Labor Markets and Non-Pecuniary Externalities*

Urban Economics: Week 5

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6th and 7th February 2012

*I thank Kurt Schmidheiny for sharing his slides on "Empirics of Urban Labor Markets and Consumer Externalities"

Specialization Among Complementary Tasks

- A continuum of tasks must be preformed to produce final output

$$Y = \min_{s \in [0,1]} y(s)$$

- Rate of production from each task s

$$y(s) = E(s)\, t_w(s)$$

  - $t_w(s)$ is working time devoted to performing the task

- Productivity in the performance of each task s

$$E(s) = h\left[t_h(s)\right]^{\gamma}$$

  - h reflects the general level of schooling or knowledge
  - $t_h(s)$ is time devoted to acquiring task-specific skills

Time Allocation Within a Task

- Total time devoted to task and skill s

$$t(s) = t_h(s) + t_w(s)$$

- Rate of production

$$y(s) = \max_{t_h} h t_h^{\gamma} [t(s) - t_h] = \Gamma [t(s)]^{1+\gamma}$$

  - For the sake of notation let $\Gamma \equiv h\gamma^{\gamma} / (1+\gamma)^{1+\gamma}$

- Optimal time allocation

$$t_h(s) = \frac{\gamma}{1+\gamma} t(s) \text{ and } t_w(s) = \frac{1}{1+\gamma} t(s)$$

Cooperative Allocation of Workers to Tasks

- Ex ante identical workers and tasks
- Workers are endowed with one unit of productive time
- Each member of a team of L workers concentrates on $1/L$ tasks

$$t(s) = L$$

- Output per capita is increasing in team size

$$\frac{Y}{L} = \Gamma L^{\gamma}$$

Becker and Murphy (1992):

> *The division of labor cannot be limited mainly by the extent of the market when many specialists provide essentially the same skills. Our claim is that instead it is usually limited by the costs of coordinating workers with different specialties.*

From the Team to the City

- Generalize the Leontief technology to CES technology

$$Y = \left\{ \int_0^n \left[y(s) \right]^\alpha ds \right\}^{\frac{1}{\alpha}} \text{ for } 0 \neq \alpha \leq 1$$

  - Leontief technology for $\alpha \to -\infty$, Cobb-Douglas for $\alpha = 0$
- Ethier's (1982) supply-side version of CES demand
  - Output is an aggregate of differentiated intermediates
  - Perfectly competitive assembly sector
- Final goods are costlessly tradable
- Intermediate inputs (i.e., tasks s) are not tradable across cities

$\Rightarrow$ Agglomeration economies from shared inputs

Competitive Allocation of Workers to Tasks

- CES demand function for each intermediate

$$p(s) = \left[\frac{Y}{y(s)}\right]^{1-\alpha}$$

- Two-stage specialization
  1. Workers choose which tasks to perform
  2. Workers set prices of the tasks they are performing
- Bertrand competition implies that only one worker performs each task
- Earnings per task equal

$$p(s)\,y(s) = Y^{1-\alpha}\left[y(s)\right]^{\alpha} = Y^{1-\alpha}\Gamma^{\alpha}\left[t(s)\right]^{\alpha(1+\gamma)}$$

- For $\alpha(1+\gamma) \leq 1$ a worker performs all the tasks he can monopolize

Gains from Specialization

Becker and Murphy (1992) again

- Fixed range of tasks $n = 1$
  - Analogous to a quality-ladder model of productivity
- Complementarities are sufficiently strong: $\alpha (1 + \gamma) \leq 1$
- Each of L city residents specializes in $1/L$ tasks

$$Y(s) = \Gamma L^{1+\gamma} \text{ for } s \in [0, n]$$

- Output per capita is increasing in city size

$$\frac{Y}{L} = \Gamma L^{\gamma}$$

- But does each worker really have a unique specialization?

