New Quality-of-Life Rankings
Evidence from U.S. Counties and PUMAs

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Location choice, agglomeration and quality-of-life (QOL)

Questions

- Comparing QOL of different geographic areas of increasing importance to households, businesses and policymakers
- Measuring impact of drivers of urbanisation and agglomeration
- Quantify how households' locational choices are affected by the non-price interaction of non-marketed goods
- Widely available QOLI unsuitable welfare analysis and policy purposes

Modelling quality-of-life

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Modelling quality-of-life

- Produce theoretically consistent rankings of quality of life
- Key input for computing regional price levels

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Key literature and related work

- Seminal papers
    - Rosen (1979), Roback (1982)
- Related work and recent applications
    - Quality-of-life: Blomquist *et al.* (1988), Kahn (1995), Costa and Kahn (2003), Shapiro (2006), Rappaport (2008, 2009)
    - New Economic Geography: Südekum (2006), Kosfeld *et al.* (2008), Winters (2009)
    - Regional growth: Monchuk and Miranowski (2007), Deller *et al.* (2008)
    - Happiness and economics of well-being: Brereton *et al.* (2008), Moro *et al.* (2008), Luechinger (2009)
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Roback-Blomquist model

1. Implicit amenity prices follow from wage and rent (housing expenditure) differentials in dual-market sorting equilibrium

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2. WTP_{a_j} is measured by hedonic gradients dp_j/da_j and dw_j/da_j and is estimated via wage and housing hedonic regressions

$$
\begin{aligned}
f_j &= q_j(dr_j/da_j) - dw_j/da_j \quad \text{or equivalently} \\
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3. K amenities prevailing in location j weighted by their full implicit prices yield quality-of-life indices (QOLI_j)

$$
\text{QOLI}_j = \sum_{i=1}^{K} f_i a_{ji} \quad j = 1, \ldots, N
$$

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Executive summary

- First large-scale, comprehensive update of the seminal study of county-level quality-of-life index (QOLI) rankings by Blomquist *et al.* (AER 78(1), 1988) using the full 2000 5% PUMS.

- Significant expansion of set of amenities by including wide-ranging categories of geographical, environmental, neighbourhood, infrastructure and urbanisation amenities.

- Substantially broadened geography (full contiguous US, not just selected urban areas).

- Key findings
    1. Major differences between the updated and original rankings with rank correlations ranging from -0.18 to +0.21.
    2. New rankings are consistent under a variety of alternative specifications.
    3. Quantile results indicate that QOLI might differ for different segments of the population.

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Table: **Characteristics of geographical coverage**

		Blomquist	Geography MSA[*]	All[†]
# of counties		253	1,086	3,110
# of PUMAs		1,041	1,835	2,057
PUMAs per county		4.13	1.69	0.67
Population	1980	110,617,710	170,867,817	226,545,805
	2000	131,860,476	224,482,276	279,583,437
	2007[‡]	–	–	301,621,157
Pop. coverage	1980	48.8%	75.4%	100.0%
	2000	47.2%	80.3%	
Pop. density (inh. per mi^2)	1980	419	402	77
	2000	500	259	94
Land area (mi^2)		263,840	865,437	2,959,064
Water area (mi^2)		25,273	61,081	160,820
Total area (mi^2)		289,113	926,518	3,119,885
Areal coverage		9.3%	29.7%	100.0%
N. Obs in sample		4,833,916 (P)	8,875,172 (P)	10,198,936 (P)
		2,587,457 (H)	4,795,515 (H)	5,484,870 (H)

Notes: [*]1980 or 2000 definitions where applicable. [†]Contiguous U.S. only. [‡]Census Bureau estimate. *Source*: Authors' calculations using Census data.

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Figure: **Variation of geographical coverage**

