CORRECTING AGGLOMERATION ECONOMIES: HOW AIR POLLUTION MATTERS

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OBJECTIVES

To correct agglomeration economies to account for the air pollution

WHAT IS AT STAKE?

- The positive role of density and accessibility on productivity (Ciconne and Hall, 1996; Combes et al., 2008, 2011)
- New transportation infrastructure or policy
  - enhanced accessibility and contribution to densification (Graham, 2007; Rice et al., 2006)
  - enlarge the concentration of actvities from which agglomeration economies arise (Gibbons and Overman, 2009)
- **Better accessibility leads to increased productivity (Venables, 2007)**
  - **But induced traffic generates air pollution!**
- Epidemiologic studies reveal the negative impact on health of local air pollution leading to
  - lower labor supply (Ostro, 1983; Hanna and Oliva, 2011; Carson et al., 2011)
  - lower labor productivity (Lavy et al., 2012; Graff Zivin and Neidell, 2012)

DATASET

- 304 French employment areas defined by commuting patterns
  - year 2009
  - 5 sectors pooled
  - panel database
- **Agglomeration economies variables: (from INSEE)**
  - employment density
  - labor productivity per worker
  - accessibility (market potential)
  - surface area, economic diversity
  - sectoral specialization
- **Air pollution variables:** (from each French AASQA: air quality monitoring association)
  - nitrogen oxide (NO_x)
  - fine particulates ($PM_{2.5}$) emissions

METHODOLOGY AND RESULTS

1. **General framework**
   - $\ln prod_z = \alpha + \beta \ln dens_z + \gamma \ln MP_z + \delta \ln area_z + \eta \ln div_z + \theta \ln spe_z + \varepsilon_z$
   - Estimate standard agglomeration economies
   - Endogeneity issues controled for industry fixed effects & instruments (lagged population densities and market potential)

   ✓ 0.05% increase in productivity for a 1% increase in density (in line with the literature)

2. **Extended framework**
   - $\ln prod_z = \alpha + \beta \ln dens_z + \gamma \ln MP_z + \delta \ln area_z + \eta \ln div_z + \theta \ln spe_z + \lambda \ln poll_z + \varepsilon_z$
   - Estimate corrected agglomeration economies
   - Endogeneity issues controled for instruments (lagged car ownership rates)

   ✓ 0.07% decrease in productivity for a 1% increase in NO_x emissions
   ✓ 0.07% decrease in productivity for a 1% increase in $PM_{2.5}$ emissions
   ✓ 0.1% decrease in productivity for a 1% increase in air pollution (both pollutants)

CONCLUSIONS

- The positive effect of density is halved when introducing air pollution: 0.03% increase in productivity for a 1% increase in density.
- Productivity gains are lower than traditionally estimated when accounting for air pollution.
- This study puts into perspective the agglomeration benefits resulting from the implementation of a new transportation infrastructure or policy.

Variables	NO_x		$PM_{2.5}$	
	OLS	IV	OLS	IV
ln *dens*	0.0514***	0.0265***	0.0510***	0.0321***
ln *MP*	0.0365***	0.0452***	0.0355***	0.0428***
ln *NOX*	-0.0595***	-0.0655***	-	-
ln *PM2.5*	-	-	-0.0647***	-0.0673***
Industry fixed-effects	Yes	Yes	Yes	Yes
N	1485	1485	1485	1485
R^2	0.617	-	0.633	-

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