Lecture 3
Housing markets

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ECON-L6000 - Urban and Regional Economics
Aalto University School of Business

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Tiebout (1956)

- Problem: How to determine the optimal level of expenditure on public goods?
  - when residents/consumers don't directly reveal preferences, unlike in the private sector
  - dominant belief among economists: no "market type" solution exists.

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- Tiebout (1956): But consumers do reveal their preferences by "voting with their feet"!
  - by choosing which local jurisdiction to reside in
  - i.e., by choosing the distribution of public good expenditures that best resembles their preferences

Tiebout (1956): Voting with your feet

Highly influential: a 9-page easy-to-read theory (no equations) with 23k cites on Google Scholar!

Key assumptions:

1. Residents are perfectly mobile
   - e.g., not restricted by discriminatory institutions or employment opportunities
2. Residents have full information
   - and are responsive to differences across jurisdictions
3. Large number of jurisdictions to choose from
4. No spillovers across jurisdictions in supply/consumption of public services

Tiebout (1956): Voting with your feet

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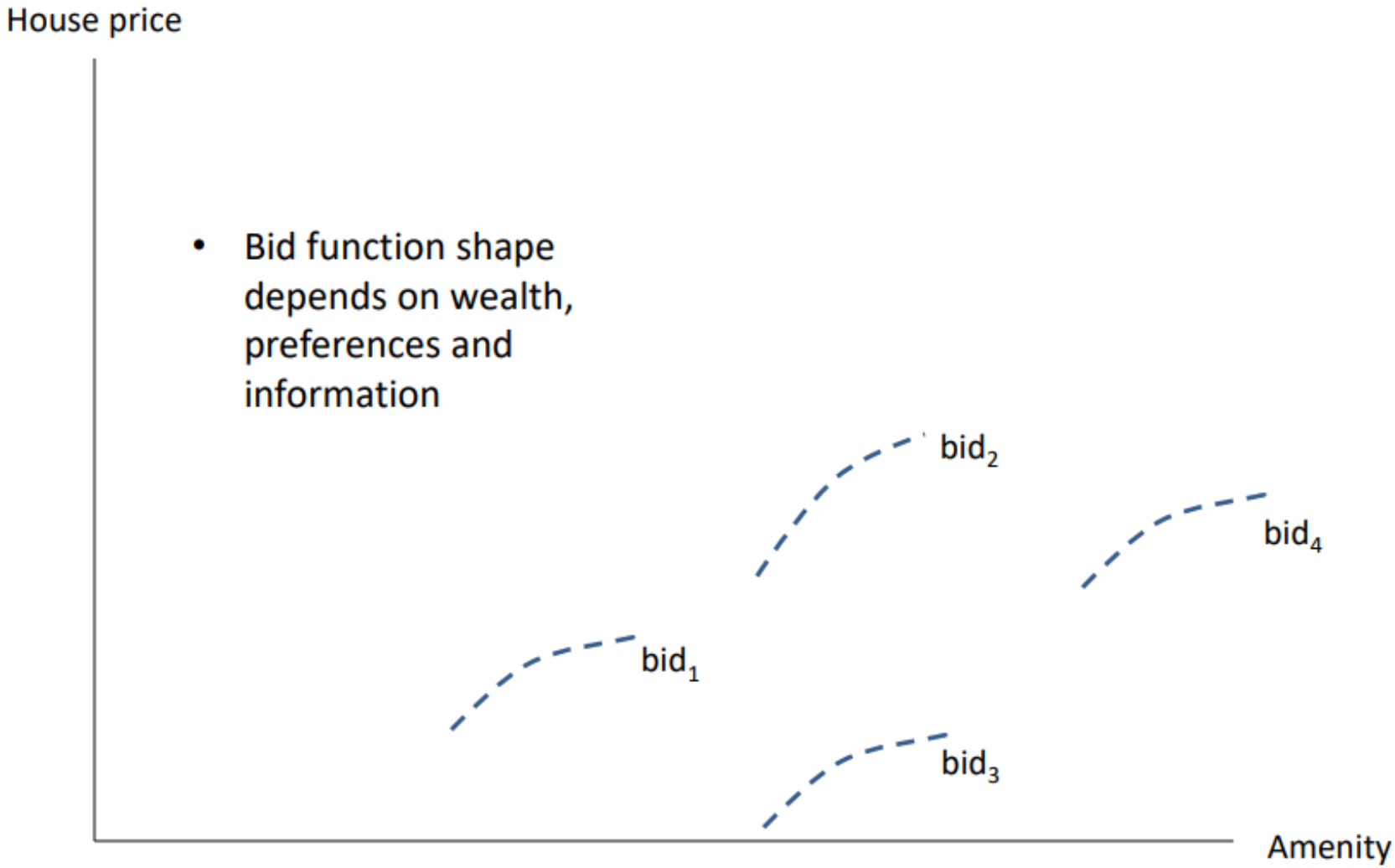
6. Jurisdictions below the optimum size try to attract new residents to lower average costs of public service provision. Those above their optimum size do the opposite.
   - Those at optimum try to keep their population constant e.g., zoning laws, etc.
   - incentive to sufficiently differentiate themselves from other jurisdictions!

