Dynamic Neighborhood Taxonomy

A Project of

Living Cities

Presentation by

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RW Ventures, LLC

CONNECTING COMMUNITIES
Using Information to Drive Change

URBAN MARKETS INITIATIVE

Agenda

- **DNT: Project Overview**
- **Measuring Change: the RSI**
- **Analytic Applications:** Where to Invest; Pace, Degree of Change; Role of Region; Drivers
- **Evolution: Discovering Patterns of Change**
- **Developing Tools: from Diagnostics to Investment**

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About Living Cities

"A partnership of financial institutions, national foundations and federal government agencies that invest capital, time and organizational leadership to advance America's urban neighborhoods."

Living Cities Partners:

AXA Community Investment Program
Bank of America
The Annie E. Casey Foundation
J.P. Morgan Chase & Company
Deutsche Bank
Fannie Mae Foundation
Ford Foundation
Bill & Melinda Gates Foundation
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Partners and Advisors

CASE
MANDEL SCHOOL OF APPLIED SOCIAL SCIENCES
CENTER ON URBAN POVERTY AND COMMUNITY DEVELOPMENT

CHAPIN HALL
CENTER FOR CHILDREN
AT THE UNIVERSITY OF CHICAGO

Chicago Metropolis 2020

CMAP Chicago Metropolitan Agency for Planning

CNT
Sustainable Communities Attainable Results

THE CLEVELAND FOUNDATION

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ECONSULT CORPORATION

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ESRI

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ICIC
Initiative for a Competitive Inner City

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mcic

METROPOLITAN POLICY PROGRAM
THE BROOKINGS INSTITUTION

NEIGHBORHOOD PROGRESS

nnip
National Neighborhood Indicators Partnership

Pattern Recognition

Social Compact

The Urban Institute

URBAN MARKETS INITIATIVE
Using Information to Drive Change

… And Over 70 Advisors including Practitioners, Researchers, Funders, Civic Leaders and Government Officials

URS

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We Know Where We Want to Go...

Common Goal:

BUILDING HEALTHIER COMMUNITIES

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The Challenge:
Scarce Resources, Many Options

- Community-Based Organizations: select interventions, identify assets and attract investment
- Governments: tailor policy and interventions
- Businesses: identify untapped neighborhood markets
- Foundations: evaluate interventions

Need for Relevant, Timely and Accessible Information Resources

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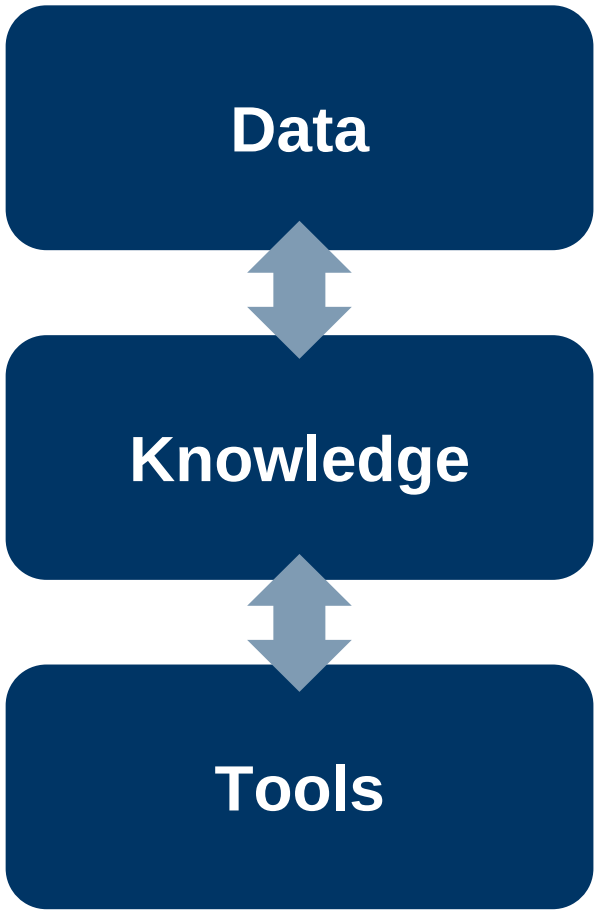
Information Resources