Endogenous Input Supply

- Intermediates $y(s)$ are produced by specialized firms
- Increasing returns at the firm level: labor requirement

$$l(s) = f + \beta y(s)$$

- Monopolistic competition for $\alpha \in (0,1)$ and endogenous wage w:

$$p(s) = \frac{\beta}{\alpha} w$$

- Zero-profit firm size

$$y(s) = \frac{\alpha}{1-\alpha} \frac{f}{\beta} \text{ and } l(s) = \frac{f}{1-\alpha}$$

- Equilibrium number of intermediates

$$n = \frac{1-\alpha}{f} L$$

Gains from Variety

- Output per capita is increasing in city size

$$\frac{Y}{L} = \frac{\alpha}{\beta}\left(\frac{1-\alpha}{f}L\right)^{\frac{1-\alpha}{\alpha}}$$

  - We can remove all constants by choosing units for intermediates

- New Economic Geography
  1. Infinite costs to transport intermediates across cities
  2. Economies of scale transfer from the firm to the city level

- CES demand implies constant mark-ups
  - Only the supply side matters: labor market, not product market
  - Firm entry is socially efficient and relative prices are undistorted

Congestion

- Linear monocentric city with population N_i
- Each worker demands a unit of land and supplies a unit of time
- Time cost of commuting: 4τ times distance from the CBD

$\Rightarrow$ Aggregate labor supply

$$L_i = 2\int_0^{N_i/2} (1 - 4\tau s)\, ds = N_i (1 - \tau N_i)$$

$\Rightarrow$ Bid rent for a homogeneous wage w_i

$$r_i(s) = 4\tau \left(\frac{N_i}{2} - s \right) w_i$$

- Outside option of land normalized to zero

$\Rightarrow$ Aggregate land rent in the city

$$R_i = 2\int_0^{N_i/2} r_i(d)\, ds = \tau w_i N_i^2$$

Optimal City Size

- Output per capita as a function of city is

$$\frac{Y_i}{N_i} = \frac{1}{N_i} L_i^{\frac{1}{\alpha}} = N_i^{\frac{1}{\alpha}-1} \left(1 - \tau N_i\right)^{\frac{1}{\alpha}}$$

- Efficiency-maximizing city size

$$N^* = \frac{1-\alpha}{\left(2-\alpha\right)\tau}$$

  - Increasing with agglomeration economies: $\partial N^* / \partial \alpha < 0$
  - Decreasing with congestion costs: $\partial N^* / \partial \tau < 0$

Competitive City Development

- A continuum of potential city sites, each controlled by a developer
  - No scarcity of land
  - No integer constraints
- Land developers propose city charters specifying
  1. City size N_i
  2. Transfers to residents t_i paid out of land rent
- Workers can relocate at no cost
  - Net income must be equalized across cities
- The development sector is perfectly competitive
  - Compete for workers by maximizing their net income

$$u_i = w_i \left(1 - 2\tau N_i\right) + t_i$$

subject to non-negative profits

$$\pi_i = \tau w_i N_i^2 - t_i N_i \geq 0$$

The Henry George Theorem

- The competitive solution is efficient
  - The private and public returns to labor are endogenously equalized

1. Developers transfer all land rents to local workers
   - Zero-profit transfer $t_i = \tau w_i N_i$
2. All cities achieve optimal size
   - The zero-profit transfer implies $u_i = w_i (1 - \tau N_i) = Y_i / N_i$

- A classic result, but not a universal one

Requirements for Efficiency

1. Land rent must be paid out to workers
   - Absentee landowners would not internalize congestion
   - $\Rightarrow$ Competitive developers or local governments
2. There must be no coordination failures
   - Overly large cities are locally stable, even with common land ownership
   - $\Rightarrow$ City charters as a perfect coordination device
3. There must be no inefficiency in production
   - The developers cannot regulate firm entry and firm size
   - $\Rightarrow$ Monopolistic competition with CES demand happens to be efficient

