# Rosen-Roback Framework
## Urban Economics

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# Agenda

# Hedonic Price Function

$$log(P_i) = \beta_0 + \sum_{j=1}^{h} \beta_j H_{ij} + \sum_{k=1}^{n} \beta_k N_{ik} + u_i \tag{1}$$

- ▶ $P$ the sales price of a house;
- ▶ $H$ represents structural and property characteristics of the house (e.g. square footage of the living area, lot size, etc)
- ▶ $N$ represents location characteristics, (e.g. quality of schools, distance to CBD, parks, etc )

# Hedonic price functions
## Problems

▶ Market definition

▶ Sample selection

▶ Functional form

▶ Omitted Variables

# Agenda

# Accounting for Unobservable Heterogeneity in Cross Section Using Spatial First Differences

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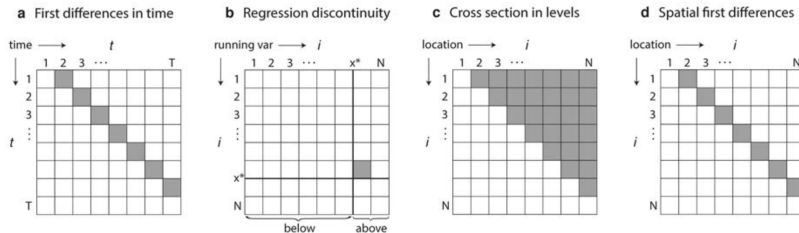


Figure 1: **Comparison of pair-wise assumptions regarding the comparability of observations needed for identification in different research designs.** Graphical depiction of the various comparisons exploited to identify causal effects in (a) FD time-series models, (b) regression discontinuity designs with discontinuity at $x^*$, (c) the cross-sectional approach in levels, and (d) SFD. Each observation in a data set appears on both a row and column for a grid. Squares are grey if the observations for that row and column are assumed to be comparable (i.e. expected potential outcomes are conditionally equal) when using the associated research design.

# Accounting for Unobservable Heterogeneity in Cross Section Using Spatial First Differences



(a) New York
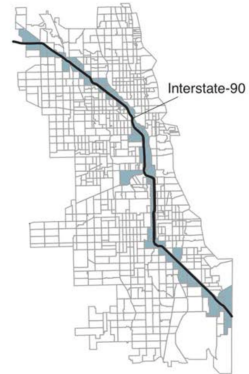
(b) Chicago

# Accounting for Unobservable Heterogeneity in Cross Section Using Spatial First Differences

| | 10th Avenue, New York | | I-90, Chicago | | Staiger and Stock (1997) | |
|---|---|---|---|---|---|---|
| | *Dependent variable: log average wage* | | | | | |
| | Levels | SFD | Levels | SFD | OLS | IV |
| Average years of education | 0.178*** | 0.089** | 0.124*** | 0.072* | 0.063*** | 0.098*** |
| | (0.015) | (0.028) | (0.020) | (0.037) | (0.000) | (0.015) |
| Constant | 4.682*** | −0.007 | 5.355*** | 0.000 | − | − |
| | (0.217) | (0.040) | (0.259) | (0.035) | | |
| Observations | 53 | 52 | 54 | 53 | 329, 509 | 329, 509 |
| R squared | 0.73 | 0.16 | 0.43 | 0.07 | − | − |

Table 1: **Cross-sectional estimates for returns to education using levels and SFD.** Data for the first four columns are for census tracts in Manhattan, New York along 10th Avenue and Chicago, Illinois along Interstate-90 for the year 2010. We report OLS standard errors, which, in this case, are more conservative than Newey-West standard errors. Asterisks indicate statistical significance at the 0.1%,***, and 1%**, and 5%* levels.

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▶ But we also need to understand how they affect productivity. Are they productivity increasing or decreasing?

▶ Intuitively, it seems like we should be able to learn about such values from observable wages and rents.

   ▶ The monocentric city will confirm this intuition, but does not lead immediately to a method for measuring the values of interest.

   ▶ The Rosen model helps with the measurement but omits construction (land) and labor markets, which must clear.

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- ▶ The Rosen-Roback model Roback (1982) is a cousin of the monocentric city model that is particularly useful for comparing one city to another.
  - ▶ It is the second workhorse model of urban economics.

- ▶ To make things simple, inter-urban models like Rosen-Roback tend to ignore intra-urban considerations like distance to the central business district.

- ▶ By dropping commuting we get an easy way to estimate the values that households and firms assign to amenities that affect the utility and productivity from cross location data describing wages, rents and amenities.

# Rosen-Roback

▶ In other words

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▶ How can we use cross-location differences in wages and rents to think about the value of changes to a location's attractiveness and productivity?

    ▶ For example, we expect that climate change will affect the attractiveness, and maybe the productivity of cities differently.

    ▶ Can we infer these values from cross-city differences in rent, wages, and climate?

# Rosen-Roback
## Set up

- 3 Sectors:
  - Consumers of Housing (homogeneous)
  - The production sector
  - The construction sector

- Assumption cities are small, and exogenous amount of land $\bar{L}$ in each city