LECTURE 14: VALUATION AND HEDONICS

14.42/14.420

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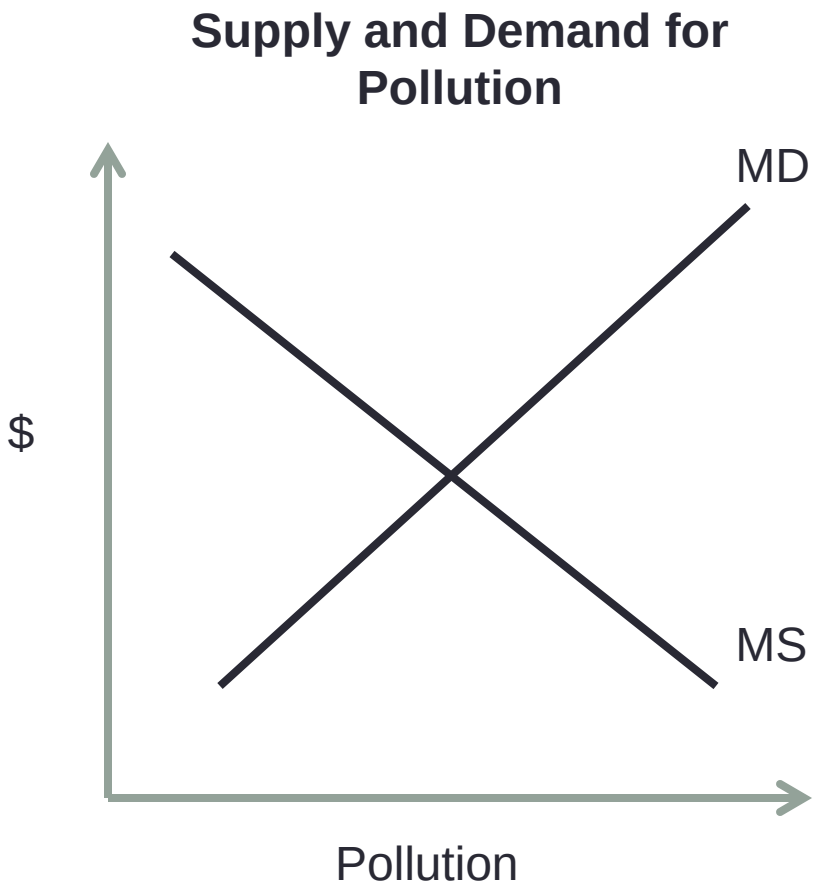
Today's Agenda

- Overview of Demand for Environmental Goods
- Love Canal
- Hedonics
- Value of a Statistical Life

Valuation

- For the past ten weeks, we have “naively” drawn supply and demand for environmental goods.
- Where did “demand” come from?
- The key feature of environmental goods is that they are non-market: there is no price.
- Other than that, we stick to standard consumer theory as closely as possible.



Key Issues in Valuation

- Goods vs. Bads
- Income effects
- Marginal WTP vs. Marginal Damage
- Marginal Willingness to Pay vs. Marginal Willingness to Accept
- Different types of values
  - Use value
  - Non-use value
    - Existence value
    - Altruistic value
    - Bequest value

Measuring Demand for Environmental Goods

- Stated Preference
  - Contingent valuation
  - Done through surveys
  - Not very reliable
  - Not very fashionable in academic economics
- Revealed Preference
  - Hedonics
    - Amount of the environmental good affects price of a market good
    - e.g. House Price = f(Pollution)
  - Household production
    - We combine environmental goods with market goods to produce a good that generates utility.
    - e.g. U = f(Parks Visited(Park Quality, Travel Time))
    - e.g. U = f(Clean Air Breathed(Air Quality, Air Masks))