Quantifying preferences for access to local public goods and amenities

Hedonic Property Value models

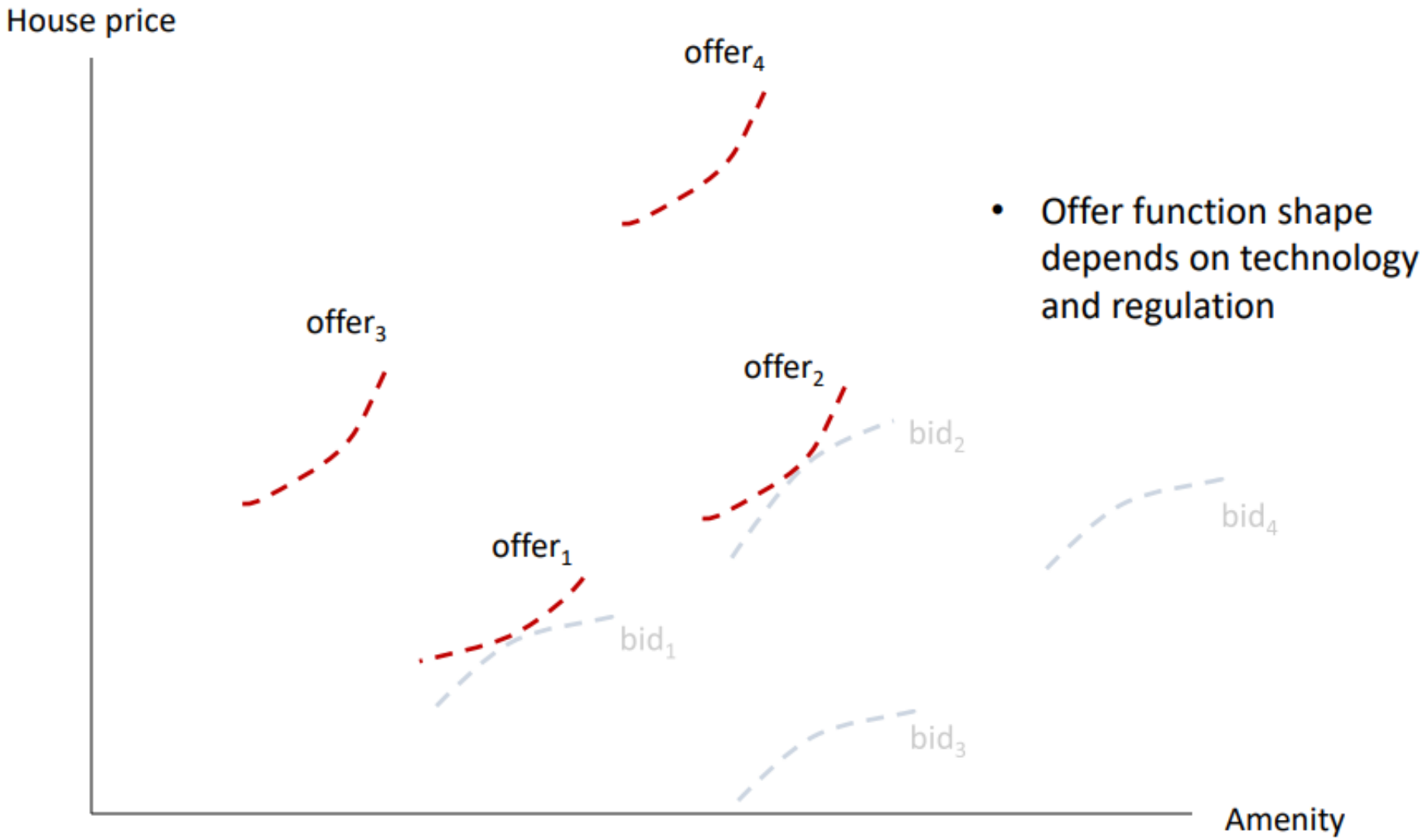
- credited mainly to *Rosen (1974)*, but expanded by many since!
- Housing units are a bundle of physical characteristics and location-specific amenities.
- Housing prices are aggregations of the implicit prices of attributes in the bundle.
- We can isolate the implicit price households are willing to pay for a particular local amenity.

Hedonic Property Value model



from *Bishop et al (2020)*

Hedonic Property Value model



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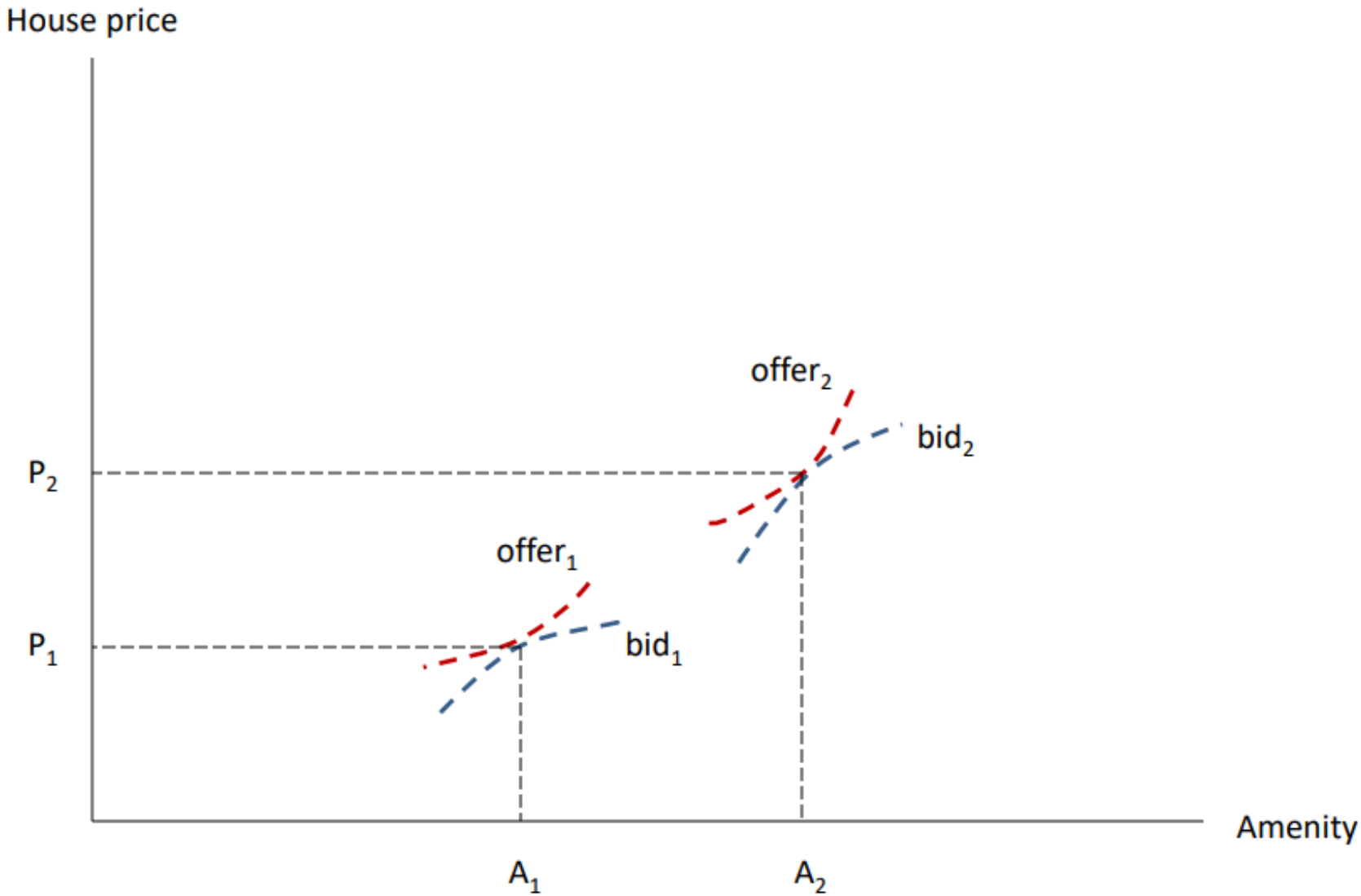

