Supplement to "The Impact of Air Pollution on Birthweight: Evidence from Grouped Quantile Regression"

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A Role of Measurement Error

One main concern with the results of this paper is the measurement error associated with the approximation used to assign pollution to women. Different types of measurement errors could be influencing the results. First, there might be an individual-level measurement error. More precisely, since pollution varies within a county, women might be exposed to a different level of pollution than the county average. Furthermore, women might spend a different amount of time outside, which affects their pollution exposure. This type of measurement error is not a reason for concern as long as it is uncorrelated with the outcome. As these errors will average out, the results are asymptotically unbiased. Second, there could be a group-level measurement error if, for example, during a given month, pollution exposure is on average lower than the average pollution level because people spend little time outside. For instance, it is plausible that people spend more time indoors during the winter months. In the extreme case that there is only a group-level measurement error, the first-stage regressions are not affected and the measurement error will affect only the second stage, which is estimated by OLS. Thus, it would lead to an attenuation bias. In the more plausible scenario that the measurement error is both at the group-level and individual-level, results of Angrist et al. (2006) suggest that measurement errors in quantile regression lead to an attenuation bias like in mean regression.[1] Third, the measurement error could be correlated with pollution, and thus, it could lead to spurious results. Knittel et al. (2016) perform a Monte Carlo study to analyze the effect of a nonclassical measurement error on their estimates of the effect of pollution on infant mortality. They find a small but positive correlation between the measurement error and pollution and conclude that the measurement error has a moderate effect, which tends to attenuate the coefficient. Given that the measurement error and pollution level, if not independent, are likely to be positively correlated also in this paper, one might expect that a bias will tend to attenuate the estimates of this paper, therefore, should not invalidate the results.

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[1] Angrist et al. (2006) derive these results by treating the measurement error as an omitted variable.