Love Canal

Love Canal: Niagara Falls, New York

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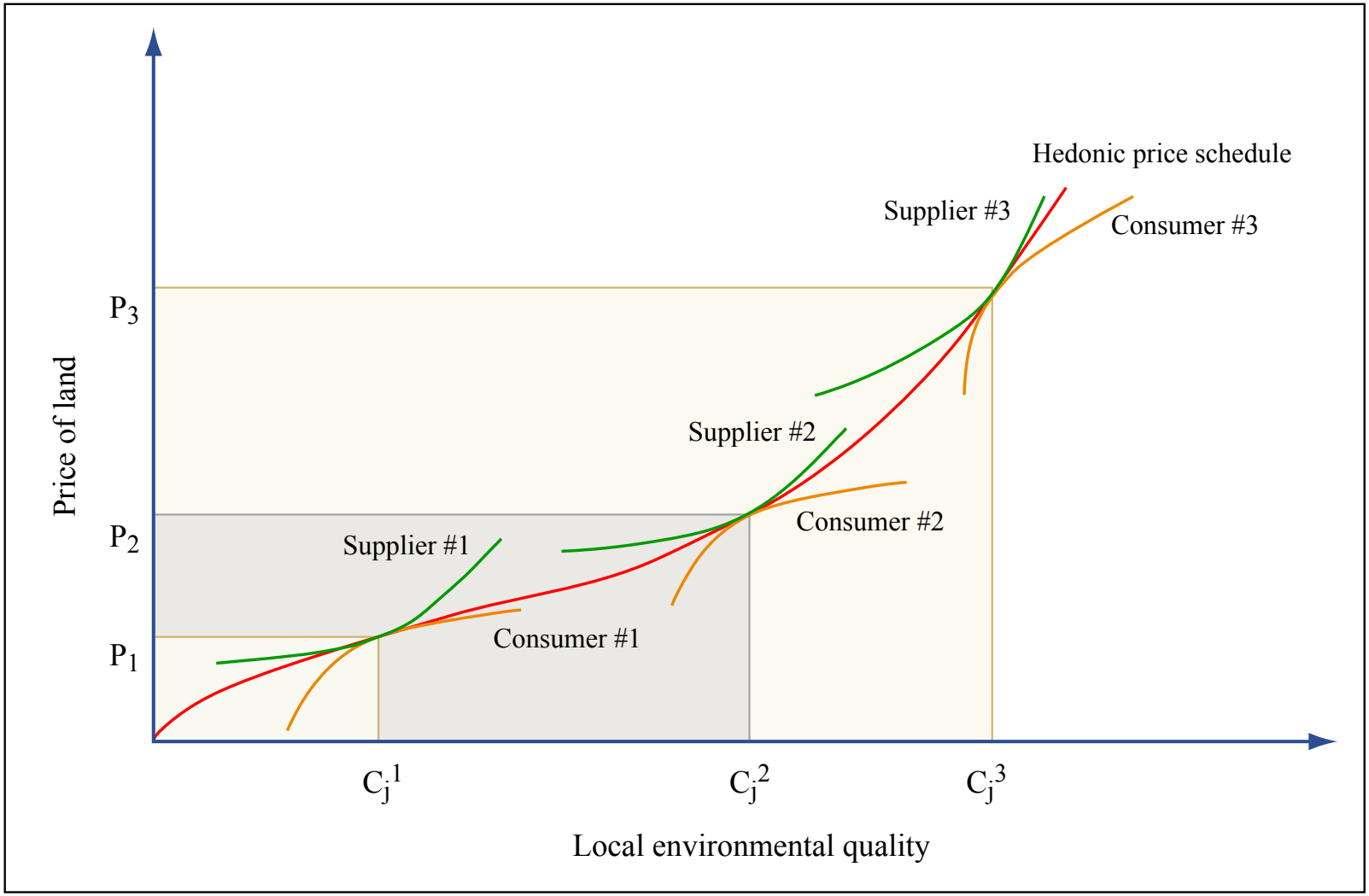
Love Canal