Statistical Economies of Scale

- A simple idea going back to Marshall
- n firms produce the numeraire with technology

$$Y_i = A_i N_i - \frac{1}{2} N_i^2$$

- Idiosyncratic productivity A_i has mean $\bar{A}$ and variance σ_A^2
- Timeline
  1. Workers choose their location
  2. The realization of A_i is observed
  3. Firms hire workers

Wages

- Equilibrium wage

$$w = \frac{1}{n}\sum_{i=1}^{n} A_i - \frac{N}{n}$$

- The expected wage is independent of city size

$$\mathbb{E}w = \bar{A} - \frac{N}{n}$$

1. A function of factor proportions, but not of market size
2. Increasing in expected productivity
3. Independent of the variance of productivity

Profits

- Equilibrium profits

$$\pi_j = \frac{1}{2}(A_j - w)^2 = \frac{1}{2}\left(\frac{n-1}{n}A_j - \frac{1}{n}\sum_{i \neq j} A_i + \frac{N}{n}\right)^2$$

- Expected profits

$$\mathbb{E}\pi_j = \frac{1}{2}\left[\frac{n-1}{n}\sigma_A^2 + \left(\frac{N}{n}\right)^2\right]$$

1. Increasing in city size for given factor proportions
2. Independent of expected productivity
3. Increasing in the variance of productivity
4. Complementarity between volatility and market size

Free Entry

- Free entry for this simple model is not too simple
  1. Expected profits are not monotonic in n
  2. n has to be an integer to create aggregate uncertainty
- Creating a firm has a cost $F > \sigma_A^2/2$
- Population $N > \sqrt{2F}$ induces entry of a finite number of firms

$$\begin{aligned}\hat{n} &= \max\left\{n \in \mathbb{N} : \left(2F - \sigma_A^2\right) n^2 + \sigma_A^2 n - N^2 \leq 0\right\} \\ &= \left\lfloor \frac{\sqrt{\sigma_A^4 + 4\left(2F - \sigma_A^2\right) N^2} - \sigma_A^2}{2\left(2F - \sigma_A^2\right)} \right\rfloor\end{aligned}$$

Ignoring the Integer Constraint

- Disregarding the integer constraint we can take comparative statics

$$\frac{\partial \log n}{\partial \log N} = \frac{2N^2}{2N^2 - \sigma_A^2 n} > 1$$

If city size N is pinned down by an exogenous housing stock

1. Larger population induces more than proportionally larger firm entry
2. Larger cities have higher expected nominal wages
3. Larger cities have higher housing prices

- Large cities have lots of small firms and thus pay a wage premium
  - In reality, city size and average firm size are positively correlated

Reallocation for Firms, Risk Sharing for Workers

- Small market: high correlation between each firm and the aggregate
  1. Small worker flows in a market-wide boom or bust
  2. Large wage fluctuations as firms bid up or down together
- Large market: idiosyncratic firm shocks largely cancel out
  1. Large worker flows from slumping to booming firms
  2. Small wage fluctuations since average productivity is stable
- We modelled demand-side agglomeration economies
  - Each firm likes a market where others are slumping when it booms
- Supply-side agglomeration economies if workers are risk averse
  - Workers like the low wage volatility of a large market
  - Even more so if wage stickiness translates into unemployment
  - But this would push towards lower average wages in larger cities

Cross-Sector Pooling

- Labor pooling across industries instead of firms in an industry
  - Costlier for workers to switch
  - Larger idiosyncratic component of shocks

$\Rightarrow$ Cities benefit from industrial diversity

  - More than an urbanization economy, an "anti-localization" economy

- Seminal work on urban diversity: Chinitz (1961), Jacobs (1961)
- Some evidence of cross-sector pooling
  - Simon (1988), Diamond and Simon (1990)
  - Unemployment is higher in more specialized cities
  - Workers demand higher wages in more specialized cities
  - The effect is stronger for industries with more cyclical variability