Quality-of-Life Geographies
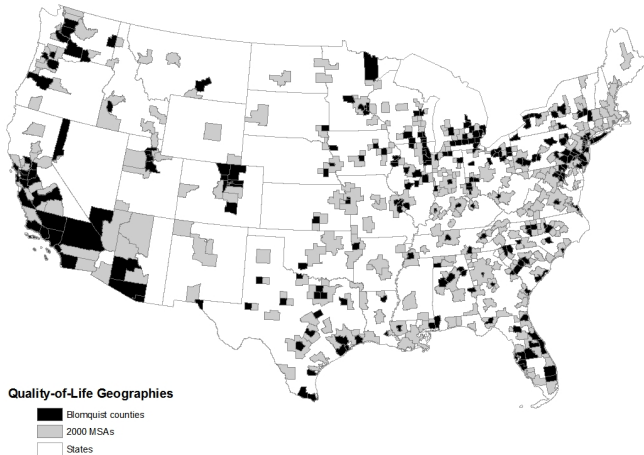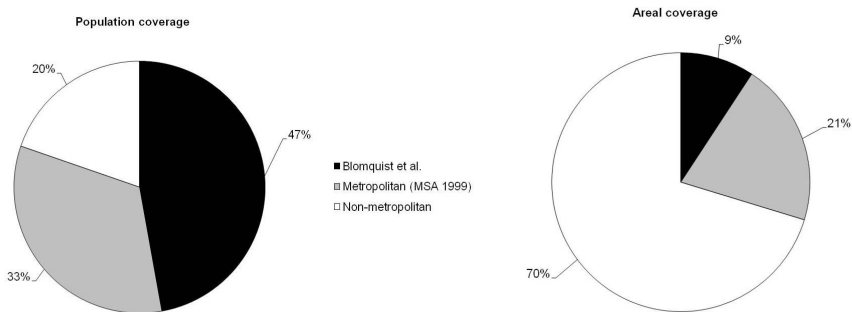- Blomquist counties
- 2000 MSAs
- States

Figure: **Shares of geographical coverage**

Source: Authors' calculations, U.S. Census Bureau.

Comprehensive set of amenities

- Significant expansion of set of amenities compared to comparable benchmark studies (over 70 vs. 16 amenities in BBH88)
  - 19 geographical amenities (vs. 9 in BBH88)
  - 21 environmental amenities (6)
  - 8 neighbourhood amenities (2)
  - 8 infrastructure amenities (−)
  - 17 urbanisation amenities (1)

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Selected amenities

	1980*	2000			
	Mean	Mean	Std. Dev.	Min.	Max.
Geographic amenities					
Mean precipitation (inches p.a., 1971–2000)	32.00	38.13	13.54	9.81	101.96
Mean relative annual humidity (%, 1961–1990)	68.30	67.64	7.40	30.50	78.00
Mean annual heating degree days	4,326.00	4,653.45	2,051.88	214.49	9,608.38
Mean annual cooling degree days	1,162.00	1,289.17	851.49	105.33	3,966.34
Mean wind speed (m.p.h., 1961–1990)	8.89	8.91	1.07	6.41	11.55
Sunshine (% of possible)	61.10	59.51	8.04	45.91	82.72
Coast (=1 if county on coast)	0.33	0.29	0.45	0	1
Environmental amenities					
NPDES effluent dischargers (PCS permits, 1989–1999)	1.51	16.67	32.51	0	209
Landfill waste (metric tons, 2000)$^\diamond$	477×10^6	4,106.13	25,474.37	0	351,877.40
Number of superfund sites	0.88	2.73	3.71	0.00	23.00
Number of treatment, storage and disposal facilities	46.40	34.42	59.80	0	570.00
Heavy fog (mean no. days with visibility ≤ 0.25 mi.)	15.80†	20.20	8.10	2.70	45.25
PM10 (μg per m^3)	73.20‡	23.73	5.30	5.00	47.05
Neighbourhood Amenities					
Crime rate (per 100,000 persons)$^\diamond$	647.00	4,692.25	6,030.59	139	96,058.00
Student-teacher ratio	0.080	0.056	0.021	0.026	0.329

Notes: * Data used in Blomquist *et al.* (1988). † BBH88 unit is miles, rather than total days with a min. visibility of less than 0.25 mi. ‡ BBH88 use total suspended particulates (TSP), a precursor measure to PM10. ◊indicates possible data misreports.

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Table: **Full implicit prices – Blomquist geography**

| | BBH (AER88)[*] | BBH 2000 update | | | New spec |
| | | BC | Q_{15} | Q_{85} | BC |
	(1)	(2)	(3)	(4)	(5)
Precip	$49.1	$33.4	$-0.7	$6.5	$-97.3
Humidity	$-90.7	$-14.1	$-49.8	$16.4	$214.2
HDD	$-0.2	$-1.0	$-0.7	$0.1	$-1.0
CDD	$-0.8	$-2.9	$-2.8	$0.3	$-7.4
WindSpeed	$-203.7	$597.0	$250.1	$47.9	$-119.6
Sunshine	$101.4	$83.9	$12.4	$-3.1	$137.0
Coast	$977.4	$1,486.3	$1,720.5	$-323.4	$1,002.5
NPDES	$-160.2	$-0.4	$3.7	$-4.8	$-7.1
Landfill	$-0.2	$0.0	$-0.1	$0.0	$0.0
Superfund	$-221.6	$164.3	$217.8	$7.5	$197.0
TSD	$-1.2	$-3.8	$-3.4	$0.2	$12.4
Fog	$-0.8	$-73.8	$-47.4	$-19.8	$-104.8
PM10	$-0.8	$31.9	$-15.3	$23.74	$151.3
Crime	$-2.1	$0.03	$0.02	$-0.1	$0.1
StudTeach[†]	$44.5	$4.7	$-17.2	$27.1	$-17.9
CentralCity	$1,347.9	$-1,441.8	$-689.3	$33.96	$-2,592.7
New amenities	–	–	–	–	Y