- 36 square blocks in Niagara Falls, New York
- 1890: William T. Love envisions a canal from Niagara River to Lake Ontario.
  - One mile of canal built: 50 feet wide, 10-40 feet deep
- 1920s: City of Niagara falls dumps municipal waste
- 1940s: US Army dumps wastes, including wastes from Manhattan Project
- 1942-1953: Hooker Chemical Company dumps 21,000 tons of chemical wastes.
- 1953: Hooker Chemical sells the land to the City of Niagara Falls for $1
  - Covered with 25 feet of soil. Discloses chemical dump and released from further legal obligations
- 1950s: 99th St. School and 93rd Street Schools opened. Private and public housing built
- 1950s: Water lines and LaSalle Expressway construction punch holes in clay walls, toxic waste begins to escape
- 1970s: Birth defects, low white blood cell counts, asthma, and epilepsy documented at high rates
- 1978: President Carter declares a state of emergency
- 900 residents relocated (although 90 choose to stay)
- 1980: Congress passes Superfund (CERCLA)
  - By 2005: $35 billion in federal funding has been spent at roughly 800 sites.

Love Canal

Toxic Waste at Love Canal

Hedonics: Theory



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Effects of an Increase in Environmental Quality

Hedonics: Takeaways

- Takeaway 1: Slope of HPS ≠ MWTP.
  - But it's MWTP that gives demand and welfare.
- Takeaway 2: Omitted variables bias is a severe problem in cross-sectional hedonic regressions
- Takeaway 3: Hedonics useful for welfare under very complicated and perhaps unrealistic assumptions.

Superfund and Housing Values

- Greenstone, Michael, and Justin Gallagher (2008). "Does Hazardous Waste Matter? Evidence from the Housing Market and the Superfund Program." *Quarterly Journal of Economics*.

- This paper is nice because it has an *exogenous* change in environmental quality.
- "Exogenous" means change in environmental quality that is not confounded by other factors.
- This can be used to infer the causal impact of environmental quality on property values.

Institutional Setting

- 1980: Congress passes Comprehensive Environmental Response, Compensation, and Liability Act (“Superfund”)
- Established National Priorities List (NPL)
- 1983: Funding allocated for 400 cleanups.
- 15,000 candidate sites, 690 finalists
- Each given a Hazardous Ranking System (HRS) Score (0-100)
- Cutoff: HRS>28.5 cleaned up, HRS<28.5 not cleaned up.

