0.95)
Respondent	0.16**	0.06	0.07	0.04
	(0.07)	(0.05)	(0.13)	(0.11)
Age	0.00	0.00	0.02***	0.00
	(0.00)	(0.01)	(0.00)	(0.01)
Male	−0.01	0.04	−0.09	−0.04
	(0.07)	(0.06)	(0.08)	(0.07)
Education	0.33***	0.09	0.50***	0.12
	(0.05)	(0.06)	(0.10)	(0.08)
Smoker	−0.12	−0.05	−0.15	0.17*
	(0.11)	(0.25)	(0.13)	(0.10)
Worker	−0.07	0.23	−0.23	0.04
	(0.12)	(0.16)	(0.16)	(0.13)
Children	0.32**	0.63**	1.58***	0.83*
	(0.15)	(0.30)	(0.40)	(0.49)
Household Income	2.94***	1.47	2.92***	1.74**
	(0.84)	(1.73)	(1.13)	(0.86)
Migrant	−0.18	−0.97**	−0.14	−0.51*
	(0.18)	(0.49)	(0.16)	(0.31)
Constant	−2.17***	−1.05	−1.29	−3.18***
	(0.37)	(4.71)	(1.52)	(0.34)
Government media				
Sufficient info	0.30**	0.33*	0.07**	0.07**
	(0.13)	(0.19)	(0.04)	(0.04)
Respondent	−0.29***	−0.26***	−0.06***	−0.06***
	−0.06	−0.07	(0.01)	(0.01)
Age	0.00	0.01	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Male	0.09	0.05	−0.01	−0.01
	(0.06)	(0.07)	(0.01)	(0.01)
Education	−0.02	−0.00	0.00	0.00
	(0.05)	(0.04)	(0.01)	(0.01)
Smoker	−0.27**	−0.22	−0.04*	−0.04*
	(0.12)	(0.20)	(0.03)	(0.03)
Worker	0.04	0.05	0.02	0.02
	(0.14)	(0.14)	(0.03)	(0.03)
Children	−0.01	−0.09	0.01	0.01
	(0.19)	(0.27)	(0.07)	(0.07)
Household Income	−0.35	−0.32	−0.15	−0.15
	(0.87)	(1.16)	(0.22)	(0.22)
Migrant	0.06	−0.03	−0.01	−0.01
	(0.24)	(0.52)	(0.05)	(0.05)
Constant	0.54**	0.43*	0.70***	0.70***
	(0.24)	(0.23)	(0.09)	(0.09)
Athrho Constant	−1.26*	0.42	0.31	−0.99
	(0.68)	(3.13)	(0.53)	(0.62)
Lnsigma Constant			−1.10***	−1.10***
			(0.05)	(0.05)
Observations	1353	1356	1353	1356

Clustered standard errors (household) in parentheses . * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
District dummies for Chaoyang and Dongchen omitted.

Appendix E. Sample Questionnaire

Air Pollution and Health Survey

Beijijng

PKU and IHEID

August 2012

A. Personal Characteristics

How many people live **in the same house**? Do you share your money with all of these people for everyday expenses (food, clothing, car, etc)?[1]

Mark as R the respondent person, M1, M2...MX the members of the family who live in the same apartment and share the same money.

> For every question, ask first about the **respondent R**, then about family **members M** who live with him (Unless the cells are covered for other family members).

ID	Relation to respondent (Father/mother/Son/daughter/ Brother/Sister/Wife/husband/ Other)	A0. How many months did this person spend in this same house in the last year (past12 months)? Drop those who spend less than 6 months	A1. Gender 0 M 1 F	A2. age (or Year born if preferred)	A3.Place of birth 1. Same district in Beijing 2. Other district in Beijing 3. Outside Beijing (rural) 4. Outside Beijing (urban)	A4. Highest education level completed 1. Just basic literacy/kindergarden 2. Primary 3.Middle school 4 High school /Technical school 5 University 6 Master and above (PhD, postdoc)	A5. What best describes your current position? 1. Student 2 Retired and not working 3.Stay at home 4 Retired, still working 5 Worker
R					_	_	
	_				_	_	_

[1] Exclude lodgers and landlords. We want people with the same budget, who make joint decisions, and for whom te respondent is more likely to know the health, income and other information.