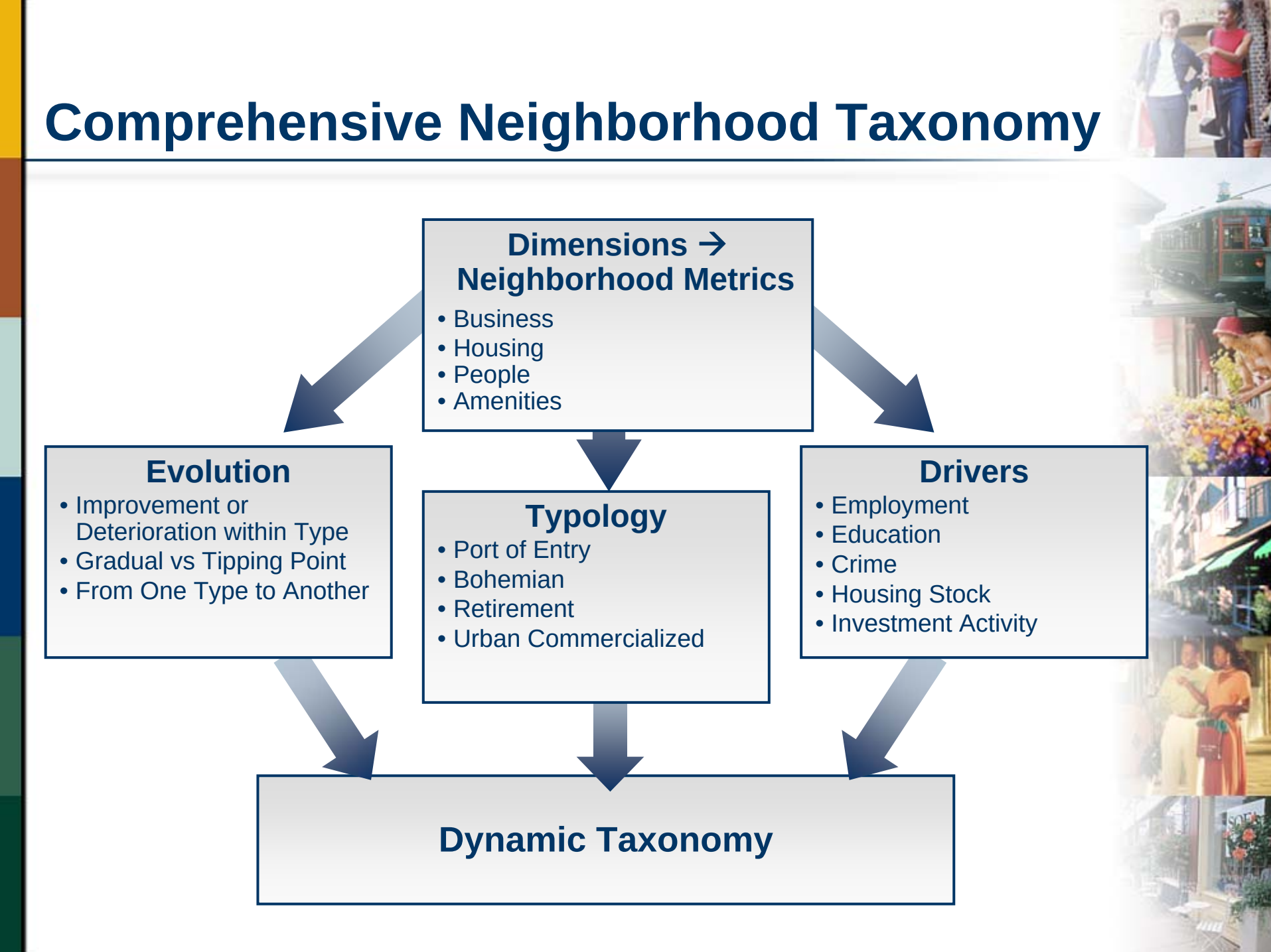


Increasingly available, but more progress to be made

Gap between practitioners and academics: need "Clinical Economics" (Sachs)

Few decision systems for neighborhood practitioners and investors

Comprehensive Neighborhood Taxonomy



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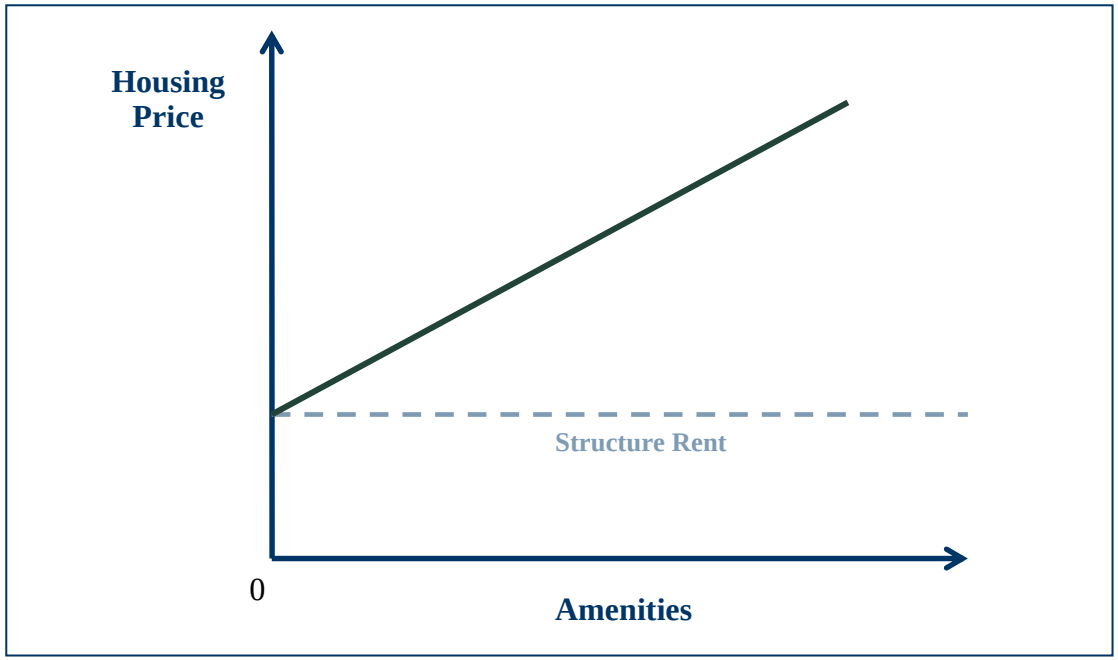
Theoretical Framework



- Use Demand for Housing as Proxy for Neighborhood Health
- Look at Housing Values to Capture Neighborhood Amenities
- Look at Change in Quantity of Housing to Account for Supply Effects

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The Challenge: Finding a Metric that Works






Issues:

- Measure change in prices controlling for change in quality of the housing stock
- Estimate at very small level of geography
- Track continuous change over time

Solutions:

- Repeat Sales to Control for Changes in Neighborhood Housing Stock
- Spatial Smoothing: Locally Weighted Regression to account for “fluid” neighborhood boundaries and address sample size
- Temporal Smoothing: Fourier expansions to track change over time

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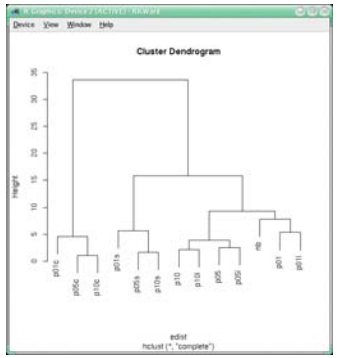
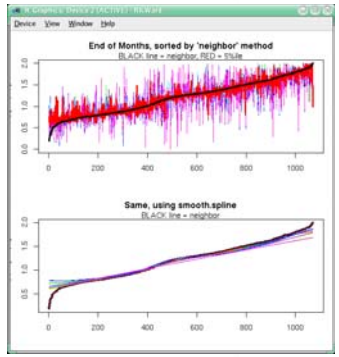
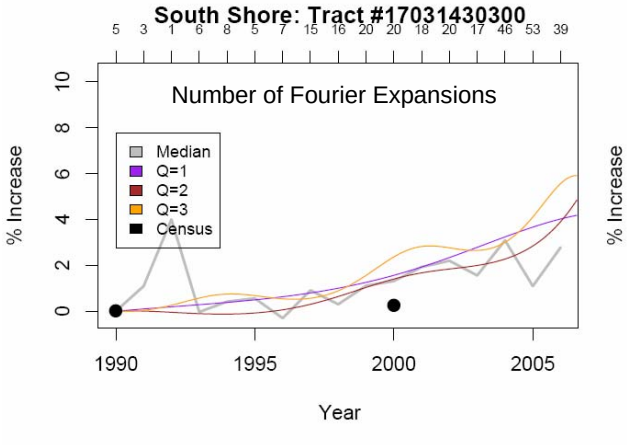
Developing the Index: Spatial and Temporal Smoothing