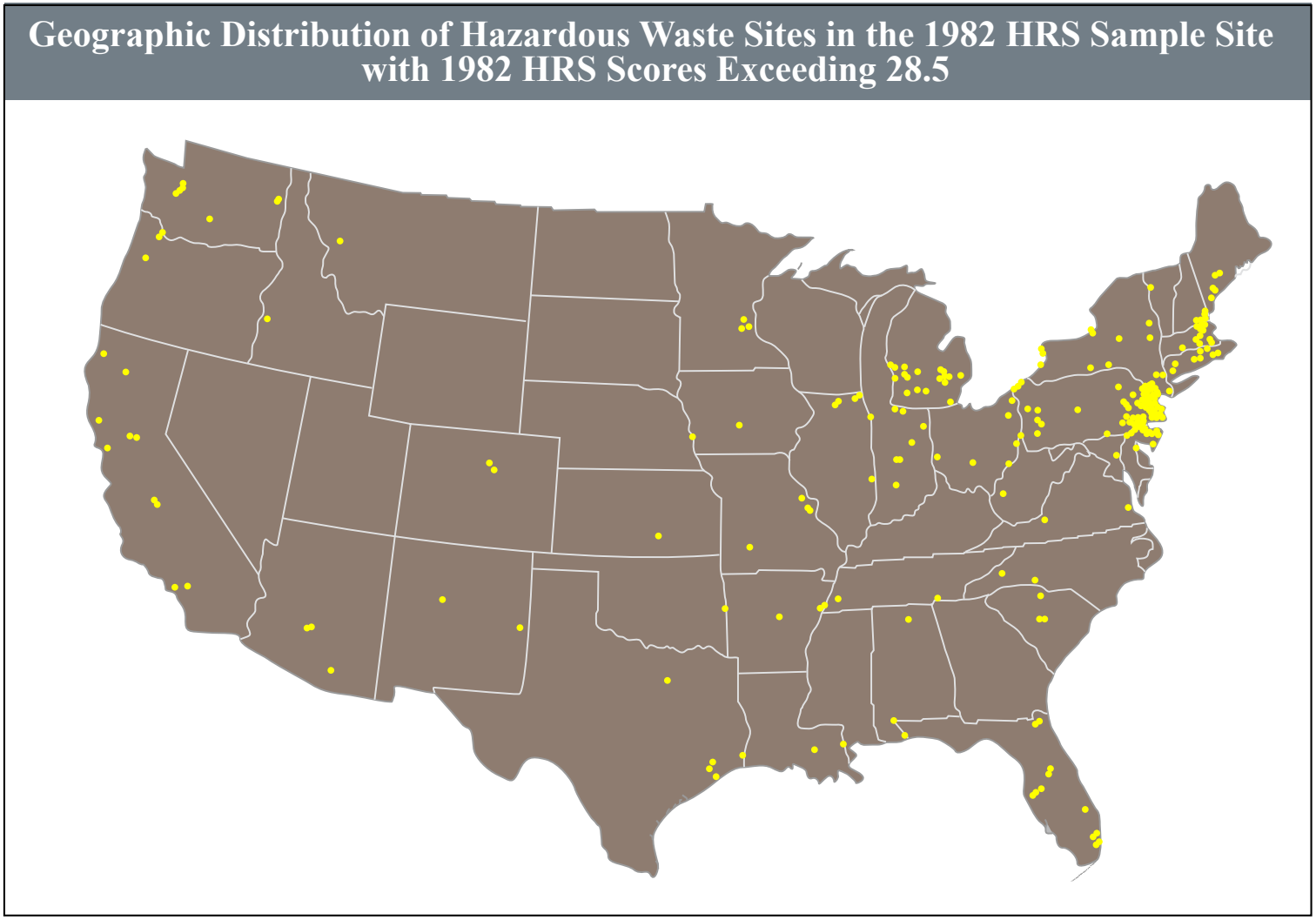
Superfund Data

SUMMARY STATISTICS ON THE SUPERFUND PROGRAM

	All NPL Sites w/ Non-Missing House Price Data (1)	1982 HRS Sites w/ Non-Missing House Price Data (2)	1982 HRS Sites w/ Missing House Price Data (3)
Number of Sites	985	487	189
1982 HRS Score Above 28.5	------	306	95
A. Timing of Placement on NPL			
Total	985	332	111
#1981-1985	406	312	97
#1986-1989	340	14	9
#1990-1994	166	4	3
#1995-1999	73	2	2
B. HRS Information			
Mean Scores | HRS $\geq$ 28.5	41.89	44.47	43.23
Mean Scores | HRS $\leq$ 28.5	------	15.54	16.50
C. Size of Site (in acres)			
Number of Sites with Size Data	920	310	97
Mean (Median)	1,187 (29)	334 (25)	10,507 (35)
Maximum	195, 200	42, 560	405, 760
D. Stages of Clean-Up for NPL Sites			
Median Years from NPL Listing Until:			
ROD Issued	------	4.3	4.3
Clean-Up Initiated	------	5.8	6.8
Construction Complete	------	12.1	11.5
Deleted from NPL	------	12.8	12.5
1990 Status Among Sites NPL by 1990			
NPL Only	394	100	31
ROD Issued or Clean-Up Initiated	335	210	68
Construction Completed or Deleted	22	16	7
2000 Status Among Sites NPL by 2000			
NPL Only	137	15	3
ROD Issued or Clean-Up Initiated	370	119	33
Construction Completed or Deleted	478	198	75
E. Expected Cost of Remediation (Millions of 200 $s)			
# Sites with Nonmissing Cost	753	293	95
Mean (Median)	$28.3 ($11.0)	$27.5 ($15.0)	$29.6 ($11.5)
95th Percentile	$89.6	$95.3	$146.0
F. Actual and Expected Costs Conditional on Construction Complete (Millions of 2000 $s)			
Sites w/Both Costs Nonmissing	477	203	69
Mean (Median) Expected Costs	$15.5 ($7.8)	$20.6 ($9.7)	$17.3 ($7.3)
Mean (Median) Actual Costs	$21.6 ($11.6)	$32.0 ($16.2)	$23.3 ($8.9)