B. Health

Insurance								
ID	B1.What is the current medical insurance type (for 2012)? (can be multiple choice) 0 none(skip to C2) 1 urban employee medical insurance 2 urban resident medical insurance 3 new cooperative medical insurance 4 other socail mecial insurance 5 commercial mecical insurance	B1.1 Were the types of medical insurance in 2011 the same with this year? 0 yes 1 no，the different types are___(	B1.2 What was the wage one year before retirement? Yuan/month (for the retired who choose 1 in B1/B1.1)	B1.3 What should you pay for the insurance each year? Yuan/year (for the ones who choose 3/4 in B1/B1.1)	B1.4 What should you pay for the commercial medical insurance each year? Yuan/year (for the ones who choose 5 in B1/B1.1)	B2. If the answer is no (0) medical insurance, why not? 1 I do not need insurance, I am healthy. 2 It is not worth because insurance reimburses only small amount of total medical costs. 3 The premium is too high for me to afford 4 Other (specify)	B3. Do you have any other types of insurance (consider those you have to pay for)? 0. Property insurance 1. Life, accident insurance 2. none	B3.1 What is the main purpose of buying the insurance? 0 averting risk/protecting life 1 investment 2 others
R								

ID	B4 How do you consider your health compared to same age group and same gender? 1 Very good 2 Good 3 Average 4 Bad 5 Very bad	B4.1 How do you consider your health of 2 years ago? 1 Very good 2 Good 3 Average 4 Bad 5 Very bad	B4.2 How do you consider your health of 5 years ago? 1 Very good 2 Good 3 Average 4 Bad 5 Very bad	B5. How many cigarettes do you smoke per day? (0 if non-smoker)	B5.1. How many years have you been smoking (include if was smoker in the past and stopped less than a year ago)?	B6. How many preventive health service/ visits did you do last year?	B6.1 How much did this service cost every time you did it? 0. Nothing, the govt/my company paid for it I paid _______	B7. Do you suffer from any of the following symptoms (see list in Appendix)? 0 no 1 yes but they are not so bad, I can go on with my daily life 2 Yes and they are bad, they affect what things I can do in my daily life, I have to take some medicines 3 Very bad, I often take medicines, sometimes I have to stay in bed, they hurt a lot.	B7.1 In which month do they manifest most? (Multiple answers possible)	B7.2 Do you have them frequently ? 0 no 1 yes
R	_									
	_									
	_									

Airborne Chronic Diseases									
ID	B8. Did you suffer from any airborne chronic disease in the last year? 0 No 1 Chronic Asthma 2 Chronic Bronchitis 3 COPD 4 Other chronic respiratory infection (Chronic Rhinitis, Pharingitis and similar diseases)[1] 5 Cardiovascular 6 Hypertension	B8.1 How many years have you been suffering from it[2]?	B8.2 severity of your chronic disease compared to 2 years ago? 0 Did not have it at that time 1 now better 2 now worse 3 basically the same	B8.3 severity compared to 5 years ago? 0 Did not have it at that time 1 now better 2 now worse 3 basically the same	B8.4 Was it ever diagnosed by a doctor? 0 no 1 yes	B8.5 In which months did you have it last year? Indicate as many as needed If all year, write 13	B8.5.1 During those months, how would you rate the pain it causes you? 0 Not painful or disturbing, I can cope with it 1 Painful and disturbs a bit my daily life 2 Very painful, usually disturbs my life any time I have it	B8.6 What is the main thing you did when you felt a lot of pain? 1 self-care 2 asked for help to family/friends 3 Saw a doctor/nurse (hospital, clinic)-jumt to G11 4 Nothing	B8.6.1 If did **not** answer 3 what was the main reason? 1. Sickness was not so bad/I can take care just myself or with family help 2. Do not like the service of doctors /hospitals 3. Could not afford cost 4 Too busy/ no time 5. Other (specify)
R				年					
				年					

Airborne Acute Illness Episodes																
ID	B9. Did you suffer from any acute illness episode last year? 0 No 1 Asthma 2 Bronchitis 3 Acute respiratory infection (Rhinitis, Pharyngitis and similar diseases) 4 Other___						B9.1 Was it diagnosed by a doctor? 0 no 1 yes	B9.2 In which months did the illness occur? Indicate as many as needed If all year, write 13						B9.2.1 How would you rate the pain it causes you in those months? 0 Not painful or disturbing, I can cope with it 1 Painful and disturbs a bit my daily life 2 Very painful, usually disturbs my life any time I have it	B9.3 What is the main thing you did when you felt a lot of pain? 1 self-care 2 asked for help to family/friends 3 Saw a doctor/nurse (hospital, clinic)-jumt to G11 4 Nothing	B9.3.1 If did **not** answer 3 what was the main reason? 1. Sickness was not so bad/I can take care just myself or with family help 2. Do not like the service of doctors /hospitals 3. Could not afford cost 4 Too busy/ no time 5. Other (specify)
R																

[1]Give priority to these diseases in case they have 5-6 and one of them.
[2]If has many chronic diseases, choose the most significant.