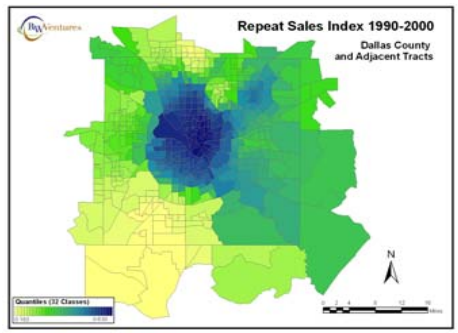
Correlations between different RSI Versions

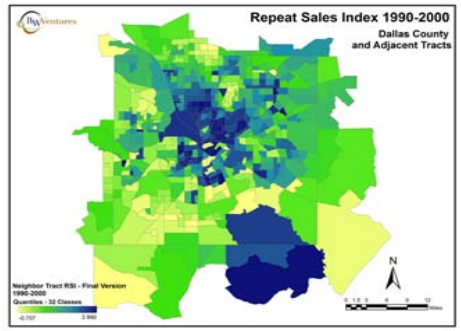
	p01	p01i	p01s	p01c	p05	p05i	p05s	p05c	p10	p10i	p10s	p10c	nb
p01													
p01i	0.96												
p01s	0.82	0.89											
p01c	0.53	0.58	0.82										
p05	0.94	0.96	0.79	0.49									
p05i	0.94	0.97	0.82	0.52	0.99								
p05s	0.83	0.90	0.99	0.77	0.84	0.87							
p05c	0.53	0.59	0.82	1.00	0.50	0.53	0.79						
p10	0.92	0.94	0.76	0.47	0.99	0.99	0.82	0.49					
p10i	0.92	0.95	0.79	0.50	0.98	0.99	0.85	0.51	0.99				
p10s	0.84	0.90	0.97	0.75	0.85	0.88	1.00	0.77	0.83	0.86			
p10c	0.53	0.59	0.82	0.99	0.51	0.54	0.79	1.00	0.49	0.51	0.77		
nb	0.11	0.13	0.11	0.07	0.13	0.13	0.12	0.07	0.13	0.13	0.12	0.07	





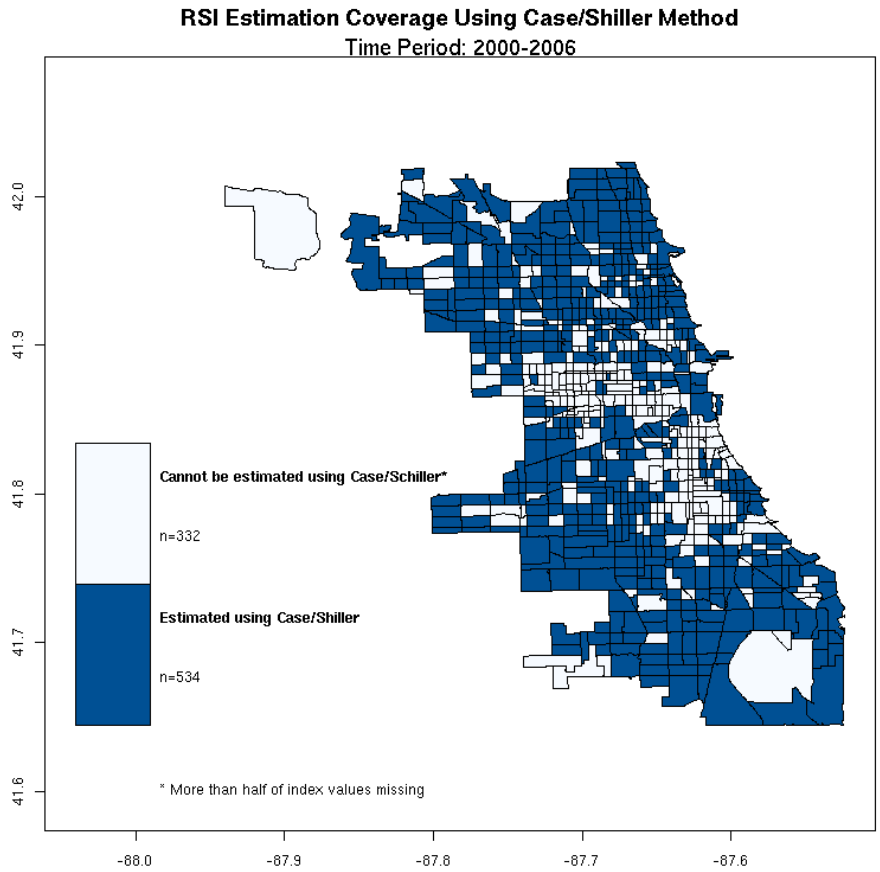


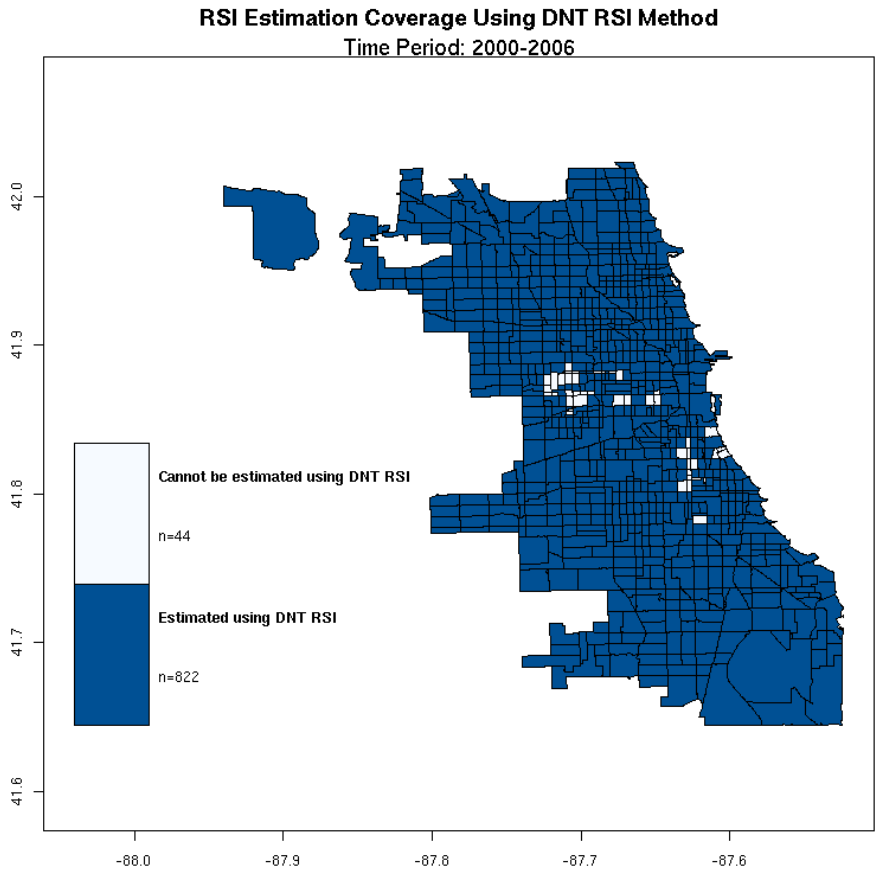




Optimizing sample size and fluid boundaries through extensive modeling and cross-validation procedures