Notes: Results from alternative specifications (OLS, full Box-Cox, interval regressions) are not reported here. [*]The original BHH88 quality-of-life index values are adjusted by CPI inflation and reported in terms of 2000 dollars. [†]Full implicit price in $000s.

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Table: **Quality-of-life rankings – Blomquist geography**

County	Rank			BBH 2000 update	New specification
	BBH	BC	BBH	BC	BC+
	(1)	(2)	(3)	(4)	(5)
Marin County, CA	142	1	$-107.5	$43,439.8	$59,526.5
San Francisco County, CA	105	2	$242.6	$41,997.9	$58,839.5
Santa Clara County, CA	88	3	$440.9	$41,461.8	$59,770.6
San Mateo County, CA	112	4	$196.2	$39,265.1	$55,335.0
Contra Costa County, CA	211	5	$-1,109.3	$38,192.7	$43,653.8
Alameda County, CA	94	6	$338.6	$33,756.4	$45,756.0
Los Angeles County, CA	58	7	$1,093.8	$30,319.5	$38,075.9
Nassau County, NY	60	8	$994.5	$30,024.9	$51,236.0
New York County, NY	216	9	$-1,167.9	$29,070.9	$-47,996.3
Bergen County, NJ	219	10	$-1,275.2	$28,252.5	$44,970.4
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
Hamilton County, OH	150	244	$-193.2	$5,309.7	$5,424.6
East Baton Rouge Parish, LA	168	245	$-383.1	$5,338.9	$-13,975.5
Kenton County, KY	162	246	$-352.4	$-12,718.7	$-8,902.3
Stearns County, MN	89	247	$440.6	$-14,521.0	$-12,400.2
Travis County, TX	181	248	$-571.6	$-14,669.7	$16,060.3
Alachua County, FL	165	249	$-356.8	$-15,116.6	$4,720.6
Leon County, FL	19	250	$1,927.3	$-15,834.2	$8,072.8
Lafayette Parish, LA	139	251	$-91.6	$-16,283.5	$-21,347.5
Cabell County, WV	153	252	$-284.0	$-16,921.3	$-13,107.8
Hidalgo County, TX	239	253	$-2,023.2	$-17,243.0	$-18,083.2

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Table: **Quality-of-life rankings – entire U.S.**

County	Rank			BBH 2000 update	New specification
	BBH	BC	BBH	BC	BC+
	(1)	(2)	(3)	(4)	(5)
Monroe County, FL	–	1	–	$63,154.2	$58,430.0
Santa Clara County, CA	59	2	$1,054.6	$38,081.1	$50,731.2
San Francisco County, CA	71	3	$814.3	$35,595.5	$49,180.2
San Mateo County, CA	65	4	$921.8	$33,770.9	$46,195.9
Middlesex County, MA	–	5	–	$33,371.1	$39,708.6
Los Angeles County, CA	206	6	$-990.9	$33,049.9	$33,233.3
Marin County, CA	143	7	$-125.1	$33,016.1	$53,451.9
Alameda County, CA	24	8	$1,817.6	$32,440.3	$38,367.8
Pacific County, WA	–	9	–	$32,200.5	$21,347.7
Contra Costa County, CA	228	10	$-1,524.1	$31,575.0	$37,425.2
⋮	⋮	⋮	⋮	⋮	⋮
Washington County, VT	–	3,100	–	$-9,230.2	$6,621.5
McMullen County, TX	–	3,101	–	$-9,240.1	$32,280.1
Karnes County, TX	–	3,102	–	$-9,264.8	$-10,343.9
Mille Lacs County, MN	–	3,103	–	$-9,520.9	$-1,063.1
Crow Wing County, MN	–	3,104	–	$-9,700.5	$5,778.6
Gallia County, OH	–	3,105	–	$-9,791.1	$-6,931.4
Scioto County, OH	–	3,106	–	$-9,936.1	$-5,884.8
Zapata County, TX	–	3,107	–	$-10,010.6	$13,309.8
Greenup County, KY	–	3,108	–	$-10,503.6	$-12,568.8
Bedford city, VA	–	3,109	–	$-13,452.6	$-64,139.8