Cost of airborn illness											
ID	B10. How much did it cost for the illness mentioned above **in total** in the past 12 months? If unclear, can move to D3.1	B10.1 How much did you **pay individually** for the illness mentioned above for health in the past 12 months? If still unclear, move to 3.2	B10.2 How much did **pay individually for health** in the past 12 months?	B10.2.1 What **percentage** of it was for the illness mentioned above?	B10.3 How much was paid by insurance for the illness mentioned above? If unclear, move to B10.4		B10.4 what is rule for health insurance reimbursement?		B10.5 For how many days were you unable to carry out normal activities due to the illness you mentioned above?	B10.6How many days of work did you lose due to the illnesses you mentioned above?	B10.6.1 Out of those that you missed, how many days of paid sick leave did you use?
					B10.3.1 govt(public insurance)	B10.3.2 commercial insurance	B10.4.1 **minimum amount of cost**	B10.4.2 **proportion**			
R								%			
								%			
								%			

Other illnesses and cost												
ID	B11.Did you suffer from any **other** major disease (chronic or acute) last year? 0 No 1 Yes (please specify)	B11.1 Was any of them diagnosed by a doctor? 0 no 1 yes	B11.2 Severity of these illnesses compared to 2 years ago? 0 Did not have it at that time 1 now better 2 now worse 3 basically the same	B11.3 Severity of these illnesses compared to 5 years ago? 0 Did not have it at that time 1 now better 2 now worse 3 basically the same	B11.4 In which months did you have these diseases ? Indicate as many as needed If all year, write 13	B11.4.1 How would you rate the pain these diseases causes you in those months? 0 Not painful or disturbing, I can cope with it 1 Painful and disturbs a bit my daily life 2 Very painful, usually disturbs my life any time I have it	B11.5 How much did you **pay individually** in the past 12 months for these other illnesses?	B11.6 How much was paid by **govt (public insurance)**	B11.7 How much was paid by **commercial** insurance?	B11.8 For how many days were you unable to carry out normal activities due to these illnesses?	B11.9 How many days of work did you lose because of these illnesses?	B11.9.1 Out of those that you missed, how many days of paid sick leave did you use?
R												

C. Exposure

Means of transportation

ID	C1. During weekdays, how do you commute? 0 Drive a car or by taxi 1Subway 2Bus 3 Motorcycle 4 Bicycle or on foot 5 Stay Indoor	C2. Frequency 0 every weekday 1 occasionally	C3. If they answer every day, how much time do you spend on commute every day of the week (minutes) when difficult to answer, write the time when leave home and the time when arrive your work place, and vice versa	C4. During weekends, how do you move around? 0 Drive a car or by taxi 1Subway 2Bus 3 Motorcycle 4 Bicycle or on foot 5 Stay indoor	C5. Frequency 0 every weekend 1 occasionally	C6. If they answer every weekend, how much time do you spend on this mean of transport in the weekend (total minutes) when difficult to answer, write the time when leave home and the time when arrive your destination place, and vice versa
R						

Time use over the day

		C7 Summer (April –Oct)		C8 Winter (Nov-March)	
ID		How much time (hours) do you spend outdoor for leisure, exercise and other activities?	If has a job, how much time (hours) do you spend at work outdoor?	How much time (hours) do you spend outdoor for leisure, exercise and other activities?	If has a job, how much time (hours) do you spend at work outdoor?
R	Weekdays	C7.1	C7.1	C8.1	C8.2
	Weekend	C7.3	C7.4	C8.3	C8.4
	Weekdays				
	Weekend				
	Weekdays				
	Weekend				
	Weekdays				
	Weekend				

D. Information about pollution

ID	D1. Where do you check for air pollution information? 1.TV, broadcasting, newspaper and magazine 2.internet2a.cell phone 2b PC 3 self-perception, relatives, friends, neighborhood and colleges 4 Other 5 Don't know or don't care_	D2. Do you think this info is enough for you or would you like more of it? or specify the channel you would like to use more 0 enough 1 TV, broadcasting, newspaper and magazine 2.internet2a.cell phone 2b PC 3 Other___	D3. Did you notice that during the last year there was very bad days of air pollution/haze? 0. No 1. Yes	D3.1 If yes, do you remember when it was? 1.2011, Jan-June 2.2011, July-December 3.2012, Jan-June	D4. Did you know that afterwards the government in Beijing started releasing information about PM2.5? 0. No 1. Yes	D5. If yes to D3 or D4 or both, what did you do after this event (the debate or the government releasing information)? 0. I did nothing 1. I started worring more about air pollution 2. I look at more information 3. I worry more about air pollution, looked at information about it more often 4. Other (please specify________)
R						