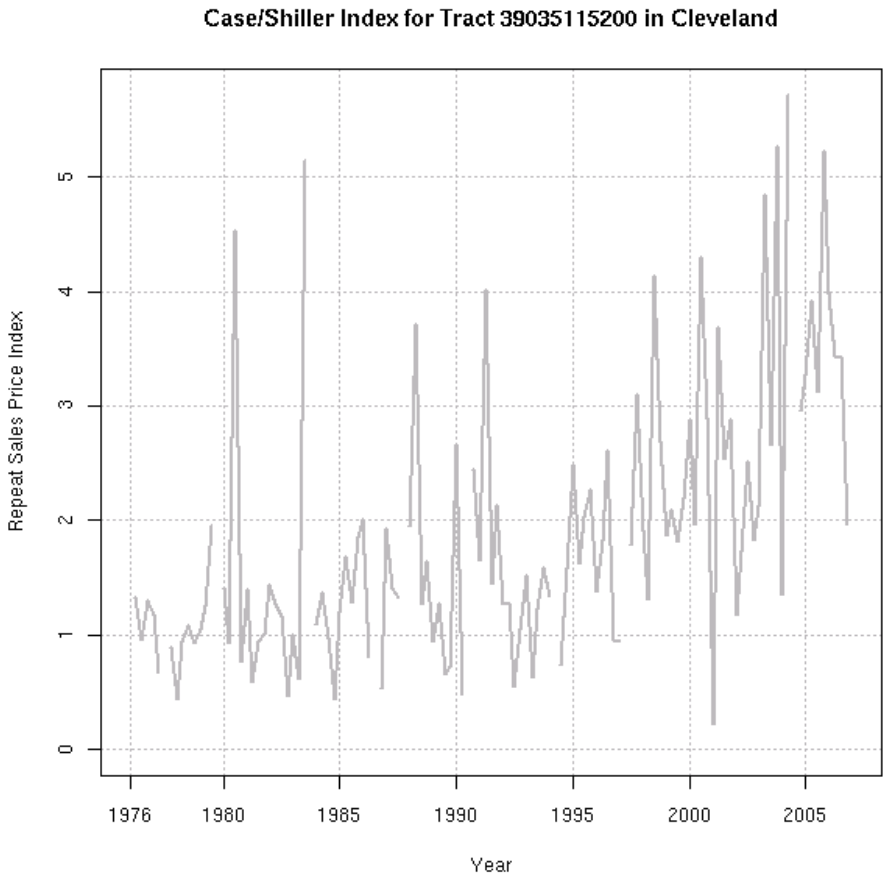
Final Product: The DNT RSI

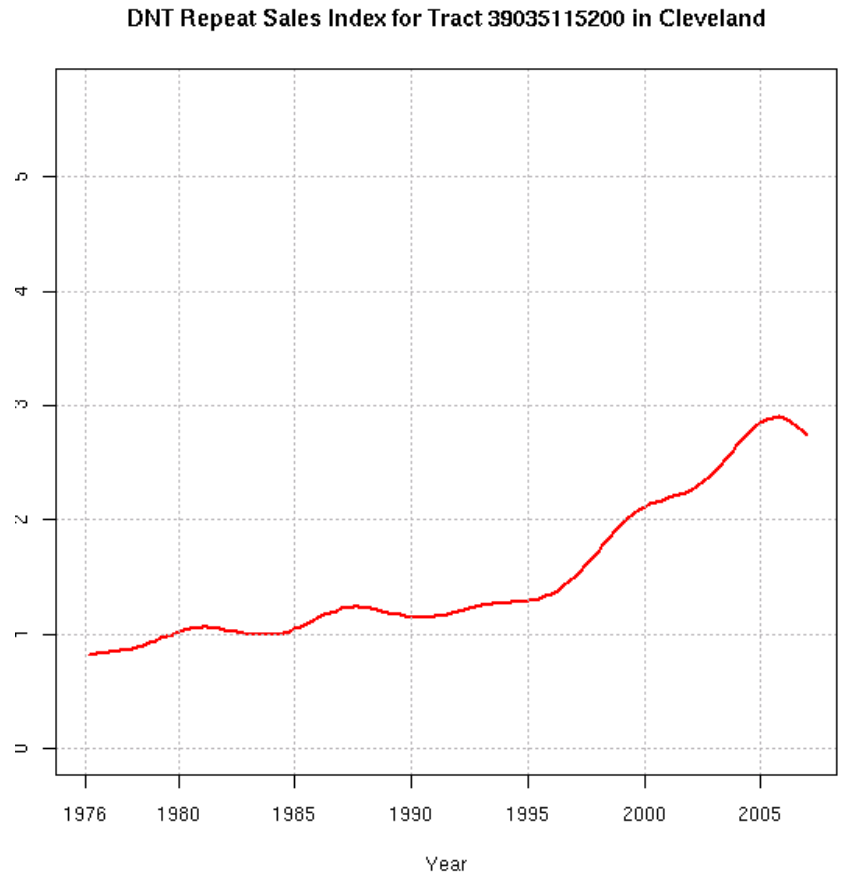




Unlike traditional repeat sales indices, the DNT RSI can be estimated for very small levels of geography