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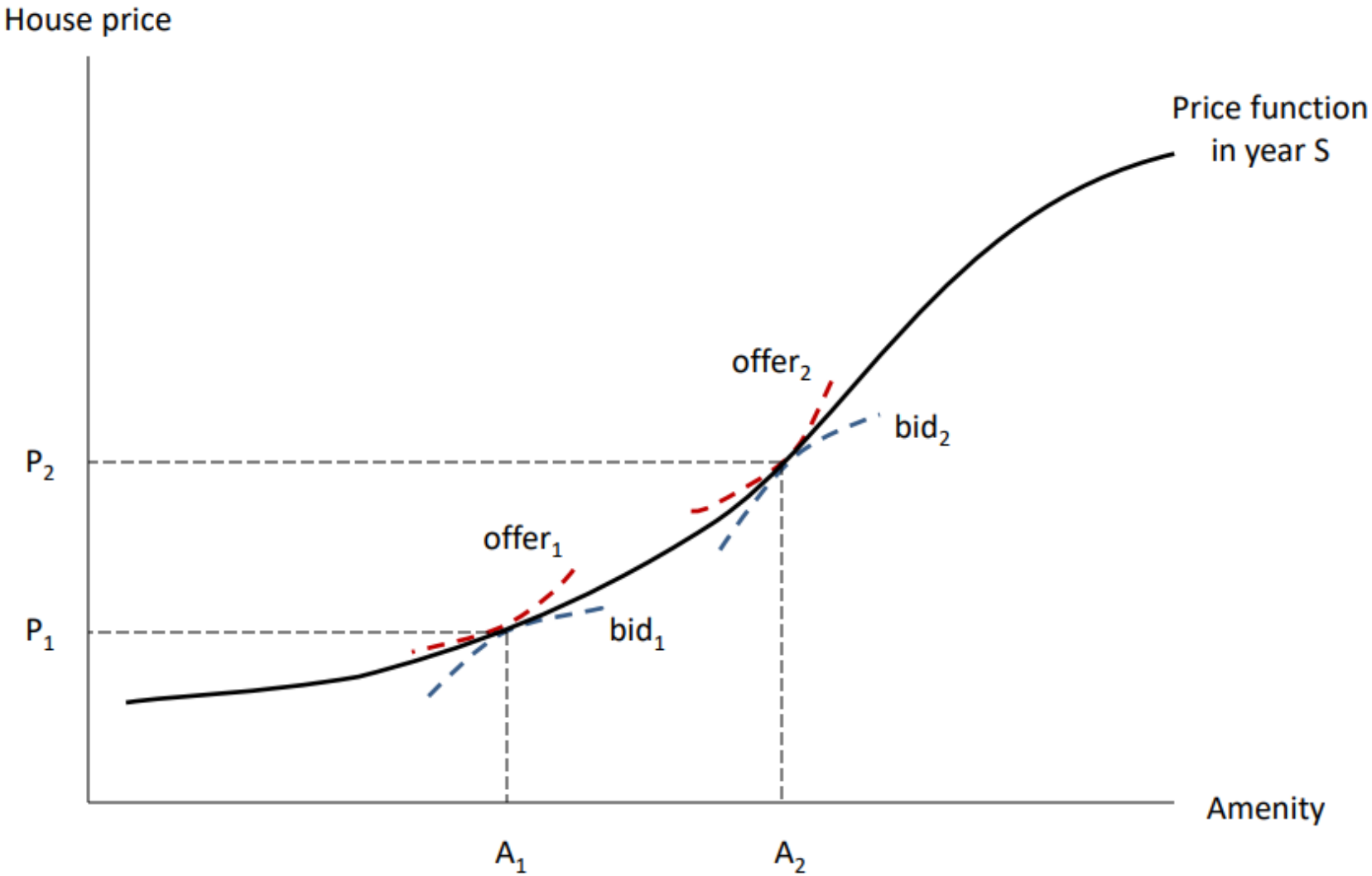

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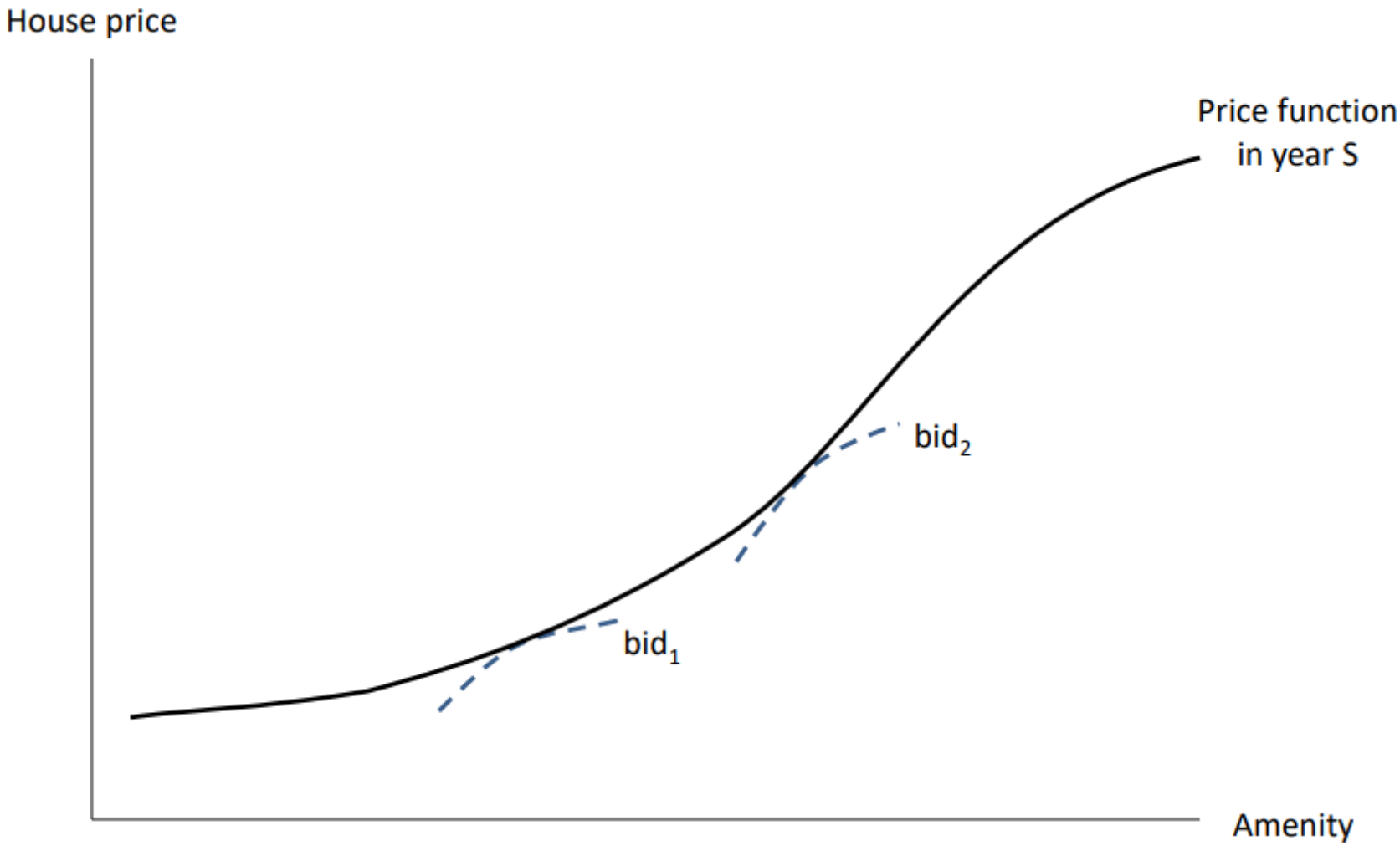