A Simple Matching Externality

- Expected match quality increases in the number of potential partners
- Worker i at firm j has match-specific productivity A_i^j
- The worker has all the bargaining power and earns A_i^j
- Each worker i observes the realizations of A_i^j for n firms
- If A_i^j are i.i.d. with distribution $F_A(a)$ and density $f_A(a)$

$$\mathbb{E}A_i^{\langle n\rangle} = n\int_0^\infty a\left[F_A(a)\right]^{n-1} f_A(a)\,da$$

- If A_i^j are i.i.d. uniform on $[0,1]$, the productivity of the best match is

$$A_i^{\langle n\rangle} \sim B(n,1) \Rightarrow \mathbb{E}A_i^{\langle n\rangle} = \frac{n}{n+1}$$

1. Increasing from $1/2$ for $n=1$ to $\lim_{n\to\infty} A_i^{\langle n\rangle} = 1$
2. Rather strongly concave in n

A Salop Model

- An endogenous number n of firms
- Increasing returns to scale: labor requirement $N_j = f + \beta y_j$
- A continuum of measure N workers supplying one unit of labor each
- Each firm produces the numeraire with a particular skill requirement
- Workers' skills are uniformly distributed on the unit circle
- Firms' skill requirements are evenly spaced on the unit circle
- If a worker's skill differs from his employer's requirement by z, the cost of the mismatch is μz, borne by the worker

Monopsonistic Competition

- Firms post a profit-maximizing wage offer w
- Each firm is competing with its two closest neighbors, at distance $1/n$
- By posting w_j firm j attracts workers with any mismatch z such that

$$w_j - \mu z \geq w - \mu\left(\frac{1}{n} - z\right) \Leftrightarrow z \leq \frac{1}{2}\left(\frac{1}{n} + \frac{w_j - w}{\mu}\right)$$

- Employment

$$N_j = N\left(\frac{1}{n} + \frac{w_j - w}{\mu}\right)$$

- Output

$$y_j = \frac{1}{\beta}\left[N\left(\frac{1}{n} + \frac{w_j - w}{\mu}\right) - f\right]$$

Wage Setting

- Profits

$$\pi_j = N\left(\frac{1}{\beta} - w_j\right)\left(\frac{1}{n} + \frac{w_j - w}{\mu}\right) - \frac{f}{\beta}$$

- Monopsonistic wage

$$w_j = \frac{1}{2}\left(\frac{1}{\beta} - \frac{\mu}{n} + w\right)$$

- Equilibrium wage

$$w = \frac{1}{\beta} - \frac{\mu}{n}$$

- Monopsony power reduces wages below marginal productivity $1/\beta$
- Higher n erodes monopsony power through labor-market competition

Free Entry

- Equilibrium profits

$$\pi_j = \mu \frac{N}{n^2} - \frac{f}{\beta}$$

- Equilibrium number of firms

$$n = \sqrt{\frac{\beta\mu}{f} N}$$

- Aggregate output

$$Y = \frac{N}{\beta} - \sqrt{\frac{\mu f}{\beta} N}$$

- Increasing returns to scale from competition
  1. n is less than proportional to N because of competition between firms
  2. In the presence of fixed costs, this increases output per worker

From Output to Income per Worker

- Matching externality: average mismatch

$$\mathbb{E}z = \frac{1}{4n}$$

- Income per worker

$$\frac{Y}{N} - \mu\mathbb{E}z = \frac{1}{\beta} - \frac{5}{4}\sqrt{\frac{\mu f}{\beta N}}$$

1. The positive matching externality induces insufficient entry
2. The negative business-stealing externality induces excessive entry

- In this specification the latter effect dominates: the social optimum is

$$n^* = \arg\max_{\tilde{n}} \left\{ \frac{1}{\beta}\left(1 - \frac{\tilde{n}f}{N}\right) - \frac{\mu}{4\tilde{n}} \right\} = \frac{1}{2}\sqrt{\frac{\beta\mu}{f}N} = \frac{n}{2}$$