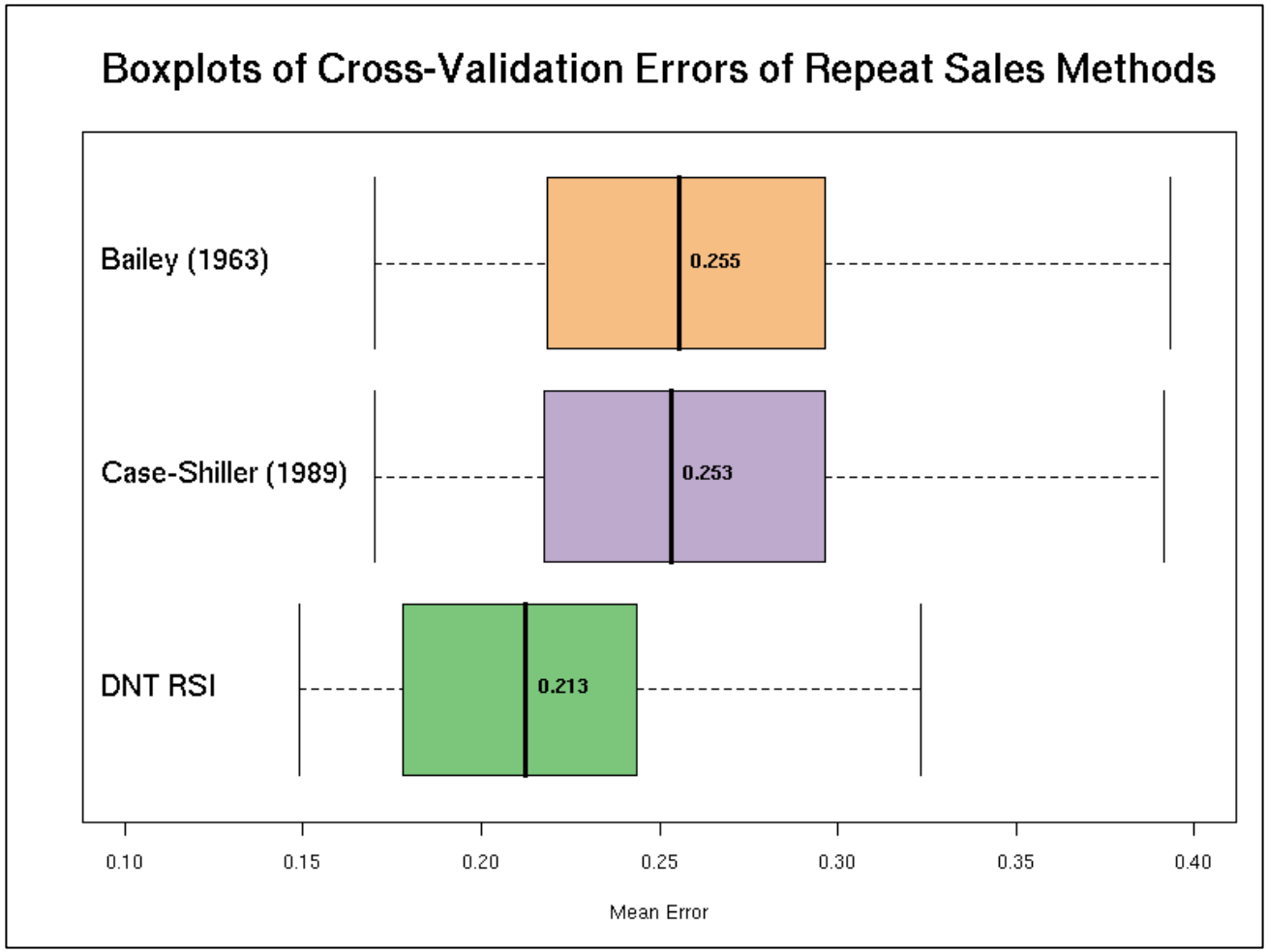
Final Product: The DNT RSI





Less volatile than traditional RSIs

Final Product: The DNT RSI



More robust than traditional repeat sales indices at the tract level

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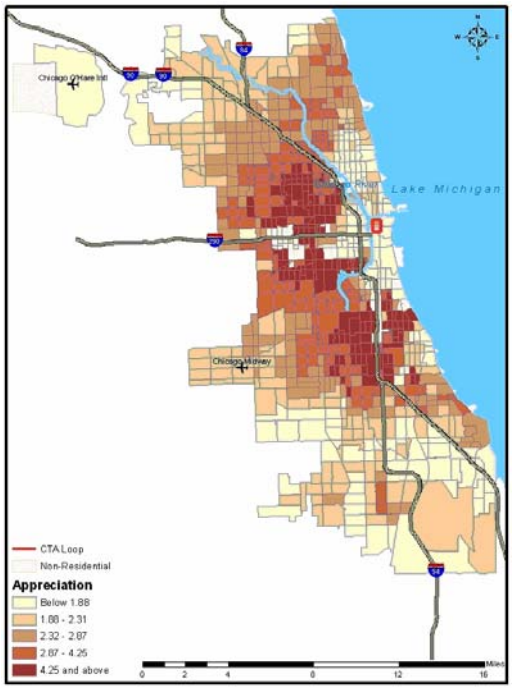
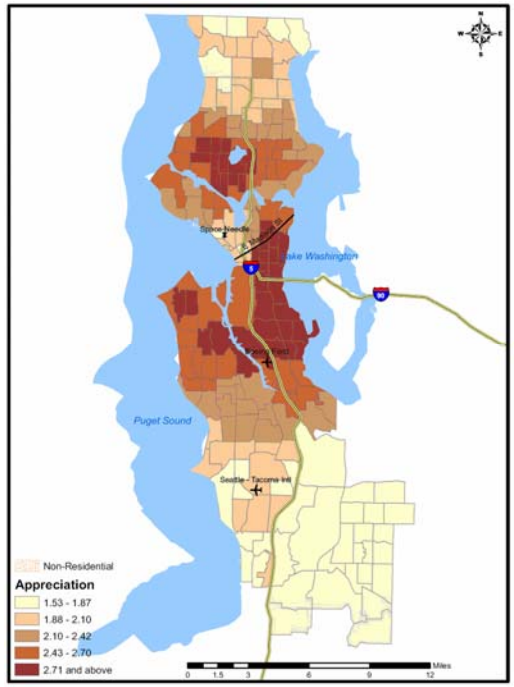
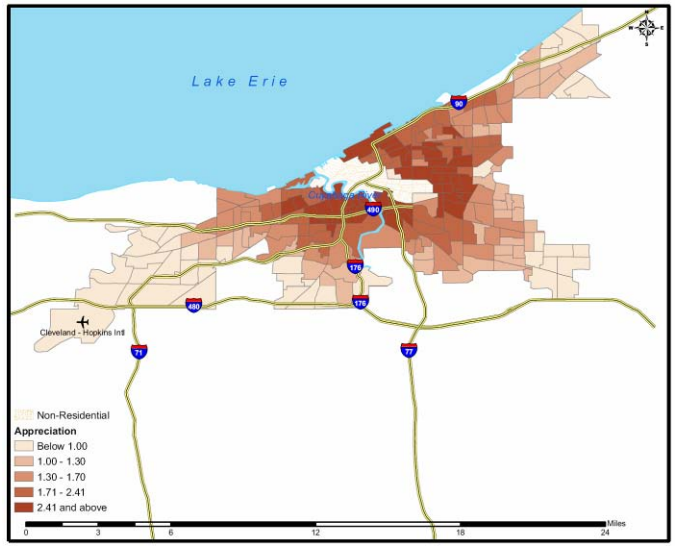
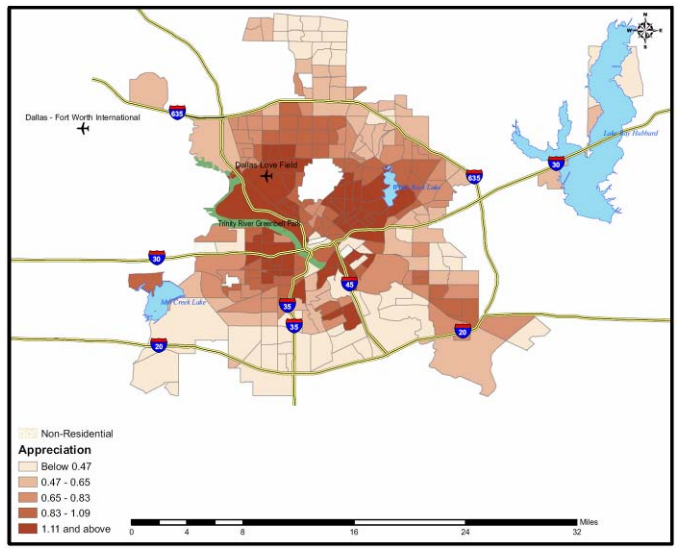
Change in Price: Poor Neighborhoods Present the Most Opportunities for Investment









