Chapter 11: Urban Quality-of-Life Measurement (Brueckner's textbook)

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Introduction

- Quality-of-life measurement.
- A generic term – amenity:
  - all "exogenous" city-specific (region-specific) advantages. E.g., climate, terrain, other natural conditions (beach, attractions), local public goods and services (parks, schools, shopping amenities, public safety, etc).
- From the open-city urban model (Ch. 2 and 3): the higher the amenity, the more people would like to move into the city. Higher housing prices.
- Is higher housing price an indicator of higher amenity level of a city? (other things being equal)

Consumer/Labor's Location Choice

- Not quite, another important dimension is the income (wages), which differs across cities. How wages and housing prices are related to amenity level? (Roback, 1982)
- Consider the equilibrium across cities. People need to be equally happy regardless of where they live. So, for some $\bar{u}$,

$$u(c, q, a) = \bar{u},$$

where c is non-housing consumption, q is housing, and a stands for amenity level of a city.

Introduction

- Suppose income y also differs across cities.
- Utility maximization entails an indirect utility function (can you write down a problem leading to this?)

$$V(y, p, a).$$

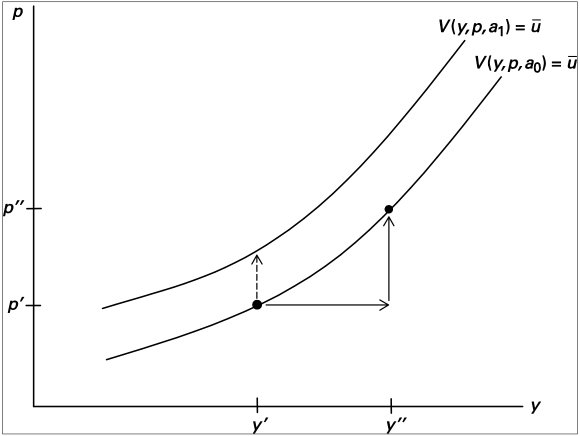
- Equilibrium populations across cities must satisfy

$$V(y, p, a) = \bar{u}.$$

Introduction

- A special kind of indifference curve: Given an amenity level, the p and y that keeps utility constant.
- Upward slopping.
- The higher the amenity, the higher the indifference curve.
- See Figure 11.1.

Figure 11.1 Indifference curves



Firms' Location Choice

- For each amenity level, the indifference indicates the combinations of (y, p) that entails the same utility.
- One equilibrium condition and two unknowns.....so need another equilibrium condition to pin down equilibrium (y, p) given an amenity level.
- Interpret p as more generally real estate price that applies to both housing and business space.
- y is also the labor cost for firms.

Firms' Location Choice

- Firms' profits may also depends on amenity.
- So, equal (zero) profits across cities/regions. Suppose firms produce a non-housing good (bread) and sell to the country-wide competitive market.
- Since the price of *bread* is normalized to 1 and does not differ across cities, the iso-profit curve can be derived from

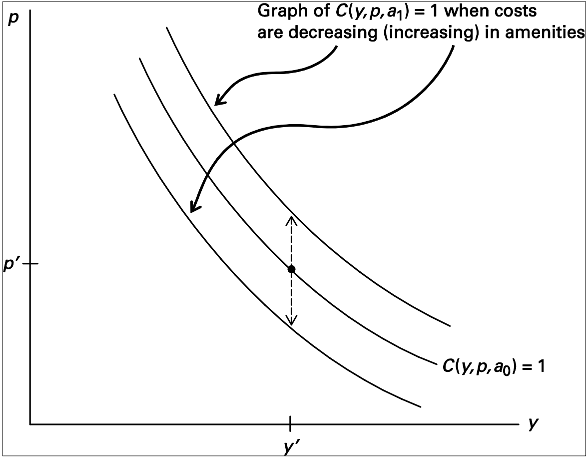
$$C(y, p, a) = 1,$$

where $C(y, p, a)$ denotes the unit cost function in terms of labor cost y, real estate price p, and amenity. The unit-cost representation has implicitly assumed constant returns to scale.

Firms' Location Choice

- How does $C(y, p, a)$ depends on a?
  - Cost-decreasing amenity: public safety, better environment to work and do business.
  - Cost-increasing amenity: precipitation (hot and humid climate) good for agricultural production, but may be viewed as negative amenity features for consumers/labor.
  - Cost-independent amenity.
- The iso-profit curve (given an amenity level) is downward slopping.
- How the iso-profit curve changes with amenity depends.

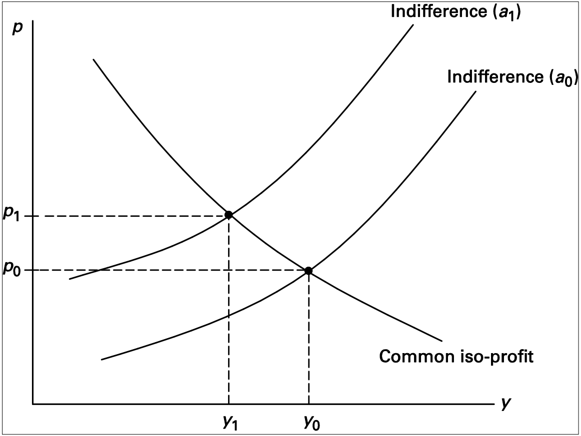
Figure 11.2 Iso-profit curves



Comparing outcomes in high-amenity and low-amenity regions

- Suppose amenity $a_1 > a_0$. And, suppose production unit cost is independent of amenity.
- Equilibrium levels (y, p) are such that $y_1 < y_0$, and $p_1 > p_0$.
- Compensating differential:
  - If housing price difference is to do all the work to equate utilities, then $p_1 > p_0$.
  - If income difference is to do all the work to equate utilities, then $y_1 > y_0$.
- Equilibrium level when amenity does not affect unit production cost simply is a combination of both.