  - The Henry George Theorem fails unless developers can tax firm entry

Increasing Returns to Matching

- A bigger market could also increase the probability of matching
  - Search and matching frictions à la Diamond-Mortensen-Pissarides
- Aggregate matching function with increasing returns to scale
  - Uncommon property in standard microfoundations
- Each worker-vacancy match is unproductive with probability ψ
- A job seeker can apply simultaneously to the stock of vacancies V
  - The worker rejects all existing vacancies with probability ψ^V
- A new vacancy receives applications from the stock of job seekers U
  - The firm rejects all initial applicants with probability ψ^U
- With continuous time flows u and v, matches are

$$m = v\left(1 - \psi^U\right) + u\left(1 - \psi^V\right)$$

  - Increasing returns in the stocks and the flows

Skills and Matching: Power Couples

- Matching may be more important for more skilled workers
  - Greater skill tends to correlate with greater specialization
  - The college educated may be more career-oriented
- Confounding factors may attract the skilled to large cities
  - The skill premium may be increasing in city size
  - Urban amenities are normal goods or even complements to education
- Costa and Kahn (2000) "power couples" vs. singles
  - Same impact of skill premia
  - Couples' colocation problem raises the importance of matching
  - Some amenities may matter more for singles (e.g., marriage markets)

Frequency of Location Choice by Household Type

	1940	1970	1980	1990
Conditional on power couple				
Large metropolitan area	0.321	0.391	0.414	0.495
Midsize metropolitan area	0.254	0.313	0.325	0.295
Small and nonmetropolitan area	0.426	0.296	0.261	0.210
Conditional on single, power man				
Large metropolitan area	0.383	0.523	0.512	0.569
Midsize metropolitan area	0.258	0.291	0.295	0.266
Small and nonmetropolitan area	0.358	0.186	0.193	0.165
Conditional on single, power woman				
Large metropolitan area	0.286	0.507	0.499	0.555
Midsize metropolitan area	0.223	0.309	0.308	0.281
Small and nonmetropolitan area	0.491	0.184	0.193	0.164

Choice of Location and Career

- Aggregate descriptive data do not control for individual characteristics
- Colocation is a problem for couples with two careers
  - Female labor force participation is endogenous
  - It may depend on city size
- Indirect utility for household i

$$V_{s,w}^{i} = x_i' \beta_{s,w} + \varepsilon_{s,w}^{i}$$

- Six choices indexed by s and w
  - City type s: small, midsize, large
  - Labor-force participation $w \in \{0, 1\}$ (defined for the wife or a single)
- Individual characteristics x_i: age, race, educational attainment

Multinomial Logit

- $\varepsilon^i_{s,w}$ has a type I (Gumbel) extreme value distribution
- Probability that household i chooses s, w

$$P^i_{s,w} = \frac{\exp\left(x_i' \beta_{s,w}\right)}{\sum_{s=0}^{2} \sum_{w=0}^{1} \exp\left(x_i' \beta_{s,w}\right)}$$

  - Estimates reported for $x_i =$ white, man age 35, woman age 33
- The model could be estimated by maximum likelihood
- Simpler alternative: linear regression of grouped data

$$\log \frac{\bar{P}^i_{s,w}}{\bar{P}^i_{0,1}} = x_i' \left(\beta_{s,w} - \beta_{0,1}\right)$$

  - Frequency $\bar{P}^i_{s,w}$ of choice s, w for households with characteristics x_i

More Appropriate Econometric Models

- Multinomial logit assumes "Independence of Irrelevant Alternatives"
  - Not plausible in this case
  - More choices for women affect the ratio of initially available options
- Nested logit: IIA holds within nests but not across nests
  - If a career in a large city becomes more attractive ...
    1. Nest by s: it draws proportionately from in and out of the labor force
    2. Nest by w: it draws proportionately from small and midsize cities
- Cross-nested logit: overlapping nests for w and s
- Multinomial probit: ε^i is a multivariate normal
  - Probit choice probabilities must be simulated numerically
- Mixed logit: full generality, at least as an approximation
  - Random coefficients, no assumption of normality

