Open Space and Urban Sprawl: The Case of the Maryland Forest Conservation Act

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Land Use Regulation, Open Space, and Sprawl

- Open space is valuable to home buyers.
- Open space often cited as motive for land use regulation:
  - Zoning
  - Maryland Forest Conservation Act (FCA)
- Does regulation increase sprawl?
  - Larger lots mean lower density development, urban boundary extending farther into rural areas.
  - Open space preservation may create leapfrog development.

The Maryland Forest Conservation Act

- Applies to all projects involving grading of 40,000+ square feet (~ 1 acre).
- Requires approval of forest conservation plan as part of the overall development approval process.
- Total forested area requirement set by formula.
- Plan must contain provisions for permanent protection of forest, including forested areas of building lots.
- Special provisions for specimen trees, riparian buffers, stand edges.

Conceptual Framework

- Land developer buys a farm of fixed size in order to subdivide it.
- The developer chooses
  - Lot size.
  - Number of lots.
  - Open space.
  - Forested share of building lots.
  - Land allocated to roads, other infrastructure.

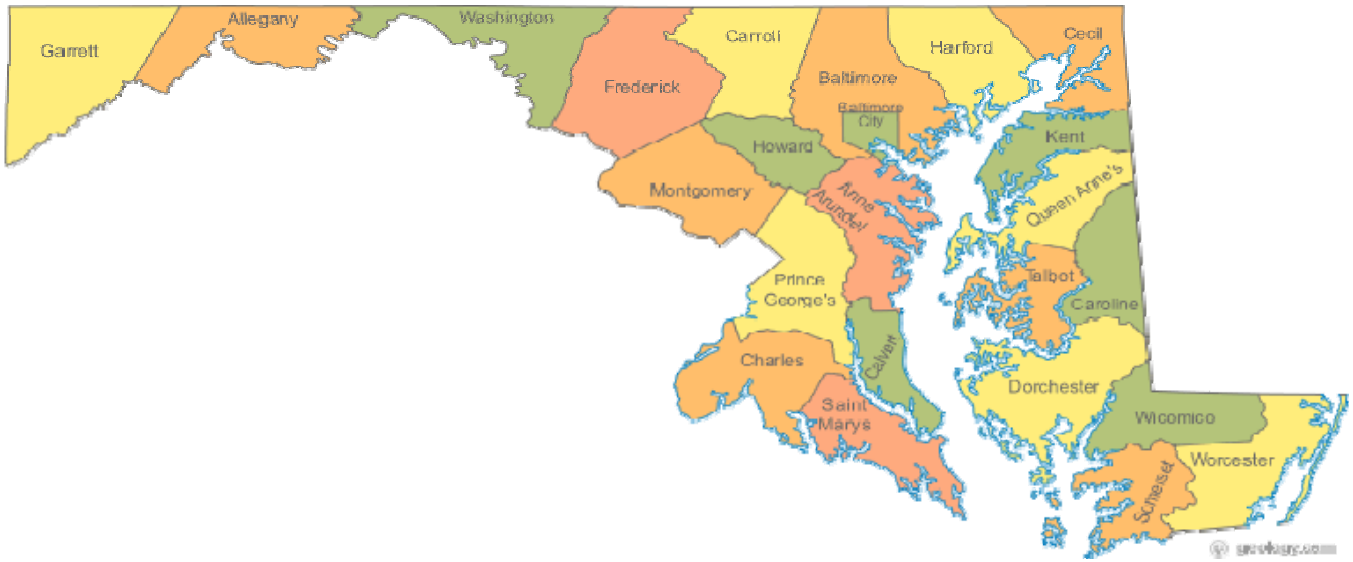
  but faces constraints on
  - Land availability.
  - Zoning.
  - FCA forested area requirement.
- Choice of forested/other open space infrastructure area balances
  - Increase in value of building lots + adjustment for impact on substitution of forested open space in lots

  against
  - Marginal development cost + opportunity cost of land.

Econometric Model

- Dependent variables = average lot size, number of lots, land allocated to infrastructure.
- Explanatory variables:
  - Zoned minimum lot size
  - Zoned maximum number of lots
  - Forest planting requirement (acres) under FCA
  - Exempt from FCA
  - Subdivision area
  - Acres of floodplain, wetland; stream frontage
  - Share of surrounding area in farmland, parks, forest/brush
  - Commuting (road) distance to nearest CBD
  - County

Data



- Random sample of subdivisions with 5+ lots in 5 suburban DC/Baltimore counties (Carroll, Howard, Montgomery, Prince Georges, Charles) approved 1991-1997.
- County planning agency files.
  - Lot numbers/sizes, infrastructure area, forest conservation plan, sewer availability, floodplain/wetlands/stream frontage.
- Property View database.
  - Commuting distance, area of farmland/parks/forest surrounding subdivision, zoning codes.
- County planning documents.
  - Minimum lot sizes, maximum densities associated with each zoning code.

Model Specification

- Separate models for subdivisions with, without public sewer access (likelihood ratio test)
- Zoning exogenous (Hausman test) for average lot size, number of lots models.
- Zoning endogenous for infrastructure in subdivisions with public sewer access.
- Only one zoning variable significant in average lot size, number of lots models.
- Subdivisions with public sewer access—seemingly unrelated regressions model.
- Subdivisions without public sewer access—three stage least squares.

Selected Parameter Estimates of the Econometric Models

Variable	Subdivisions with Public Sewer Access			Subdivisions without Public Sewer Access		
	Average Lot Size	Number of Lots	Infrastructure Area	Average Lot Size	Number of Lots	Infrastructure Area
Subdivision exempt from FCA (yes = 1)	-0.02311 (0.042139)	-14.4145* (6.719066)	1.846359 (1.698451)	4.045513** (0.990613)	-7.28269* (3.551771)	1.080632 (6.563622)
Forested acres required by FCA	0.011120** (0.00395)	1.644565* (0.641174)	-0.86866** (0.210340)	0.020901 (0.026156)	0.010218 (0.093372)	-0.57019** (0.173008)
Zoned minimum lot size (acres)	1.112685** (0.064012)		-1.50248 (6.601744)	0.571127* (0.287637)		-0.98321 (1.658766)
Zoned maximum number of lots		0.644008** (0.051181)	0.012375 (0.012922)		0.063588 (0.035602)	0.548384** (0.079066)

Impact of Regulation on Sprawl

1% Change in Regulation	Percentage Change in Land Needed to Accommodate Existing Population	
	Subdivisions with Public Sewer Access	Subdivisions without Public Sewer Access
Increase in minimum lot size	+0.53	+0.10
Decrease in maximum number of lots	+0.74	+0.31
Increase in FCA planting requirement	+0.19	+0.22

- Changes in land calculated using total derivative of land constraint.
- Coefficients of average lot size, number of lots, infrastructure area from regression models reported here. Coefficient of open space from Lichtenberg, Tra, and Hardie (JEEM 2007).
- Elasticities calculated at means of regulatory variables, subdivision area.

Implications

- Zoning contributes substantially to sprawl, especially in areas with public sewer access.
- Modest conflict between forest conservation/open space preservation and prevention of sprawl, especially in areas without public sewer access.