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Spatial pattern of new QOL estimates

All amenities – average effects
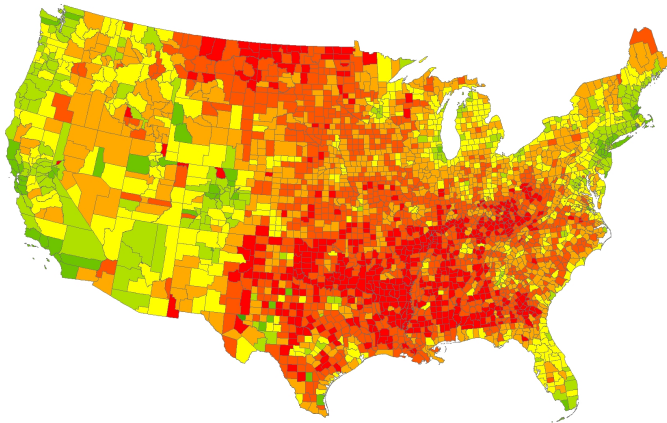
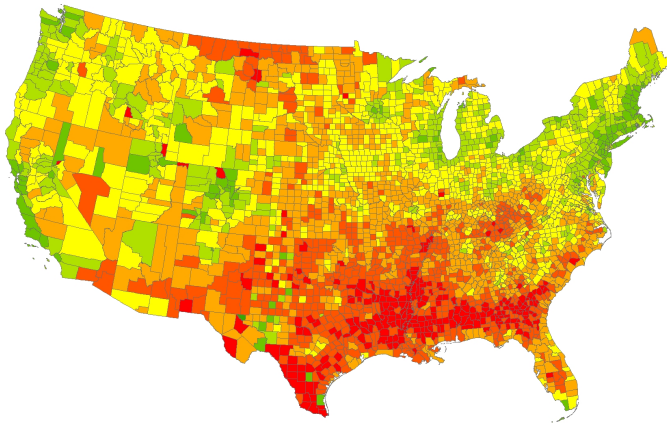# Spatial pattern of new QOL estimates

All amenities – 15% quantile

Table: **Quality-of-life index rank correlations**

| | BBH specification | | | | | New specification | | | |
	BBH88	OLS	BC	BC full	IntReg	OLS+	BC+	BC full+	IntReg+
BBH88	1.000	0.120	0.096	-0.186	0.120	0.157	0.122	0.199	0.155
OLS	–	1.000	0.997	-0.886	1.000	0.580	0.588	0.422	0.579
BC	–	–	1.000	-0.883	0.997	0.568	0.580	0.415	0.568
BC full	–	–	–	1.000	-0.885	-0.511	-0.513	-0.436	-0.510
IntReg	–	–	–	–	1.000	0.580	0.588	0.423	0.579
OLS+	–	–	–	–	–	1.000	0.994	0.831	1.000
BC+	–	–	–	–	–	–	1.000	0.840	0.995
BC full+	–	–	–	–	–	–	–	1.000	0.834
IntReg+	–	–	–	–	–	–	–	–	1.000