E. Averting behaviour

Table 1 – Reasons for not adopting averting behaviour	
Reason	Example
0 Misunderstanding	Although the air is haze, the air quality is not bad Haze air doesn't hurt health Should exercise more to improve their physique in haze air. Think this behavior doesn't help to avert effectively
1 Low elasticity of behaviour	Difficult to change long-standing habit Hope to change, but cannot to The time outdoor is already very little, cannot reduce more Uncomfortable to wear a mask
2 Good health	Health is good, so don't worry about the haze air
3 Not applicable	During that time no plan for go out for exercise or leisure Already the best way (e.g. by car or taxi)
4 Other	

Under extreme circumstances (ask only if they noticed them, see question D3 D4) Assume those who do not know will behave same as in normal times.

ID	Did you ever do the following **during the extreme air pollution days** this year.		E2.1 (all no for E1 E2) the reason for not taking any of the two (see table 1 above):	E3. Did you change mean of transportation during extreme air pollution this year? 0 No 1 Yes	E3.1 If yes, specify below from which to which (e.g. bus to car) 0 Drive a car or by taxi 1Subway 2Bus 3 Motorcycle 4 Bicycle or on foot 5 Stay indoor	E3.2 If no, why not(see table 1 above)?	E4. Did you wear masks during extreme air pollution this year？ 0 No 1 Ordinary 2 Sophisticated	E4.1 if no, why not(see table 1 above)?
	E1 cancel leisure activities outdoor 0 No 1 Yes	E2 cancel excercise outdoor 0 No 1 Yes						
R					from______to___			
					from______to___			
					from______to___			

Under normal circumstances (all the rest of the year)

ID	Did you ever do the following because of air pollution the rest of the year?		E6.1(all no for E5 E6) the reason for not taking any of the three (see table 1 above):	E7. Did you change mean of transportation because of air pollution the rest of the year? 0 No 1 Yes	E7.1 If yes, specify below from which to which (e.g. bus to car) 0 Drive a car or by taxi 1Subway 2Bus 3 Motorcycle 4 Bicycle or on foot 5 Stay indoor	E7.2 if no, why not?	E8. Did you wear masks **because of air pollution** the rest of the year? 0 No 1 Ordinary 2 Sophisticated	E8.1 if yes, which months (not need to wear everyday, but often)? 13 = all year long	E8.2 if no, why not?
	E5 cancel leisure activities outdoor 0 No 1 Yes	E6 cancel excercise outdoor 0 No 1 Yes							
R					from______to___				
					from______to___				
					from______to___				

F. Air purifier [1]

ID	F1. How many air purifiers (air conditioner with air purifying function) do you have in your family (include gifts to other people)? 0 None (ask only K1.1) 1 One 2 More than one	F2 If no, why have you never bought one? 1 Don't know there is such thing in market 2 Air quality (indoor or outdoor) is not bad 3 All are healthy in home, don't need that 4 Don't believe it help to avert effectively 5 Too expensive, can't afford 6 Other reason (specify)	F2.1 If yes and you (or a member of your family) bought it, when did you buy it? (year and month)	F2.2 How much did it cost (in case you bought it)? (If not known, ask the brand-show cards)	Where do you keep it?		F4. How often do you use it at home? 1 almost all time, 2 only when the air is bad, 3 seldom use it
					F3.1 place 1 bedroom 2 Common room (kitchen, living room, bathroom) 3 Other	F3.2 1 Specific person's room,	

[1] Only for the function of cleaning air, NOT Humidification

G. Financial Information

ID	G1 If working (4-5), what is your job? See categories in appendix	G2 Is your job in one of the following categories (see list at the end)?	G3 Do you work in government, state enterprises / private or foreign companies? 0 Government, state enterprises 1 private or foreign companies	G4 Are you ever exposed on the workplace to dusts, sprays, gases, mists, smokes and fumes? 0 Never 1 Rarely 2 Often	G5.1 How many hours did you work this year per day?	G5.2 How many days per Week?	G5.3 How many months in th whole year?	G6 What is your net income per month through working[1]? If does not want to answer, say roughly.	G7. Do you have other sources of income (pension, scholarship, lodgers, financial)? 0 No Yes > If yes, how much is it in total per month? _____	G8. What is the total yearly income[2] of your household ?	G9 How much was your family income 2 years ago?	G10 How much was your family income 5 years ago?
	_											
	_											