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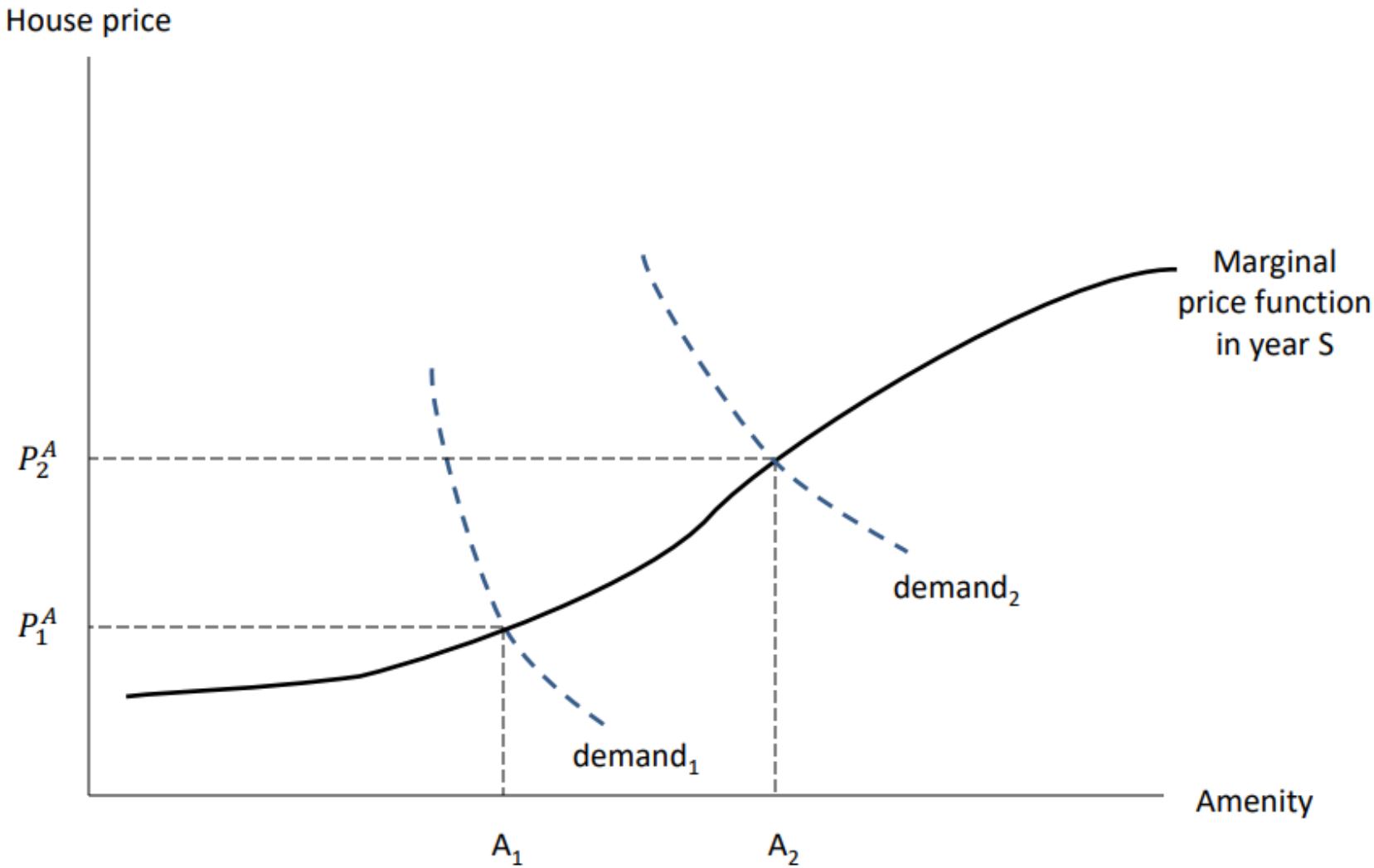

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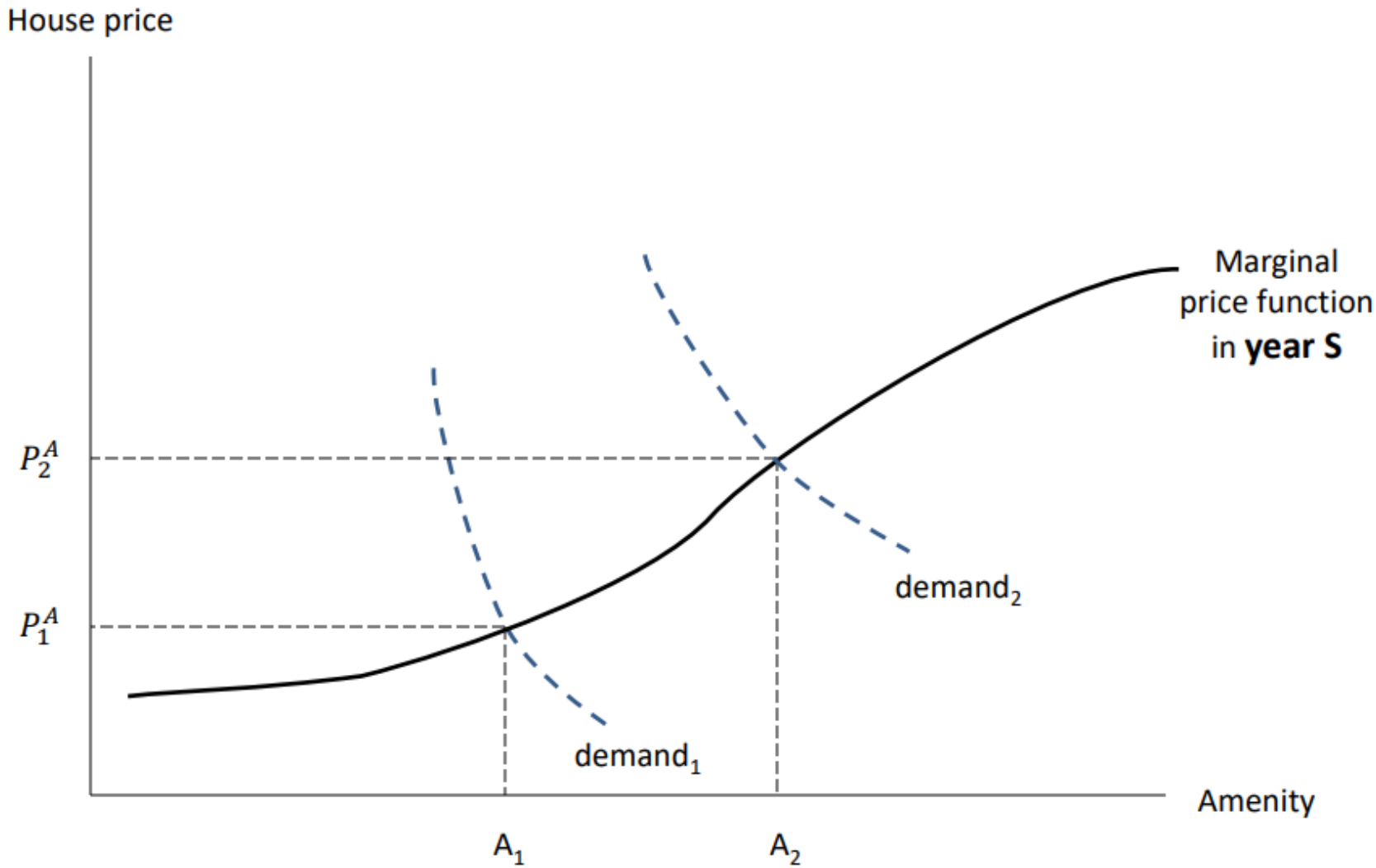