B Additional Results

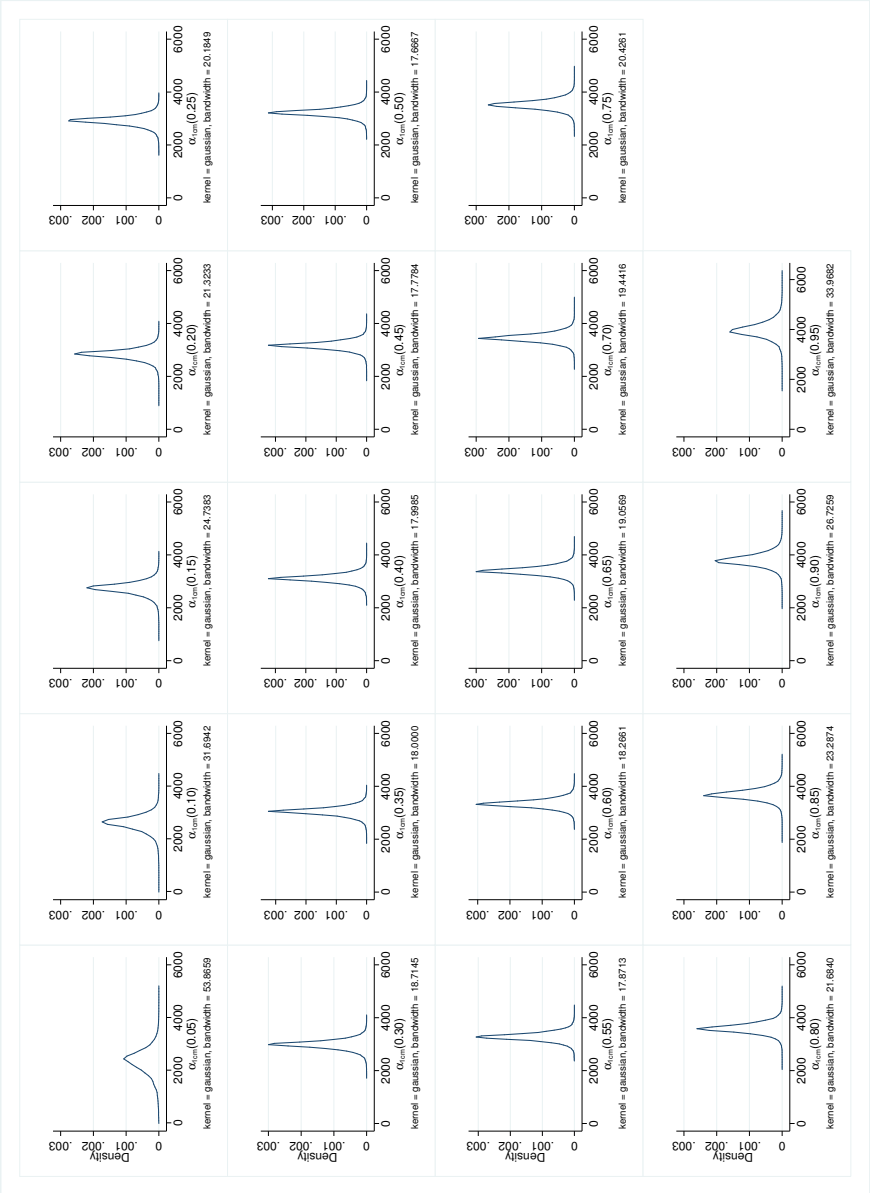

Fig. A. 1: Kernel Densities of $\hat{\alpha}_{1,cm}(u)$

The Figure illustrates the Kernel densities of the estimated constant of the first stage, $\hat{\alpha}_{1,cm}(u)$, for quantiles $u \in \{0.05, 0.1, ..., 0.95\}$. The kernel densities are based on 13,239 estimates for each quantile u.

	PM_{10} Level				
	(1) 1st quartile	(2) 2nd quartile	(3) 3rd quartile	(4) 4th quartile	(5) Total
Individual-Level Variables					
Birthweight					
Mean	3333.8	3311.2	3305.2	3304.4	3313.6
Standard Deviation	575.5	584.0	579.0	570.9	577.5
5th percentile	2410	2381	2381	2390	2381
10th percentile	2693	2665	2665	2665	2665
25th percentile	3033	3005	3005	3005	3005
50th percentile	3370	3345	3345	3335	3345
75th percentile	3686	3675	3657	3657	3670
90th percentile	3997	3969	3969	3966	3969
% Female	0.488	0.488	0.489	0.489	0.488
% Black	0.196	0.246	0.234	0.189	0.216
% Hispanic	0.174	0.204	0.291	0.314	0.246
Mother's age	27.79	27.15	26.92	26.87	27.19
Mother's education	13.19	12.91	12.60	12.60	12.83
Cigarettes	0.783	0.854	0.731	0.739	0.777
County-Level Variables					
PM_{10}					
Mean	18.16	22.75	26.87	35.63	25.85
Standard Deviation	1.898	1.156	1.197	6.206	7.251
Temperature	14.05	14.98	15.55	15.39	14.99
Precipitations	3.134	2.867	2.570	1.795	2.592
Per capita personal income	33941.0	32627.6	33098.3	30421.4	32522.5
Public medical benefits	873.4	951.2	836.2	772.1	858.2
SNAP	60.60	77.11	79.09	80.86	74.41
Personal current transfers	4308.0	4254.6	3943.9	3959.2	4116.5
Unemployment benefits	131.3	119.1	117.1	114.2	120.4
Income maintenance benefits	406.3	483.9	464.9	453.4	452.1
N	1,949,124	1,948,015	1,948,761	1,947,345	7,793,245