ID	G6. Does your family own house property? 1 Yes 2 No, public / collective 3 No, commercial rent 4 Yes, other	G6.1 (Only if owned) How many meters squared is the house?	G6.2 how much is the house(s) worthy [3]	G6.3 are there any other house owned by your family?	G6.4 What is their Approximate value?	G6.5. How much is your morgage per month? 0 No morgage ____ if morgage	G7. If applicable, how much do you pay in monthly rent? 0 No rent ____ if rent	G8. Did your family ever buy a car? 0. No ___ Specify how many if yes	G8.1 If yes, how much were they when you bought it? (sum if more than 1 car)	G8.2 If yes, how much do you spend on your car per month?
H[4]	_		_ _ _ _ _	_ _ _ _		_ _ _	_ _ _	_		

[1] After tax
[2] Again, after tax
[3] Check with the community workers
[4] For the whole family

H. Extended family support

<table>
<tr><td>H1 Do you have your spouse or young, dependent children living somewhere else?</td><td>H2 If yes, specify where.</td><td colspan="2">H3 Do you have any family members who do NOT live in your house who help you and your family financially (money or goods)? Or you help them financially?[①]</td><td colspan="2">H4 Do you have any family members who do NOT live in your house who regularly help you and your family in other non-financial ways (cook for you, take care of children, house chores, etc.)? Or you help them non-finacially?</td><td>H5. Do you have any PAID external helper in your family (baby-sitter, cleaning lady or carer for the old ones)?

0 No
1 Yes</td></tr>
<tr><td>0 No
1 My spouse (wife/husband)
2 Childern (1 or more)
3 Both wife and children</td><td>1 Beijing, same district
2 Beijing, other district (specify____)
3 rural areas
4 Other cities</td><td>H3.1 amount received last year</td><td>H3.2 amount send last year</td><td>H4.1 get help
0 no
1 yes</td><td>H4.2 give help
0 no
1 yes</td><td rowspan="4"></td></tr>
<tr><td></td><td></td><td rowspan="3">_______yuan/year</td><td rowspan="3">_____yuan/year</td><td rowspan="3"></td><td rowspan="3"></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
</table>

[①] For example, on the regular basis or for festivels

I. Household Location

ID	I.1What is the Hokou status of your family[1]? 0 Beijing downtown 1 Other city 2 Rural 3 Unified	I1.1 If Beijing Hokou (0), when did you get it (year)? 0. Always had it (skip to C2) 1. Obtained in ________	I1.2 If 1, what was the previous one? 1 Other city 2 Rural 3 Unified	I2. When did you move to the current location (house where you live)? (Year → if 2011-2012, ask month)	I3. Where did you live before? 0 Beijing downtown (same district) 1 Beijing downtown (other district ________) 2 Other city 3 Rural	I4. What was the main reason for your family to move to this location? 0 Job 1 Studies 2 Quality of life 3 Cost of living 4 Replacement house (no location choice) 5 Born here 6 Marriage 7 other Ask for household first, then for each member	I5. How many days do you spend on holiday outside Beijing in the last 12 months?
						_	
						_	

J. Division of tasks

ID	J1. Who does the **main** house chores (cleaning, grocery shopping, washing up...)? 1 if the person does more than 1/3 of it, 0 otherwise. E if external person[2]	J2. Who does most of the caring of children? 1 if the person does more than 1/3 of it, 0 otherwise. E if external person, write E for all household members	J3. Who does most of the care of the elderly? 1 if the person does more than 1/3 of it, 0 otherwise. E if external person, write E for all household members
	_	_	_
	_	_	_
	_	_	_

[1]If family members have different Hokou, please specify if at least one has the Beijing hokou/what is the highest Hokou
[2]Write E for all household members if there is an external helper who does most of the household chores/caring

K. Filled by the investigator

K1. Was there anybody beside the respondent: 0 no 1 family members 2 other people

K2. Was there anybody to impede the respondent to answer the questionaire 0 no 1 yes, occasionally 2 yes, often

K3. Rate the williness to responce, the understanding and concentration of respondent (tick at the score number from bad(1 2 3 4 5) middle(6 7 8) good (9 10))

***