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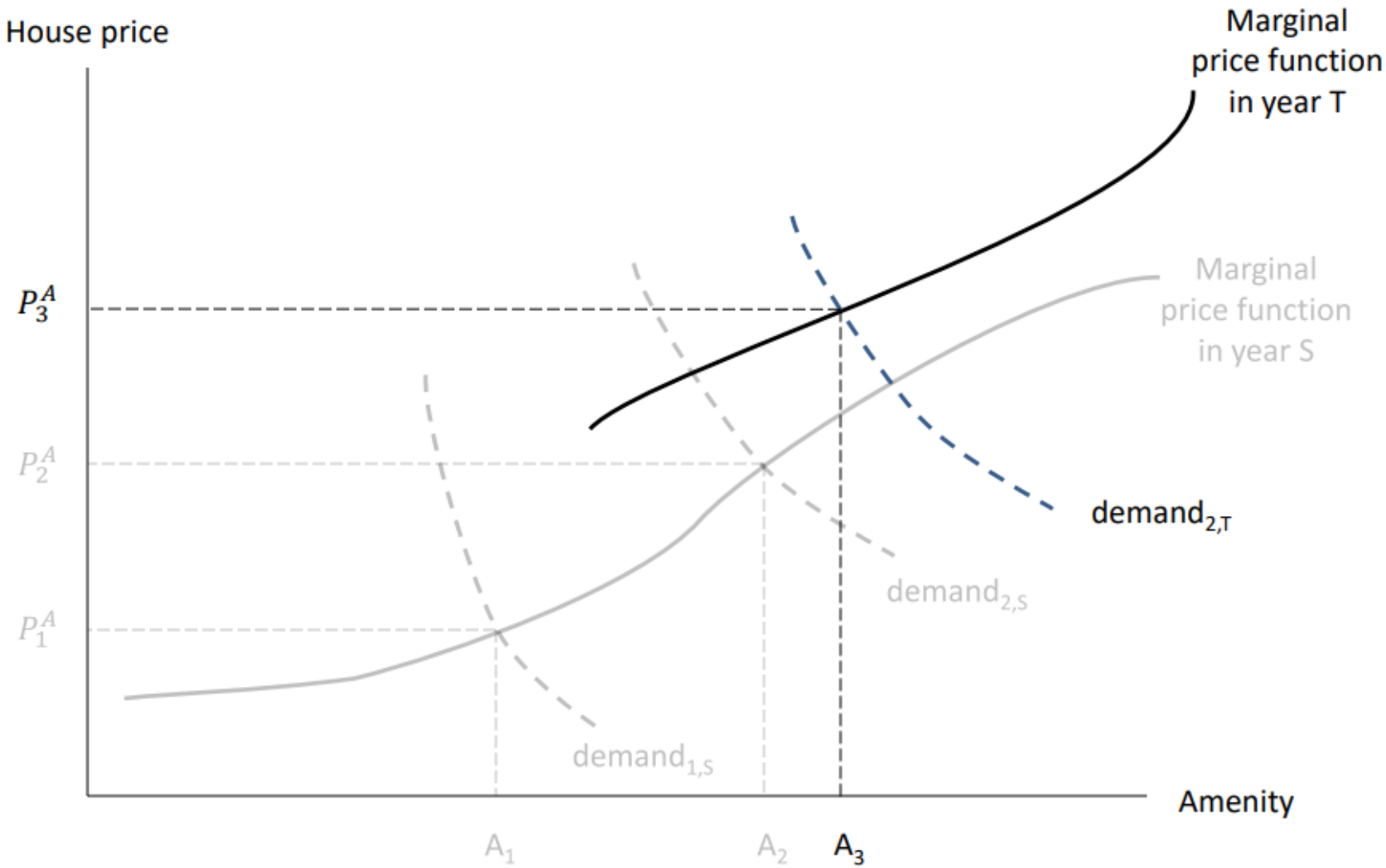
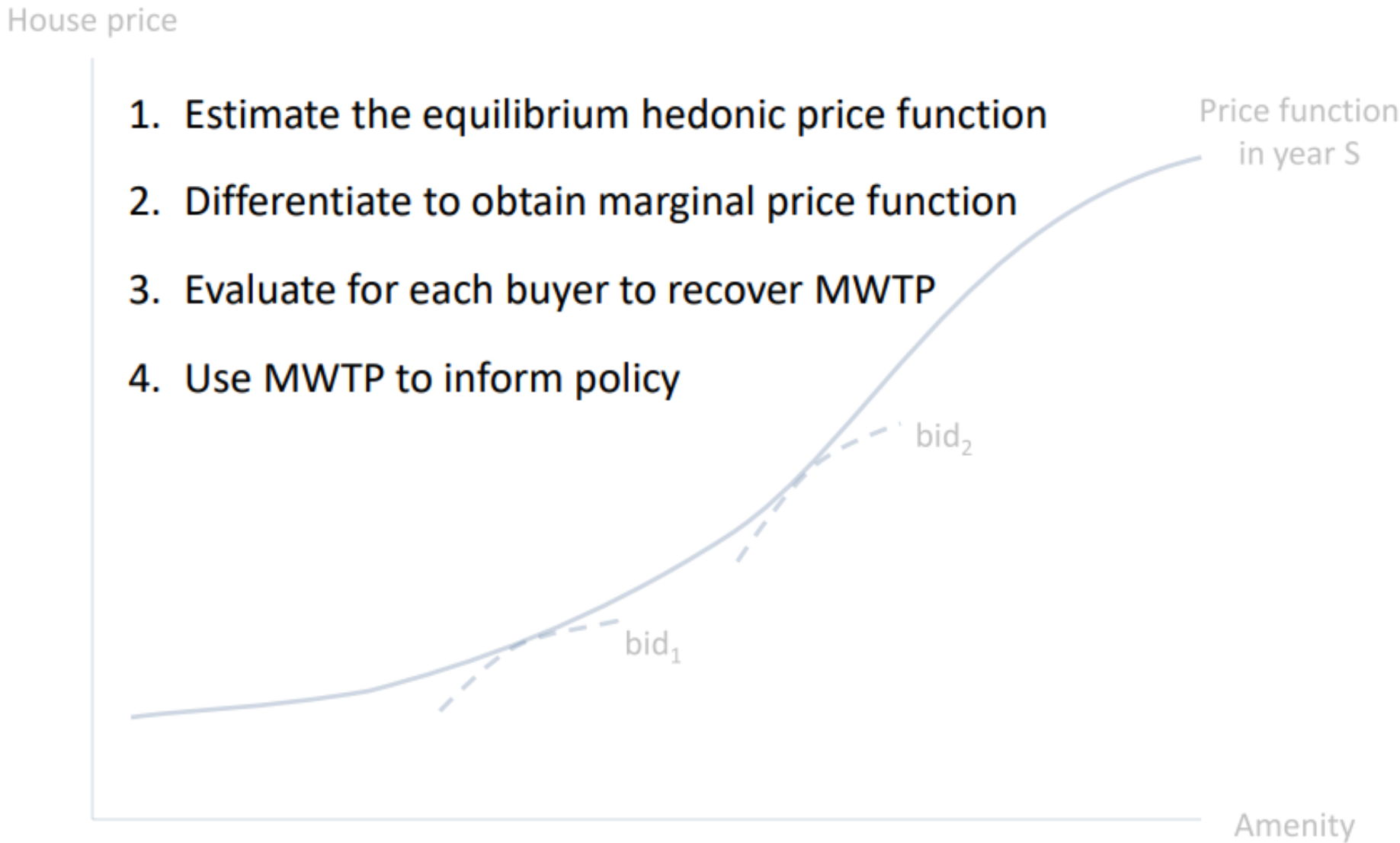


