Residential mobility and the value of water quality restoration in the Milwaukee Area of Concern

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Introduction

Legacy pollutants left from decades of industrial activities threaten human and environmental health in the Great Lakes.

Figure 1. Great Lakes AOCs

We examine the economic value of removing legacy pollutants in the Milwaukee Estuary AOC, which is one of 43 heavily polluted nearshore bodies of water prioritized for cleanup through the Great Lakes Water Quality Agreement between the United States and Canada. Since the establishment of AOCs, nearly $23 billion has been spent on AOC cleanup (Hartig 2020).

Research Question: Will households pay more to reside near an AOC after remediation?

References

1. Hartig, J. H., Krantzberg, G., & Alsip, P. (2020). Thirty-five years of restoring Great Lakes Areas of Concern: Gradual progress, hopeful future. Journal of Great Lakes Research, 46(3), 429-442.
2. Depro, B., Timmins, C., & O'Neil, M. (2015). White flight and coming to the nuisance: Can residential mobility explain environmental injustice? Journal of the Association of Environmental and Resource Economists, 2(3), 439–468.

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Methods

To measure the effect of remediation on where people live and how much they pay for housing near the Milwaukee Estuary AOC, we use a 2-stage residential sorting model (Depro et al. 2015).

Stage 1

We simulate residents' move and stay decisions over 2 decades with a system of equations:

$$(1)\quad \sigma_j^{t+10} = \sum_{k=1}^{N+1} \left(\frac{e^{\left(\delta_{jt} - \delta_{kt} - \mu_t MC_{j,k}\right)}}{\sum_{l=1}^{N} e^{\left(\delta_{lt} - \delta_{kt} - \mu_t MC_{l,k}\right)}} \right) \sigma_k^t$$

$$(2)\quad \%Stay = \frac{\sum_{k=1}^{N} s_{k,k} pop_k^{t+1}}{\sum_{l=1}^{N} pop_k^{t+10}}$$

The solution to the system of equations produces estimates of the mean utility δ_j of each residential location and marginal utility of income μ_t before and after cleanup.

Stage 2

We use regression analysis of housing prices, P_{jt}, and the parameters δ_j and μ_t to estimate willingness to pay (WTP) to live near the AOC after cleanup with the equation,

$$P_{jt} + \frac{\delta_{jt}^g}{\mu_t^g} = \tilde{\beta}_p^g post_t + \tilde{\beta}_d^g \frac{1}{d_j} + \tilde{\beta}_c^g \frac{cleanup_{jt}}{d_j} + \tilde{\beta}_{cp}^g \frac{cleanup_{jt}}{d_j} \times post_t + \tilde{\beta}_Z^g Z_{jt} + \frac{\ln(M_j)}{\mu_t^g} + \frac{\xi_{jt}^g}{\mu_t^g}$$

where $\tilde{\beta}_{cp}^g \frac{cleanup_{jt}}{d_j} \times post_t$ measures the effect of cleanup on willingness to pay to live near the AOC after remediation.

Conclusion & Discussions

We found that WTP increased to live near parts of AOC after cleanup, and that WTP scaled with distance. We looked for but did not find WTP differences between race groups, but did find large differences between tenure groups, implying that remediation actions benefited owners significantly more than renters.

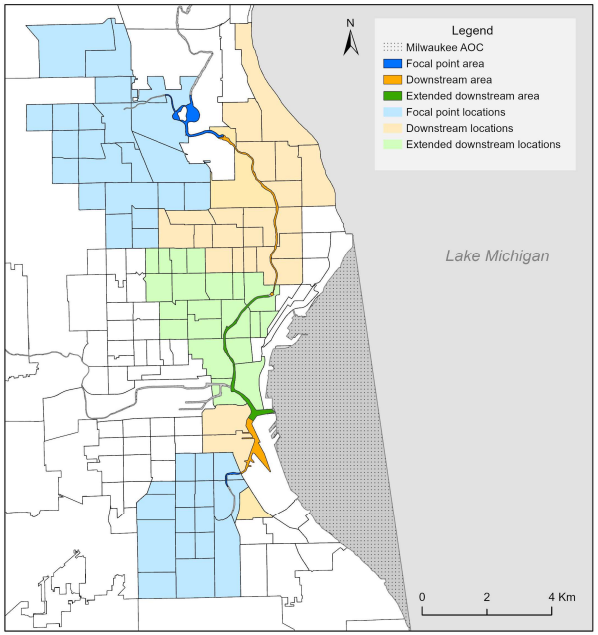

Figure 2. Milwaukee Estuary AOC

Results

The regression results indicate that remediation affects location decisions in the downstream area. We use the variable *cleanupx1/dxpost* to calculate group-specific WTP to live near the downstream area after cleanup. The results indicate that WTP to live in the downstream area increased after the remediation projects for owners more than it did for renters.

Group	WTP	90% confidence interval	
White owners	411.04**	(99.29	722.78)
White renters	27.53	(-234.72	289.78)
Black owners	563.09**	(238.74	887.44)
Black renters	179.58	(-145.03	504.20)
Hispanic owners	499.23**	(52.98	945.48)
Hispanic renters	115.73	(-230.99	462.44)
Population weighted average	268.06**	(104.12	432.00)

We calculate that the population weighted average WTP is $268 per household. With a 5% discount rate the per household WTP is $5,362. In total for all households, this is $350 million, which is greater than the cost of cleanup of $83 million.