Notes: All dollar figures are in 2000 $s. Column (1) includes information for sites placed on NPL before 12/31/99. The estimated cost information is calculated as the sum across the first Record of Decision for each operating unit associated with a site. See the Data Appendix for further details.

Location of Superfund Sites

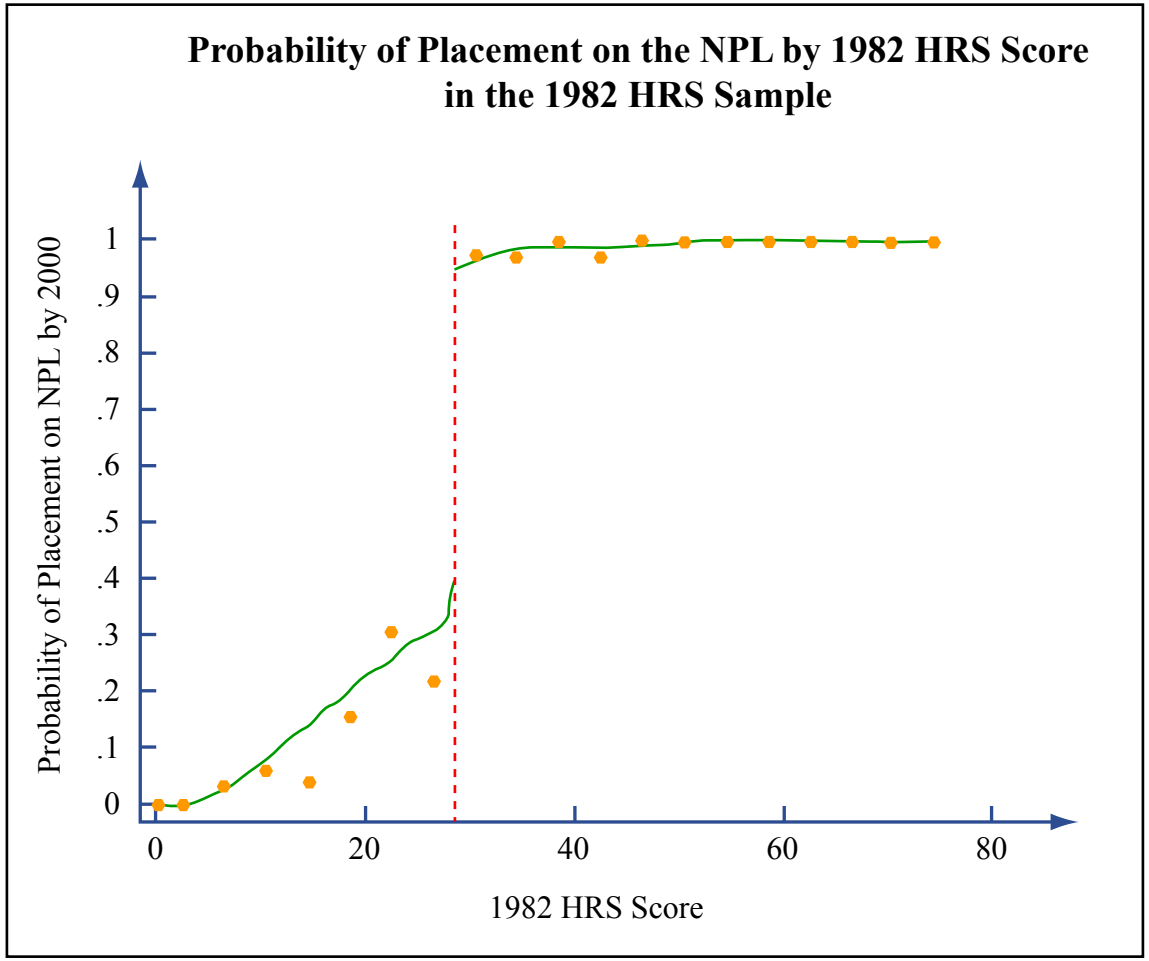


Census Tract Data

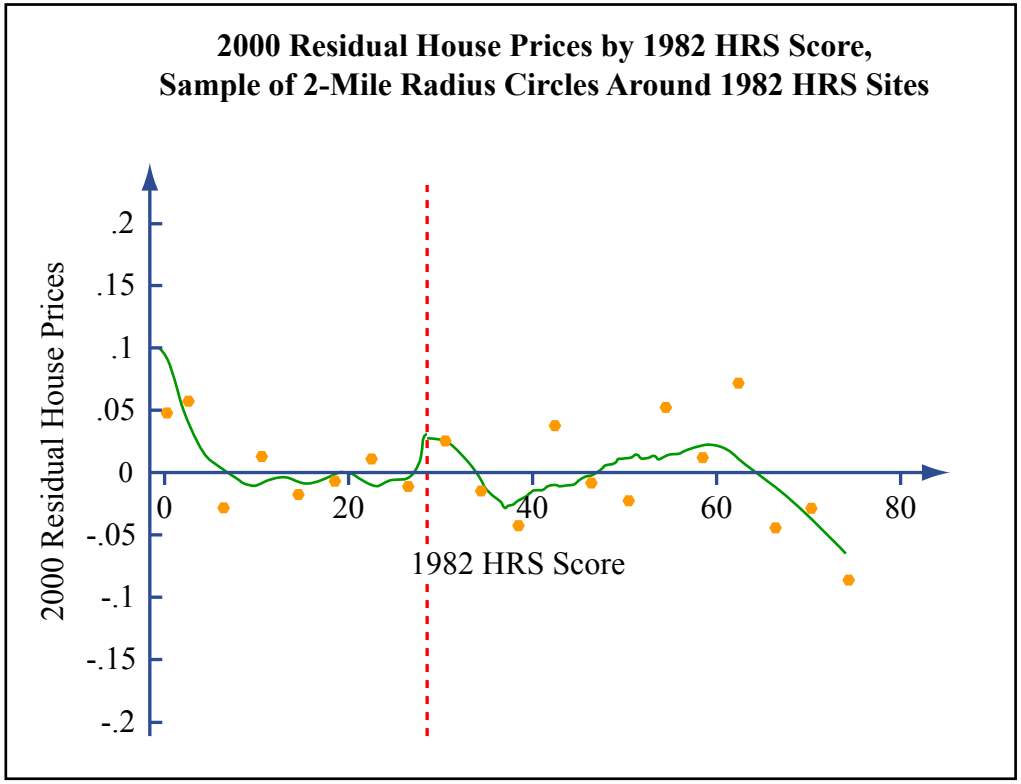
Mean Census Tract Characteristics by Categories of the 1982 HRS Score