from *Bishop et al (2020)*

Estimating Marginal Willingness to Pay (MWTP)



from *Bishop et al (2020)*

Practical challenges to estimating MWTP

1. Defining an appropriate market
   - a time and space that can characterized by a single price function
   - i.e., identical houses (bundle of attributes) must sell for the same price throughout the market
   - when working with larger metro areas and longer time periods, need a model that accounts for frictions and price function shifters within the market.

Practical challenges to estimating MWTP

2. Using property transaction data that:
   - describe sale prices
     - instead of predicted prices (e.g., self-reported estimates or tax appraisals) with measurement errors that are often correlated with buyer/housing/neighborhood characteristics
   - are spatially disaggregate
     - median price house in a neighborhood doesn't reflect what buyers are willing to pay for median air quality
     - e.g., median price house may have above-median size and below-median air quality.

Practical challenges to estimating MWTP

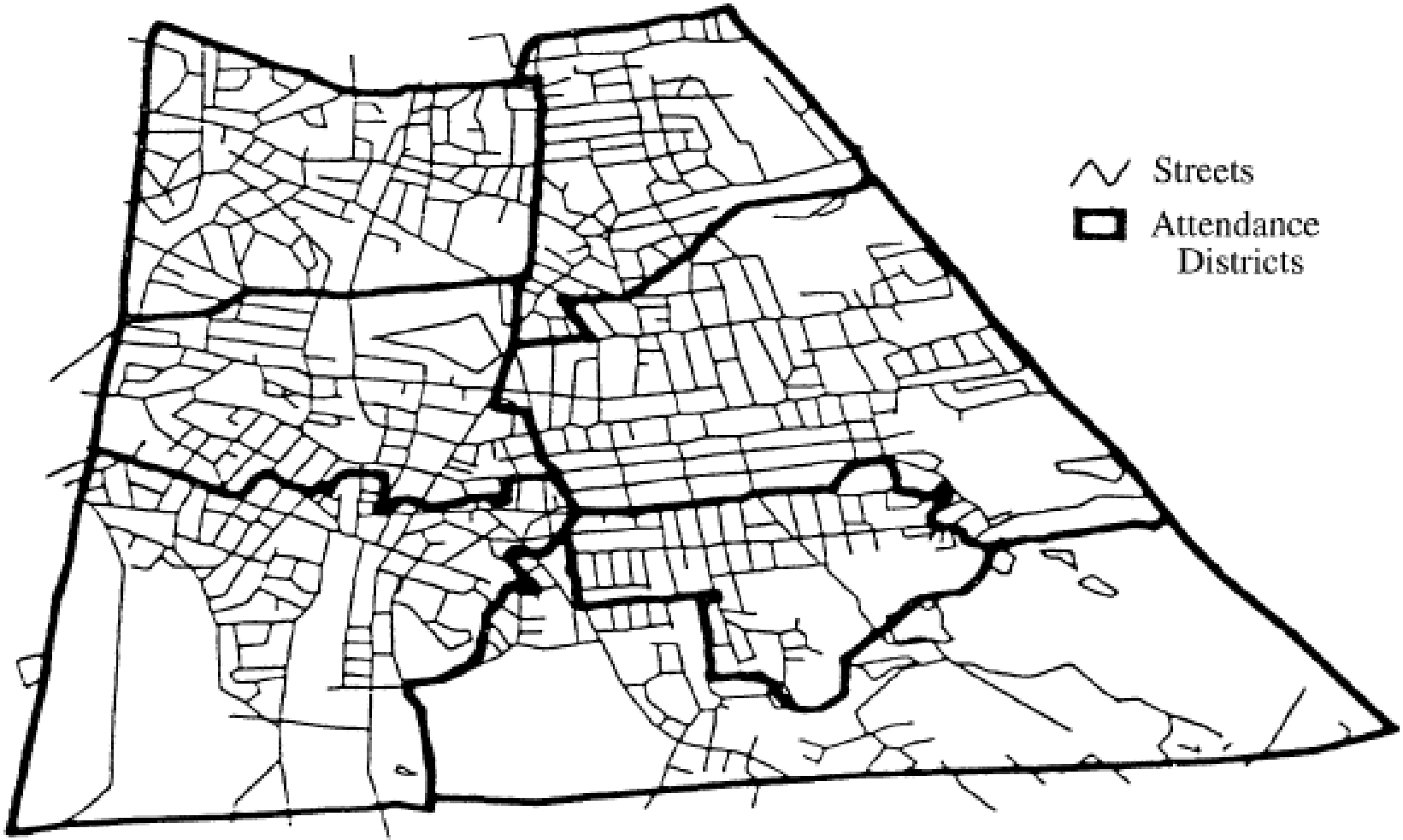
3. Accounting for home-buyer perception in model
    - observable characteristics are only a proxy for attributes buyers are paying for.
    - buyer beliefs about "proxy"ness may be heterogeneous
    - beliefs may be based on past and/or future characteristics
        - e.g., *Bishop and Murphy (2019)*: how to test for forward-looking behavior?