Many of the poorest neighborhoods are the ones that grew the most, outperforming wealthier communities in each of the four sample cities

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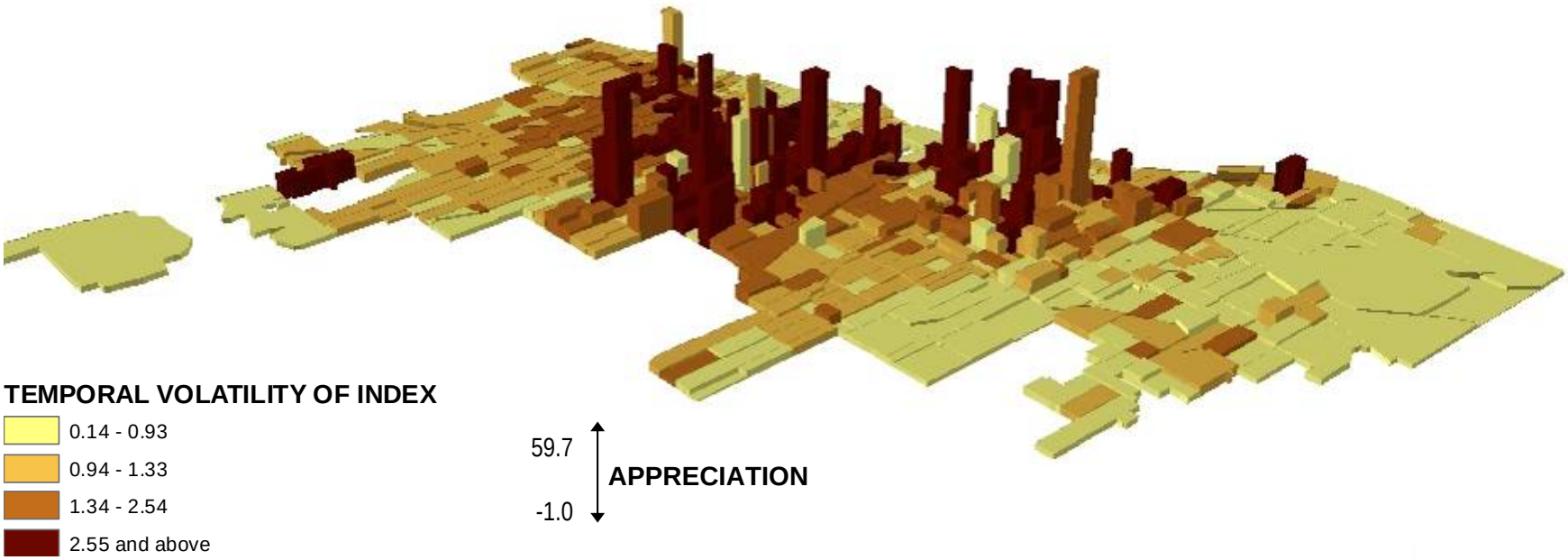
Partly Due to Lack of Information, These Areas Are Also the Most Volatile



By increasing the availability of information on these markets, we could reduce risk, increase market activity, and help stabilize these communities, further strengthening their performance.

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Using the RSI to Develop New Knowledge

- **How Much and How Fast do Neighborhoods Change?**
  - Neighborhood change is a slow process: over 15 years, most neighborhoods don't change their position relative to other neighborhoods in the region.

    (Methodology: Transition Matrices)

- **How Important Is the Region?**
  - Across cities, 35% of all neighborhood change is accounted for by regional trends.

    (Methodology: Correlations and Regressions)

- **Do Neighborhoods "Converge"?**
  - Overall, neighborhoods tend to "catch up" with each other, but there are important exceptions

    (Methodology: Sigma and Beta Convergence)

