

# Scaling Laws & Mechanistic Insight

- Availability of Data → Empiricism + Science of Cities
- Surge of “Scaling Laws” ( $Y \sim P^\beta$ )
  - Lack of Mechanistic Insight → Misguided Interpretations

Problems with: “Are larger cities greener or smoggier? (per capita)”

- No standard proxy for measuring CO<sub>2</sub> emissions
  - Time vs. Distance
- Defining a city
  - “...scaling exponents are very sensitive to the definition of a city.” (Barthelemy, 2014, pg. 768)

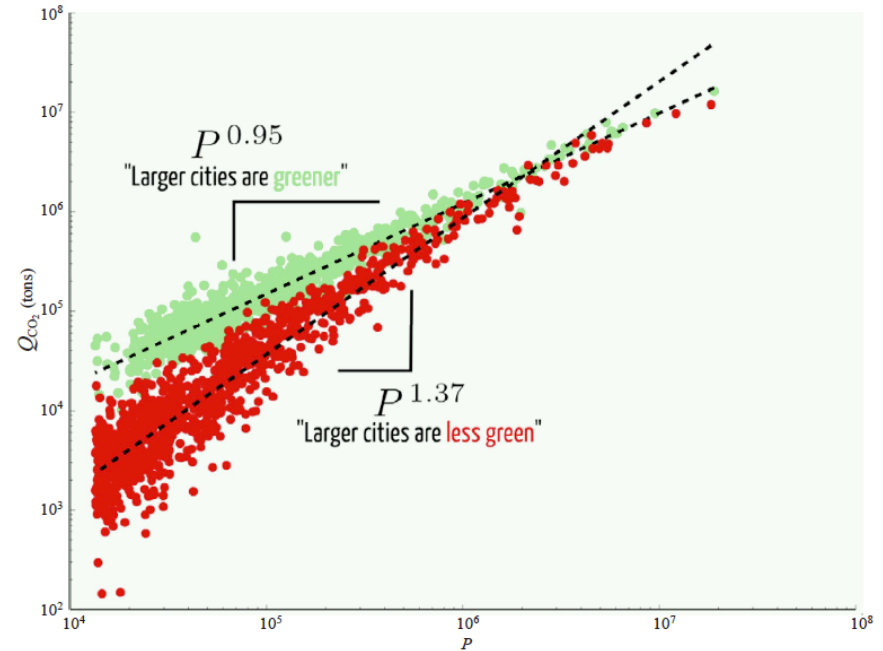
Different definitions of a city lead to opposite conclusions (right)

## Major Takeaways:

- It is dangerous to interpret empirical results without any mechanistic insight.
- Conclusions cannot safely be drawn from data analysis alone.



“Are larger cities greener or smoggier? (per capita)”



$Q_{CO_2}$  = Quantity of CO<sub>2</sub>  
 $P$  = Population Size