4. Flexible functional forms

Practical challenges to estimating MWTP

5. Accounting for confounding unobservables
   - that are correlated with amenity of interest
     - e.g., school quality is correlated with property taxes and public good provision.
   - e.g., *Black (1999)*: estimate parental valuation of better schools through housing prices.
     - Better schools tend to be in better neighborhoods (and not all determinants of neighborhood quality are observable)
     - **boundary discontinuity design**: by comparing houses very close to school attendance district boundaries (where there is a discrete change in school quality), we can control for the unobservable characteristics that change continuously over space.

Boundary discontinuity design



from *Black (1999)*

Boundary discontinuity design

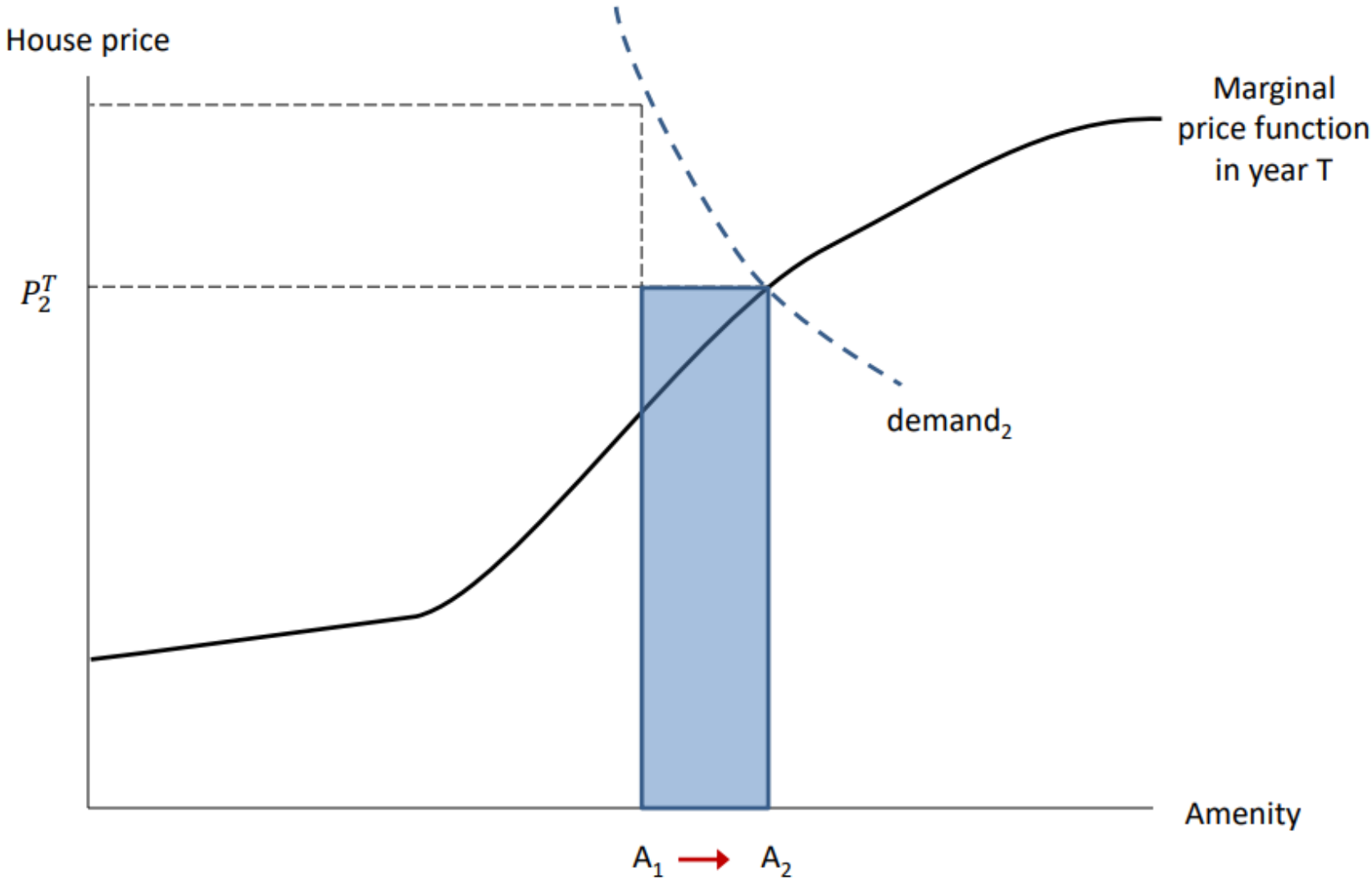
Not a perfect solution! Potential concerns?

Boundary discontinuity design

Not a perfect solution! Potential concerns?

- Endogeneous amenities (e.g. demographics of neighbors)
  - that will also (endogeneously) vary discretely at boundaries
  - we will consider this later in the course.
- Spillover effects
  - Do control areas reflect how treatment areas would have evolved in the absence of treatment?
- External validity
  - MWTP for households outside the boundary zone?

Using MWTP to inform policy



from *Bishop et al (2020)*

Using MWTP to inform policy

To point-identify WTP (and not just a lower bound), need more data and model assumptions on buyer preferences.

- We will see some examples later in the course.

Broadly, no dominant solution: models have to trade off internal and external validity.

Review of hedonic model literature

Freeman, A. Myrick, III, Joseph A. Herriges, and Catherine L. Kling. 2014. *The Measurement of Environmental and Resource Values: Theory and Methods.* Washington, DC, RFF Press.

Kuminoff, Nicolai V., V. Kerry Smith, and Christopher Timmins. 2013. "The New Economics of Equilibrium Sorting and Policy Evaluation using Housing Markets." *Journal of Economic Literature.* 51(4): 1007-62.

Palmquist, Raymond B. 2005. "Property Value Models." In *Handbook of Environmental Economics*, vol. 2, eds. Goren-Maler Karl, and Jeffrey Vincent, 763-819. Amsterdam: North Holland Press.

Phaneuf, Daniel J. and Till Requate. 2017. *A Course in Environmental Economics: Theory, policy and practice.* Cambridge, UK: Cambridge University Press.

Taylor, Laura. 2017. "The Hedonic Method." In *A Primer on Nonmarket Valuation*, eds. Champ, Patricia, Kevin Boyle, and Tomas C. Brown, 331-93. Netherlands: Springer Netherlands.