Predicted Probability of Location Choice

	1940	1970	1980	1990
Conditional on power				
Large metropolitan area, LFP = 1	0.083	0.146	0.255	0.348
Large metropolitan area, LFP = 0	0.264	0.240	0.157	0.141
Midsize metropolitan area, LFP = 1	0.045	0.136	0.206	0.218
Midsize metropolitan area, LFP = 0	0.217	0.183	0.121	0.080
Small and nonmetropolitan area, LFP = 1	0.067	0.142	0.179	0.165
Small and nonmetropolitan area, LFP = 0	0.325	0.152	0.082	0.049

	1940	1970	1980	1990
Single, power man				
Large metropolitan area	0.394	0.526	0.518	0.542
Midsize metropolitan area	0.267	0.294	0.291	0.273
Small and nonmetropolitan area	0.339	0.180	0.191	0.185
Single, power woman				
Large metropolitan area	0.289	0.489	0.501	0.534
Midsize metropolitan area	0.230	0.319	0.305	0.291
Small and nonmetropolitan area	0.482	0.192	0.193	0.175

Differences in Differences

- In levels, singles are more likely than power couples to be in large cities
  - Single-specific amenities could account for this pattern
- Changes over time, 1970 to 1990
  - Married women's careers have become more important

1. Raw time difference for power couples = .103
   - Educated couples are increasingly attracted to large cities
2. Double difference comparing to "coincidental couples" = .067
   - Control group: unrelated man and woman living in the same city
   - Two-thirds of the increase are due to colocation
3. Triple difference comparing to less educated households = .020
   - One fifth of the increase is due to skill-matching complementarities

Urban Outside Options

- A worker can make a non-contractible investment in human capital
  - Private cost k
  - Increase in productivity p
- Workers cannot relocate after making the investment
- Firms have all the bargaining power

1. An investment specific to a single firm in the city cannot be made
   - The worker anticipates being offered his reservation wage anyway
2. If there are two firms the worker can work for, he will invest
   - Bertrand competition compensates the worker perfectly

- A general mechanism so long as the long side of the market invests
  - Agglomeration *diseconomies* if the short side were investing

Agglomeration and Hours Worked

- Labor productivity is the main focus, but other factors matter
- Extensive margin: less unemployment, more labor force participation
  - Theory and evidence about matching and (cross-sector) pooling
- Intensive margin: hours per worker (Rosenthal and Strange 2008)

TABLE 1.—AVERAGE HOURS WORKED AMONG FULL-TIME WORKERS (35 HOURS OR MORE PER WEEK) IN SELECT METROPOLITAN AREAS[a]

Occupation Category	Metropolitan Area	Young Males	Middle-Aged Males
Nonprofessional workers[b]	New York, Chicago, Los Angeles	44.08	44.08
	Hartford, Milwaukee, Sacramento	44.01	44.27
Professional workers (including lawyers & judges)[b]	New York, Chicago, Los Angeles	49.06	48.01
	Hartford, Milwaukee, Sacramento	47.74	47.15
Lawyers and judges	New York, Chicago, Los Angeles	50.32	48.94
	Hartford, Milwaukee, Sacramento	48.26	48.88

[a] All data are weighted to be representative using the perwt variable in the IPUMs. Hours worked are based on the "usual hours worked per week." Full-time is defined as 35 or more hours per week.
[b] Professional workers are individuals in occupations categorized as professional-technical in the OCC1950 variable of the IPUMS *and* who have a master's degree or more. Nonprofessionals include all other workers except managers and agricultural workers *and* who have less than a bachelor's degree.