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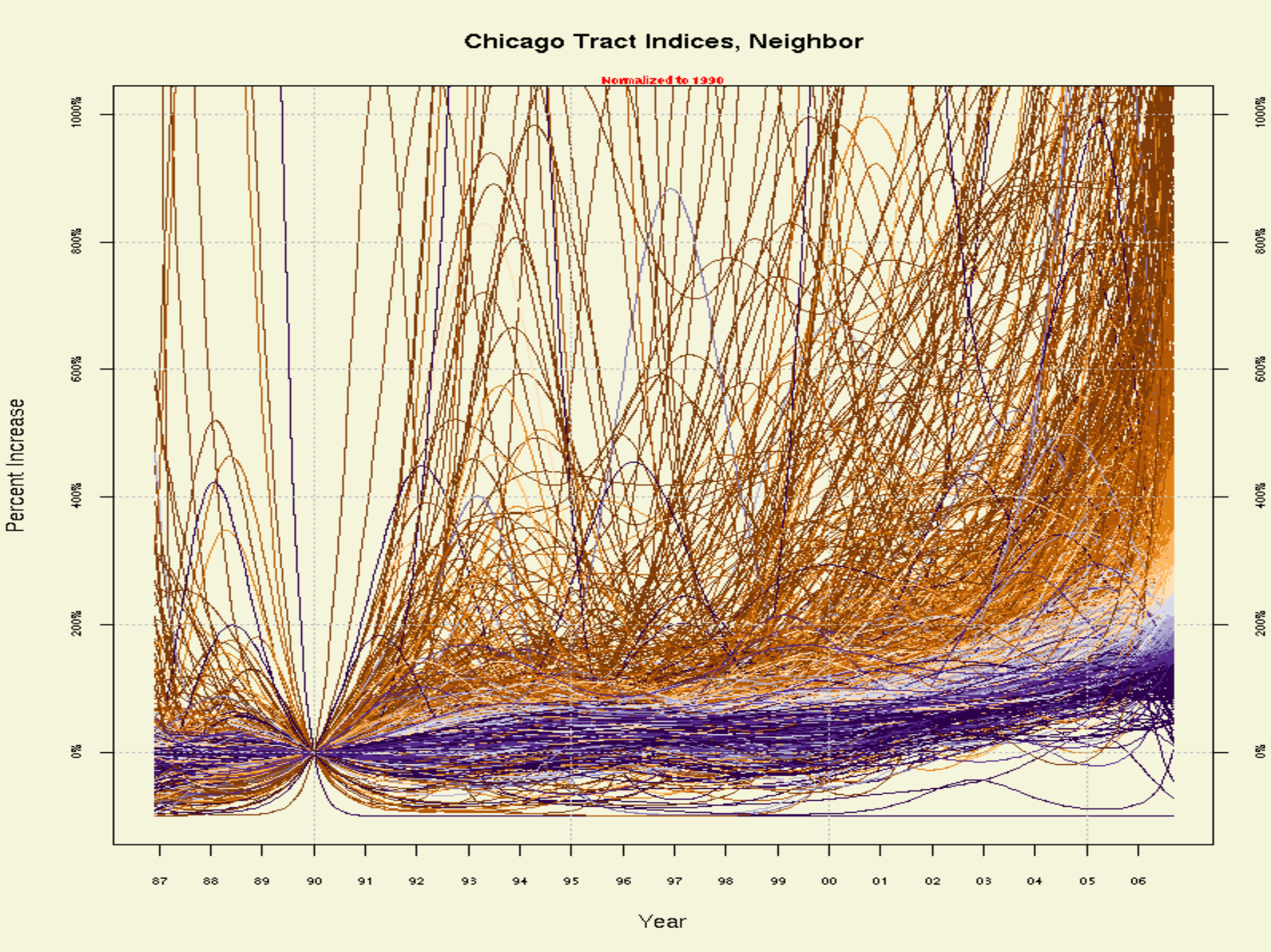
Chicago Tract Indices, Neighbor
Normalized to 1990
Percent Increase
1000%
800%
600%
400%
200%
0%
87
88
89
90
91
92
93
94
95
96
97
98
99
00
01
02
03
04
05
06
Year

Identifying Patterns of Change

Three Complementary Methodologies:

- **Cluster Analysis:** group all neighborhoods by overall pattern
- **Trend Breaks:** classify neighborhoods based on number and type of structural breaks
- **Pattern Search:** specify a pattern of interest and search for matches in the data

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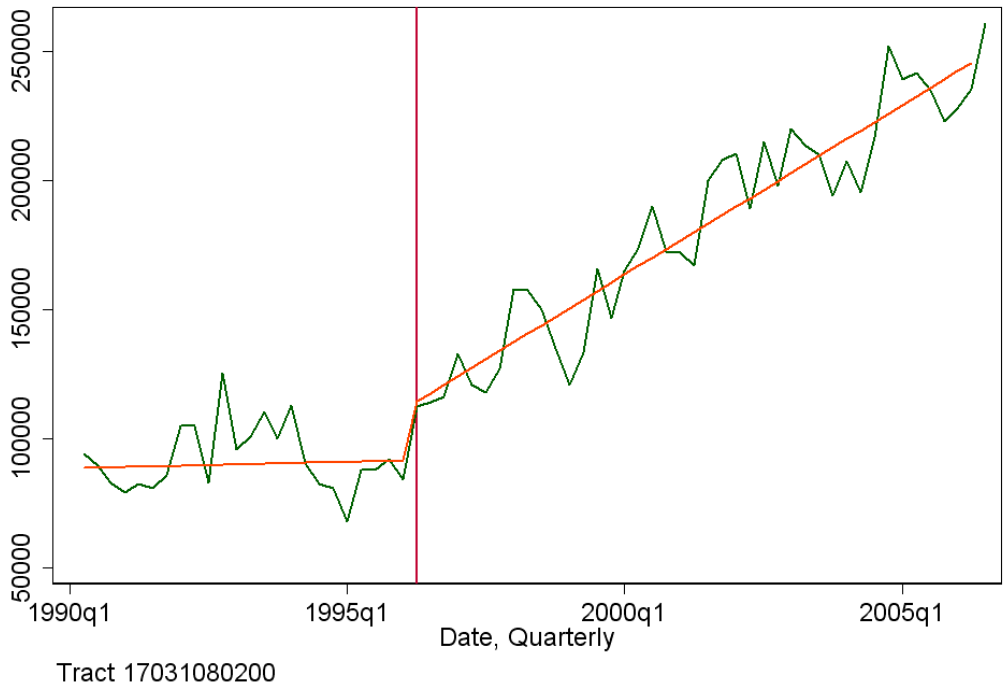
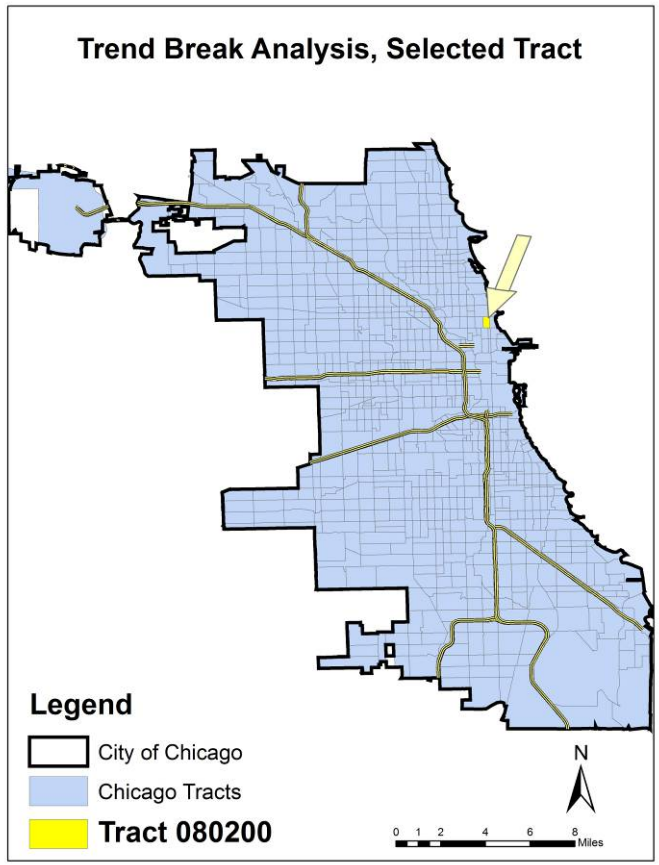
Patterns of Interest: Tipping?