Han, Heblich, Timmins, and Zylberberg (2021)

The value of Urban Trees

Han, Heblich, Timmins, and Zylberberg (2021)

A naive empirical strategy would exploit the observed change in the tree canopy over time. Letting i denote a property, t denote a certain year, and p a postcode, we could estimate:

$$\ln(P_{ipt}) = \alpha + \beta TD_{pt} + \gamma \mathbf{X}_{it} + \eta_p + \mu_t + \varepsilon_{ipt}$$

where P_{ipt} is the transaction price, TD_{pt} is the tree cover calculated from its area share within a radius of 10 meters from the shape of a postcode, $\mathbf{X}_{ipt}$ are property characteristics and other time-varying controls (e.g., differential dynamics across: wards, latitude, longitude, the initial land cover in 2007), μ_t are year fixed-effects and η_p are postcode fixed-effects.

from *Han et al (2021)*

Han, Heblich, Timmins, and Zylberberg (2021)

Paper's empirical strategy:

$$\ln(P_{ipt}) = \alpha + \beta TD_{pt} + \gamma_{\mathbf{t}} \mathbf{X}_{ipt} + \eta_p + \varepsilon_{ipt} \quad (1)$$

where TD_{pt} is instrumented by A_{pt}, and $\mathbf{X}_{ipt}$ captures the evolution of the time-varying premium associated to observable house characteristics (i.e., number of bedrooms and number of washrooms) and interactions between year fixed effects and ward fixed effects; a measure of street tree density; latitude and longitude; and area shares from the land classification in 2007 (tree canopy, grass/shrub, bare earth, water, buildings, roads, other paved surfaces and agriculture). The specification

from *Han et al (2021)*

Housing Supply

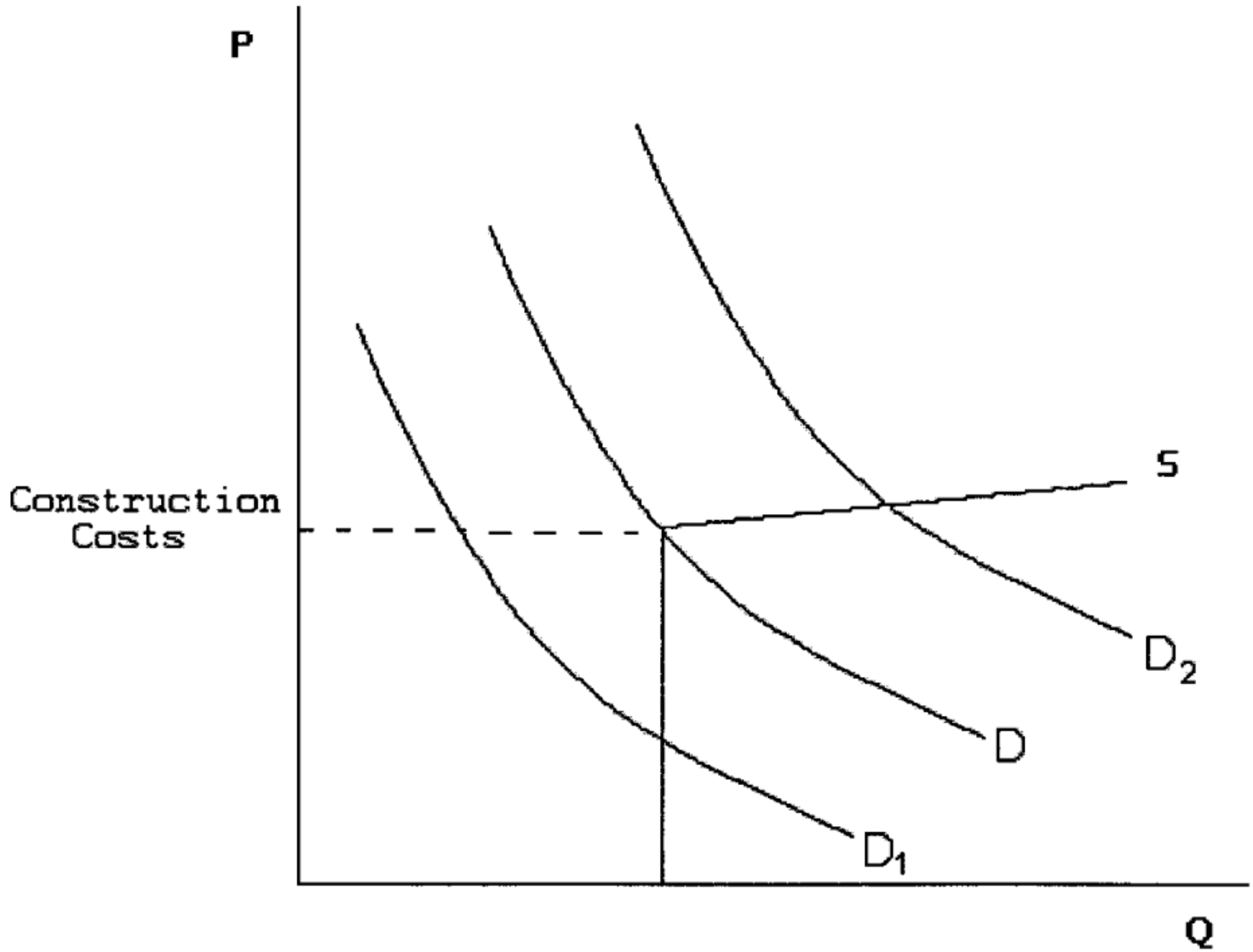
Determinants of housing supply elasticity

Saiz (2010)

- geographic and regulatory constraints
- make cities more expensive and housing supply less elastic
- Anti-growth local land policies more likely in land-constrained cities
- model how to adjust housing supply response to demand shocks

Durable housing and urban decline

Glaeser and Gyourko (2005)



Durable housing and urban decline

Glaeser and Gyourko (2005)

1. cities grow more quickly than they decline
2. positive shocks increase population more than they increase housing prices
3. negative shocks decrease housing prices more than they decrease population
4. if housing prices below construction costs, city declines

Anagol, Ferreira, and Rexer (2021)

Welfare effects of a zoning reform in Sao Paulo

References

Anagol, Santosh, Fernando V. Ferreira, and Jonah M. Rexer (2021). "Estimating the economic value of zoning reform." NBER Working paper 29440.

Bishop, Kelly, Nicolai V. Kuminoff, Spencer H. Banzhaf, Kevin J. Boyle, Katherine von Graevenitz, Jaren C. Pope, V. Kerry Smith, and Christopher D. Timmins (2020). "Best Practices for Using Hedonic Property Value Models to Measure Willingness to Pay for Environmental Quality." *Review of Environmental Economics and Policy*, 14(2).

Bishop, Kelly, and Alvin Murphy (2019). "Incorporating Dynamic Behavior into the Hedonic Model." *Review of Economics and Statistics*, 101(1): 134-145.

Black, Sandra E. (1999). "Do Better Schools Matter? Parental Valuation of Elementary Education." *Quarterly Journal of Economics*, 114(2): 577-599.

Glaeser, Edward L., and Joseph Gyourko (2005). "Urban Decline and Durable Housing." *Journal of Political Economy*, 113(2): 345–375.

References

Han, Lu, Stephan Heblich, Christopher Timmins, and Yanos Zylberberg (2021). "Cool Cities: The Value of Urban Trees." Working paper.

Rosen, Sherwin (1974). "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition." *Journal of Political Economy*, 82(1), 34-55.

Saiz, Albert (2010). "The Geographic Determinants of Housing Supply." *The Quarterly Journal of Economics*, 125(3): 1253–1296.

Tiebout, Charles M. (1956). "A Pure Theory of Local Expenditures." *Journal of Political Economy*, 64(5), 416-424.