Table A. 1: Summary Statistics: PM_{10} Sample

Percentile of birthweight	Effect of $PM_{2.5}$				Effect of PM_{10}
	(1)	(2)	(3)	(4)	(5)
5th	-28.00**	-23.61*	-27.01*	-28.46**	-33.45**
	(10.62)	(9.881)	(10.42)	(10.29)	(12.38)
10th	-20.45**	-15.74*	-19.49**	-16.91**	-17.37*
	(6.761)	(6.514)	(6.560)	(6.412)	(7.278)
15th	-10.82*	-8.800	-10.60	-8.636	-12.66*
	(5.355)	(5.419)	(5.387)	(5.091)	(6.171)
20th	-9.270*	-8.220	-9.344*	-5.905	-13.75*
	(4.554)	(4.453)	(4.569)	(4.393)	(6.368)
25th	-6.167	-5.054	-6.360	-4.041	-8.845
	(4.406)	(4.419)	(4.434)	(4.201)	(6.070)
30th	-4.544	-3.002	-4.848	-3.255	-10.42
	(3.910)	(4.044)	(3.985)	(3.721)	(5.595)
35th	-2.502	-1.685	-2.810	-1.474	-10.10
	(3.671)	(3.786)	(3.729)	(3.501)	(5.766)
40th	-0.764	0.196	-1.134	-0.0899	-5.769
	(3.615)	(3.475)	(3.533)	(3.436)	(5.954)
45th	-1.275	-0.570	-1.529	-0.671	-6.081
	(3.675)	(3.544)	(3.557)	(3.462)	(6.221)
50th	1.684	3.284	1.512	2.243	-4.458
	(4.002)	(3.773)	(3.783)	(3.775)	(6.733)
55th	1.402	3.707	1.129	1.460	-1.517
	(4.145)	(3.859)	(3.976)	(3.958)	(6.855)
60th	0.965	3.309	0.722	0.651	-1.856
	(4.773)	(4.445)	(4.708)	(4.587)	(6.558)
65th	0.404	2.551	0.351	-0.314	-2.429
	(4.668)	(4.414)	(4.612)	(4.639)	(6.627)
70th	1.736	3.556	1.837	0.260	-1.987
	(4.812)	(4.572)	(4.805)	(4.729)	(6.706)
75th	1.515	3.227	1.905	-0.177	0.118
	(4.574)	(4.208)	(4.508)	(4.585)	(6.760)
80th	1.612	3.326	1.819	-0.256	3.397
	(4.436)	(4.088)	(4.446)	(4.442)	(6.370)
85th	-0.569	1.921	-0.0796	-1.451	-1.209
	(4.799)	(4.616)	(4.885)	(4.787)	(6.109)
90th	5.403	7.305	5.521	5.491	0.253
	(5.522)	(5.172)	(5.572)	(5.256)	(8.172)
95th	4.483	6.061	4.060	6.541	-3.992
	(6.572)	(6.269)	(6.586)	(6.431)	(8.448)
Individual Controls	x	x	x	x	x
Weather Controls	x		x	x	x
Income Controls	x			x	x
Transfers Controls	x			x	x
County FE	x	x	x	x	x
72 Months FE	x	x	x		x
12 Months & 6 Years FE				x	
Number of Observations	13'239	13'239	13'239	13'239	10'603

Table A. 2: Effect of $PM_{2.5}$ and PM_{10} on the Conditional Distribution of Birthweight

The grouped quantile regressions estimates give the effect of an increase in $PM_{2.5}$ (columns 1 to 4) and PM_{10} (column 5) during gestation by one standard deviation on the conditional distribution of birthweight. Results are based on a sample of 9,016,342 individual births divided into 13,239 groups (column 1 to 4) and on a sample of 7,793,245 individual births divided into 10,603 groups (column 5). The dependent variable is birthweight in grams. Regressions are weighted for the number of births in each group. Heteroscedasticity robust standard errors in parenthesis are clustered at the county level. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

C Additional Reference

References

Angrist J, Chernozhukov V, Fernández-Val I (2006) Quantile regression under misspecification, with an application to the U.S. wage structure. Econometrica 74(2):539–563

Knittel CR, Miller DL, Sanders NJ (2016) Caution, drivers! children present: Traffic, pollution, and infant health. Rev Econ Stat 98(2):350–366