Notes: The rank correlation between any two specifications i and j are computed as Spearman's rank correlations with $\rho = 1 - \frac{6 \sum_{k=1}^{n} d_k^2}{n(n^2-1)}$, where n is the number of observations and d_k^{ij} is the k-th observation's difference between the rank from specification i and the rank from specification j.
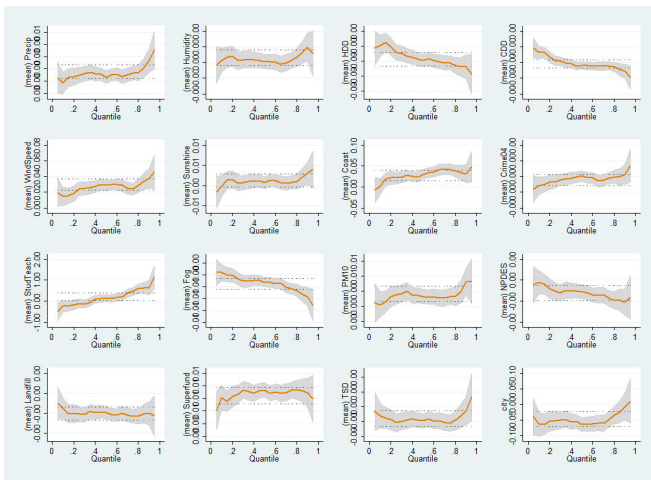
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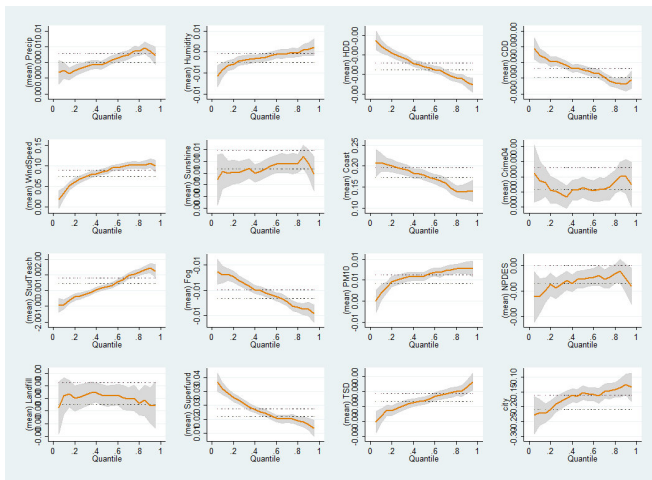# Quantile wage regressions – Blomquist geography

Notes: Horizontal lines represent the corresponding OLS estimates. The shaded areas around parameter estimates are 95% confidence intervals.

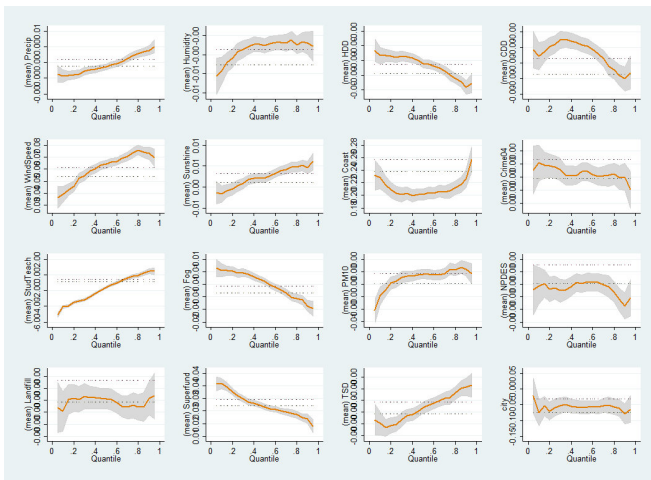# Quantile wage regressions – entire U.S.
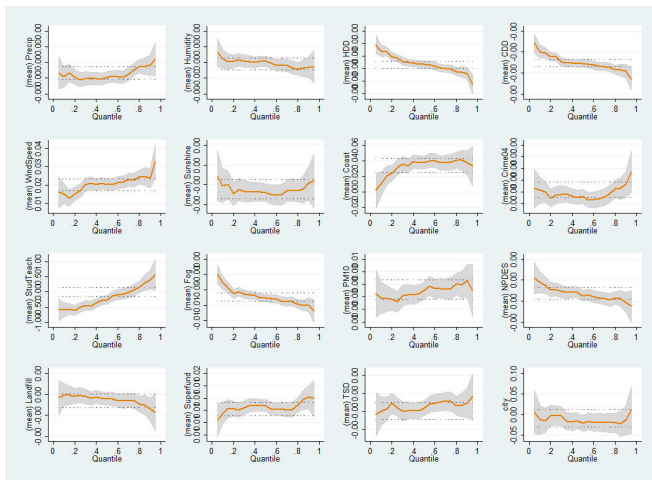
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Quantile housing regressions – Blomquist geography

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Quantile housing regressions – entire U.S.

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Further research

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     - WTP endogeneity $\rightarrow$ unobservable attributes affect both consumption and WTP

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   - Introduce theoretically consistent rankings based on heterogeneous preferences within augmented Roback-Blomquist framework
   - Econometric issues:
     - Instrumenting for endogenous attributes
     - WTP endogeneity $\rightarrow$ unobservable attributes affect both consumption and WTP
   - Intraurban variation in QOL

Further research

1. Work in progress:
   - Introduce theoretically consistent rankings based on heterogeneous preferences within augmented Roback-Blomquist framework
   - Econometric issues:
     - Instrumenting for endogenous attributes
     - WTP endogeneity $\rightarrow$ unobservable attributes affect both consumption and WTP
   - Intraurban variation in QOL
   - Variation in QOL across different amenity bundles