Systematic Patterns

- Individual-level data with demographic control variables
- Focus on extreme segments of the labor market
  - Top: postgraduate degree and "professional and technical" occupation
  - Bottom: less than a BA degree and nonprofessional occupation
- Also distinguish young (30–39) and middle-aged (40–49)

1. Professionals work longer hours in a denser labor market
2. Nonprofessionals work shorter hours in a denser labor market

- Stronger for the city-occupation (localization) than city (urbanization)
  - Localization matters more for young than middle-aged professionals

Why Does Density Correlate with Longer Hours Worked?

1. Productivity
   - Density makes workers more productive, raising their wage
   - Workers respond by working longer hours
   - Skill and density may be complementary
2. Selection
   - Density attracts workers with a low relative value of leisure
   - Perhaps because it attracts more productive workers
   - Perhaps because urban amenities require income, non-urban ones time
3. Rivalry
   - Denser markets are more competitive, requiring more effort
   - High-skill occupations may require more signalling of unobserved ability
   - The young may need more signalling than the middle aged
   - Casual argument: no model of agglomeration and rivalry

- Hand-waving "work-spreading" argument for the opposite pattern

The Rat Race

- Rivals: workers in the same occupation with similar age and wage

1. Young professionals work longer hours when surrounded by more rivals
2. Middle-aged professionals work shorter hours when surrounded by more rivals

- Rewards to signalling: wage inequality within an occupation

1. Always connected to an increase in hours worked
2. Always a positive interaction with the presence of rivals

- Rivalry can account for one more hour worked per week

Consumer City

- Cities may exist and grow because people enjoy living there
  - Not a higher wage, but higher utility for a given wage

1. Input sharing for consumers rather than producers
   - Non-tradable services: restaurants, art venues, sport stadiums ...
   - Economies of scale in the production of local services
   - Greater population supports greater variety of consumer services
   - Variety of goods stocked by retailers (Handbury and Weinstein 2011)
   - Love of variety (Dixit–Stiglitz) or ideal variety (Lancaster/Salop)
2. Matching with individuals rather than jobs
   - Social partners, friends, spouses ...
3. Aesthetics: at least some people find at least some cities beautiful

The Rise of Reverse Commuting

	Daily Commutes (millions)			Annualized growth rate	
	1960	**1980**	**1990**	**1960-80**	**1980-90**
City-city	**18.8**	**20.9**	**24.3**	**0.52%**	**1.52%**
City-suburb	**2.0**	**4.2**	**5.9**	**3.65%**	**3.46%**
City-other	**0.6**	**1.2**	**1.9**	**3.63%**	**4.70%**
Suburb-city	6.6	12.7	15.2	3.34%	1.81%
Suburb-suburb	11.3	25.3	35.4	4.09%	3.42%
Suburb-other	1.1	3.7	6.8	6.22%	6.27%
Total	40.5	68.0	89.5	2.62%	2.79%

Source : Commuting in America. ENO Transportation Foundation.

The Success of High-Amenity Cities

	Population Growth	
UNITED STATES (77-95)	**Estimate**	**t-value**
Temperate climate	0.35	17.8
Proximity to ocean coast	0.24	12.5
Live performance venues per capita	0.14	6
Dry climate	0.12	6.5
Restaurants per capita	0.05	2.9
Art galeries and museums per capita	-0.03	-1.5
Movie theaters per capita	-0.05	-2.6
Bowling alleys per capita	-0.19	-11.3

Rising Demand for Some Cities' Amenities

	Wage growth	Rent growth
ENGLAND (1988-1998)		
London	4.90%	8.60%
Rest of England	4.70%	7.50%
Difference-in-difference (London amenity premium)		*0.90%*
FRANCE (1990-1995)		
Paris	3.60%	4.20%
Rest of France	4.00%	3.50%
Difference-in-difference (Paris amenity premium)		*1.10%*

Notes : Annualized growth rates. See Data Appendix for data sources.