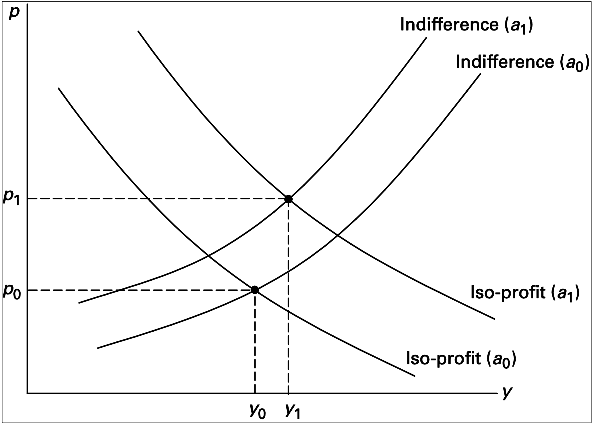
Figure 11.3 The case in which costs are independent of amenities



Comparing outcomes in high-amenity and low-amenity regions

- Next, consider cost-decreasing amenity.
- Equilibrium levels (y, p) are such that $p_1 > p_0$, but the effect on y is ambiguous.
- If the effect of amenity on unit production cost is minor, then the prediction is the same as the case where the unit cost is independent of amenity.

Figure 11.4 The case in which costs are decreasing in amenities



Comparing outcomes in high-amenity and low-amenity regions

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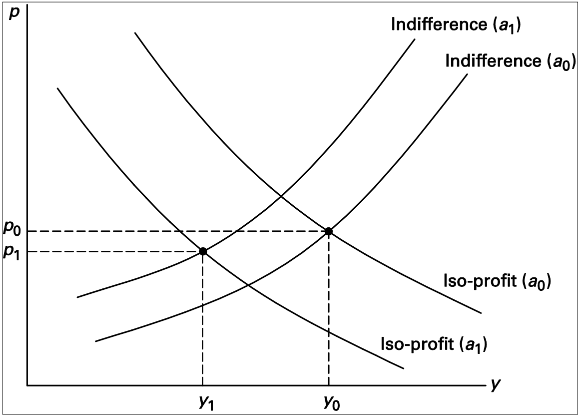
Figure 11.5 The case in which costs are increasing in amenities



Measuring Urban Quality of Life

- Roback's (1982) approach of measuring urban quality of life.
- There are multiple amenities, $a_1, a_2, ..., a_m$.
- Suppose that amenities enter utility in a linear way,

$$a = \sum_{i=1}^{m} \beta_i a_i,$$

where β_i is the marginal valuation of amenity i.

- Once with an estimate of $\hat{\beta}_i$ for each i, the quality of life measure is simply $\hat{a} = \sum_{i=1}^{m} \hat{\beta}_i a_i$, and a_i is the observed level of amenity (in a city).

Measuring Urban Quality of Life

- How to estimate β_i? A two-step procedure which is somewhat complicated.
- First step:
    - A hedonic housing price regression: a bunch of house characteristics and local amenity levels....obtain the effect of each amenity i on the housing price (p).
    - A hedonic wage regression: a bunch of individual characteristics and local amenity levels....obtain the effect of each amenity i on individual wages (y).
- Recall the equilibrium p and y are determined by $V(y, p, a) = \bar{u}$ and $C(y, p, a) = 1$. So, we need to consider both the direct impact of a on utility and the indirect impact through y and p.

Measuring Urban Quality of Life

- Second step: plug the estimated amenity coefficients from these two regressions into a particular formula, which then gives the $\hat{\beta}_i$ value.
- Blomquist et al. (1988) used 16 different amenity levels to obtain quality-of-life rankings for urban counties and their metropolitan areas for the year 1980.
- Table 11.1 also show the 1980 Almanac report of quality-of-life ranking. Almanc's approach is based on $\hat{\beta}_i$ that were chosen (arbitrarily) by the Almanac's staff.

Measuring Urban Quality of Life

- The third column lists the top ten metropolitan areas by Gabriel and Rosenthal's (2004) ranking.
- The methodology of Gabriel and Rosenthal (2004) is conceptually equivalent to Blomquist et al. (1988), but they employ panel data (1977-1995) to back out the amenity level by a *fixed effect model*, i.e., using city dummy to capture the amenity level for its effect on housing prices and wages. The rest is to use Roback's approach to calculate $\hat{\beta}_i$.
- It is nice to avoid measuring amenity level (how many and how to measure?) directly.

Table 11.1 Quality-of-life rankings of metropolitan areas

	1980 (Blomquist et al. 1988)	1980 (*Places Rated Almanac*, 1981)	1977-1995 (Gabriel and Rosenthal 2004)
1	Pueblo, Colorado	Atlanta, Georgia	Miami, Florida
2	Norfolk, Virginia	Washington, D.C.	San Diego, California
3	Denver, Colorado	Greensboro, North Carolina	Los Angeles, California
4	Macon, Georgia	Pittsburgh, Pennsylvania	San Francisco, California
5	Reno, Nevada	Seattle, Washington	Tampa, Florida
6	Binghamton, New York	Philadelphia, Pennsylvania	New York, New York
7	Newport News, Virginia	Syracuse, New York	Albany, New York
8	Sarasota, Florida	Portland, Oregon	Greensboro, North Carolina
9	West Palm Beach, Florida	Raleigh-Durham, North Carolina	Sacramento, California
10	Tucson, Arizona	Dallas-Ft. Worth, Texas	Norfolk, Virginia