	NPL Site by 2000	No NPL Site by 2000	HRS < 28.5	HRS > 28.5	HRS >16.5 & < 28.5	HRS >28.5 & < 40.5	P-Value (1) vs. (2)	P-Value (3) vs. (4)	P-Value (5) vs. (6)
	1	2	3	4	5	6	7	8	9
# Census Tracts	985	41,989	181	306	90	137	----	---	---
Superfund Clean-up Activities									
Ever NPL by 1990	0.7574	-----	0.1271	0.9902	0.2222	0.9854	----	0.000	0.000
Ever NPL by 2000	1.0000	-----	0.1602	0.9902	0.2667	0.9854	----	0.000	0.000
1980 Mean Housing Prices									
Site's Census Tract	58,045	69,904	45,027	52,137	46,136	50,648	0.000	0.000	0.084
2-Mile Radius Circle Around Site	56,020	-----	48,243	53,081	48,595	52,497	----	0.016	0.179
3-Mile Radius Circle Around Site	56,839	-----	51,543	54,458	49,434	53,868	----	0.257	0.126
1980 Housing Characteristics									
Total Housing Units	1,392	1,350	1,353	1,353	1,367	1,319	0.039	0.951	0.575
% Mobile Homes	0.0862	0.0473	0.0813	0.0785	0.0944	0.0787	0.000	0.792	0.285
% Occupied	0.9408	0.9330	0.9408	0.9411	0.9412	0.9411	0.000	0.940	0.989
% Owner Occupied	0.6818	0.6125	0.6792	0.6800	0.6942	0.6730	0.000	0.959	0.344
% 0-2 Bedrooms	0.4484	0.4722	0.4691	0.4443	0.4671	0.4496	0.000	0.107	0.417
% 3-4 Bedrooms	0.5245	0.5016	0.5099	0.5288	0.5089	0.5199	0.000	0.202	0.586
% Built Last 5 Years	0.1434	0.1543	0.1185	0.1404	0.1366	0.1397	0.006	0.050	0.844
% Built Last 10 Years	0.2834	0.2874	0.2370	0.2814	0.2673	0.2758	0.506	0.012	0.723
% No Air Conditioning	0.4903	0.4220	0.5058	0.4801	0.5157	0.5103	0.000	0.253	0.870
% Units Attached	0.0374	0.0754	0.0603	0.0307	0.0511	0.0317	0.000	0.040	0.297
1980 Demographics & Economic Characteristics									
Population Density	1,407	5,786	1,670	1,157	1,361	1,151	0.000	0.067	0.570
% Black	0.0914	0.1207	0.1126	0.0713	0.0819	0.0844	0.000	0.037	0.926
% Hispanic	0.0515	0.0739	0.0443	0.0424	0.0309	0.0300	0.000	0.841	0.928
% Under 18	0.2939	0.2780	0.2932	0.2936	0.2885	0.2934	0.000	0.958	0.568
% Female Head HH	0.1616	0.1934	0.1879	0.1576	0.1639	0.1664	0.000	0.017	0.862
% Same House 5 Yrs Ago	0.5442	0.5127	0.6025	0.5623	0.5854	0.5655	0.000	0.001	0.244
% 25 No HS Diploma	0.3427	0.3144	0.4053	0.3429	0.3881	0.3533	0.000	0.000	0.060
% > 25 BA or Better	0.1389	0.1767	0.1003	0.1377	0.1092	0.1343	0.000	0.000	0.036
% > Poverty Line	0.1056	0.1141	0.1139	0.1005	0.1072	0.1115	0.003	0.109	0.716
% > Public Assistance	0.0736	0.0773	0.0885	0.0745	0.0805	0.0755	0.084	0.041	0.578

HRS Score and Placement on NPL



HRS Score and Property Values



Empirical Findings and Conclusions

- Superfund cleanups had economically and statistically insignificant effects on:
  - Residential property values
  - Rental rates
  - Housing supply
  - Total population
  - Types of individuals living near the site
- Suggests that the mean local benefits of Superfund clean-up are substantially lower than the $43 million average cost.

Value of a Statistical Life

- The value of a statistical life reflects willingness to pay for a reduction in the risk of death.
- There are many examples of how we trade off money and risk of death.
- There are also many examples of how the government makes such a decision on our behalf.
- The government can spend (or force society to spend) a lot of money (or not very much money) to reduce risk of death. What is an acceptable risk?
- Policymakers can define an acceptable risk based on their citizens' revealed preferences.

Reading

- Kolstad Chapter 9 for next time.

14.42 / 14.420 Environmental Policy and Economics

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