The Increasing Wealth of the Inner City

Panel A: All MSAs

Income Relative to City Average	***1980***	***1990***
Within one mile of CBD	89%	94%
One to three miles of CBD	95%	95%
Three to five miles of CBD	101%	100%
Beyond five miles of CBD	109%	107%

Panel B: 10 biggest MSAs

Income Relative to City Average	***1980***	***1990***
Within one mile of CBD	144%	163%
One to three miles of CBD	88%	97%
Three to five miles of CBD	86%	86%
Beyond five miles of CBD	105%	100%

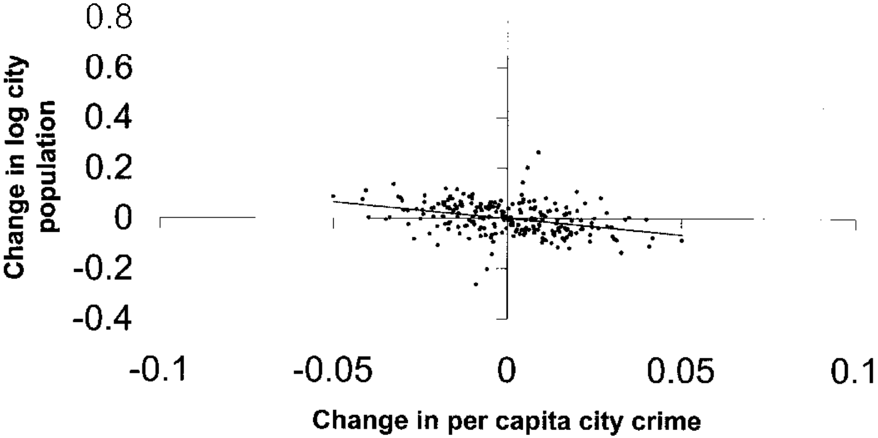
Crime Rates and City Population

Cullen and Levitt (1999) study out-migration due to crime

- An exogenous increase in crime is a consumption disamenity
    1. Lower density if there's any congestion
    2. Lower housing prices if there's congestion in construction
    3. Higher nominal wages if there's congestion in production
- Data limitations
    - Reliable city population data come from the decennial census
    - Annual data are estimates, so it's unclear they capture migration well
    - There are instead annual data on actual real-estate transaction prices
    - But those have the problem of an endogenously changing basket
- Endogeneity
    1. Criminality is at most exogenous at infra-annual frequencies
    2. Even an exogenous crime shifter may well interact with density
        - Agglomeration economies for criminals (Glaeser and Sacerdote 1999)

City Crime and Population Changes by Decade

Within-City Variation Only



Flight from Crime

1. A $\sigma \approx 10\%$ increase in crime predicts a $\sim 1\%$ population decline
   - Changes are more suited to predict changes in theory
   - Changes are more robust to cross-city differences in police data
2. IV: Lagged changes in the punitiveness of the state justice system
   - Strong first-stage correlation, but debatable orthogonality
   - Only available for annual data
   - Not even Levitt can get proper identification here
3. Differential impacts using household data
   - The migration response to crime increases with education
     College educated 50% more responsive than high-school dropouts
   - Households with children are twice as responsive as those without
   - Mostly flight from the city to the suburbs within the metropolitan area

Environmental Quality

- Matthew Kahn has an active research agenda, two books and a blog on cities and the environment
- Kahn (1999) looks specifically at how the decline of manufacturing correlates with a reduction in pollution

1. Particulate levels are lower in counties with less manufacturing activity
   - In 1982, the bottom decile has 50 $\mu g/m^3$ and the top decile 56
   - The most significant industries are SIC 32 (stone, clay, and glass), SIC 33 (primary metals), and SIC 35 (industrial metals)
2. There is evidence of cross-county spillovers
   - Weaker than within-county effects
3. Effects of the large decline of the U.S. metal industry
   - Employment in SIC 33 fell by 62% in the Rust Belt, 1967-1987
   - Pollution in Pittsburgh declined by 60.7 $\mu g/m^3$, 1977-1987
   - Changes in economic activity predict half of the decline (28.7 $\mu g/m^3$)