Chicago, North Side

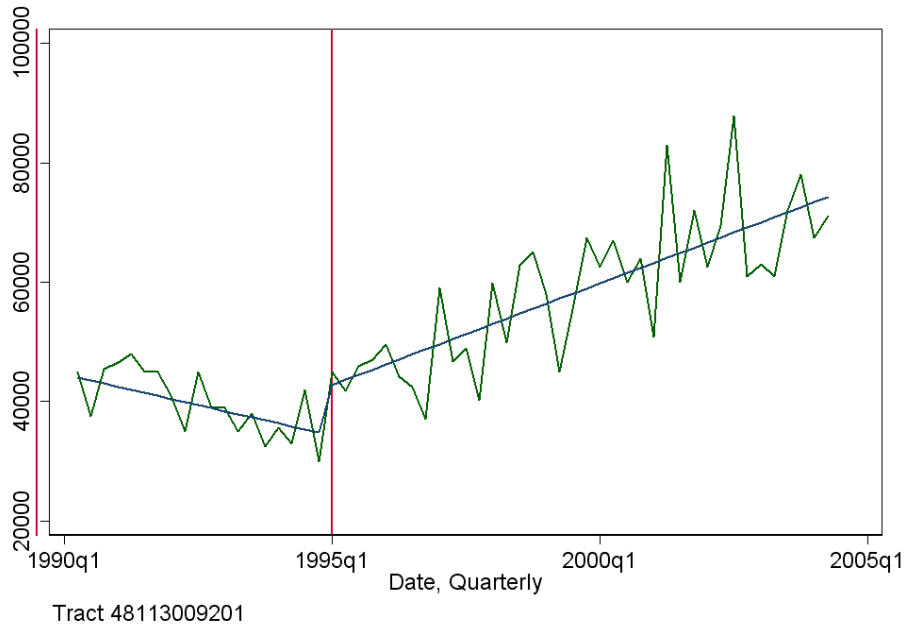


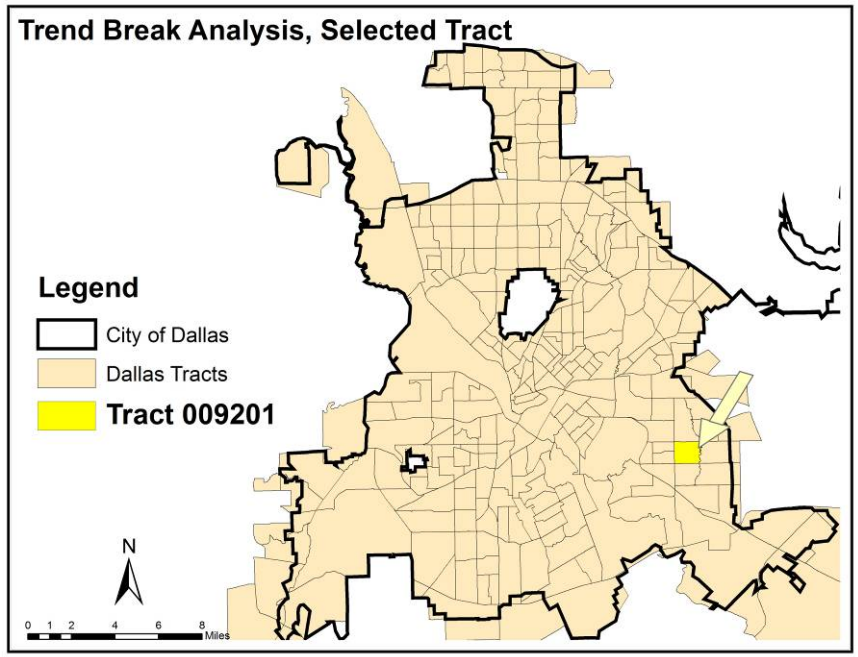


Statistically Identifying Structural Breaks

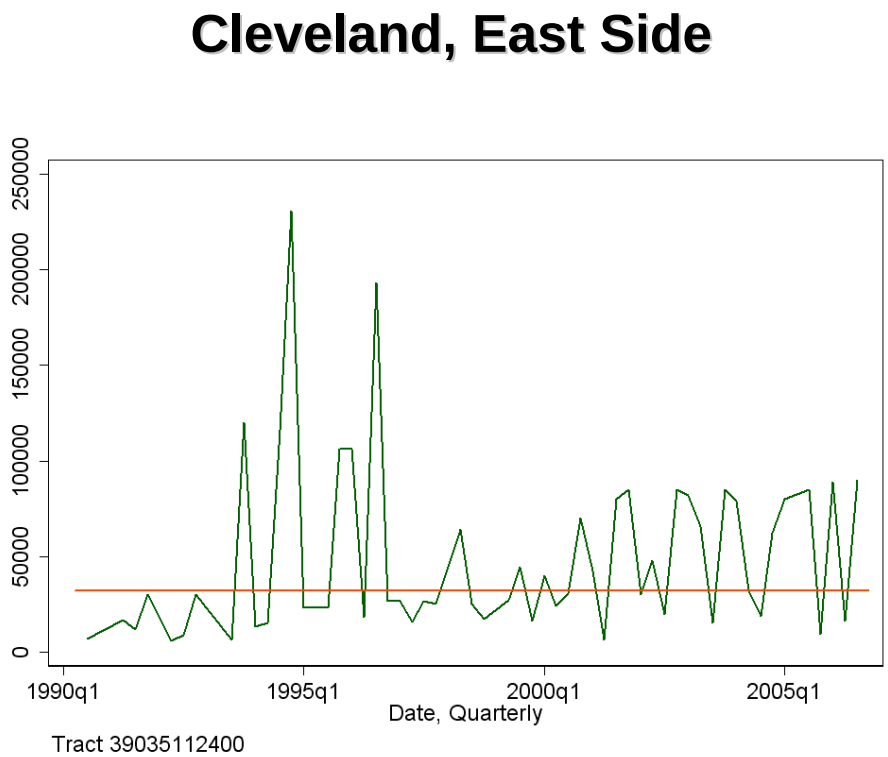
Patterns of Interest: Neighborhood Turnaround

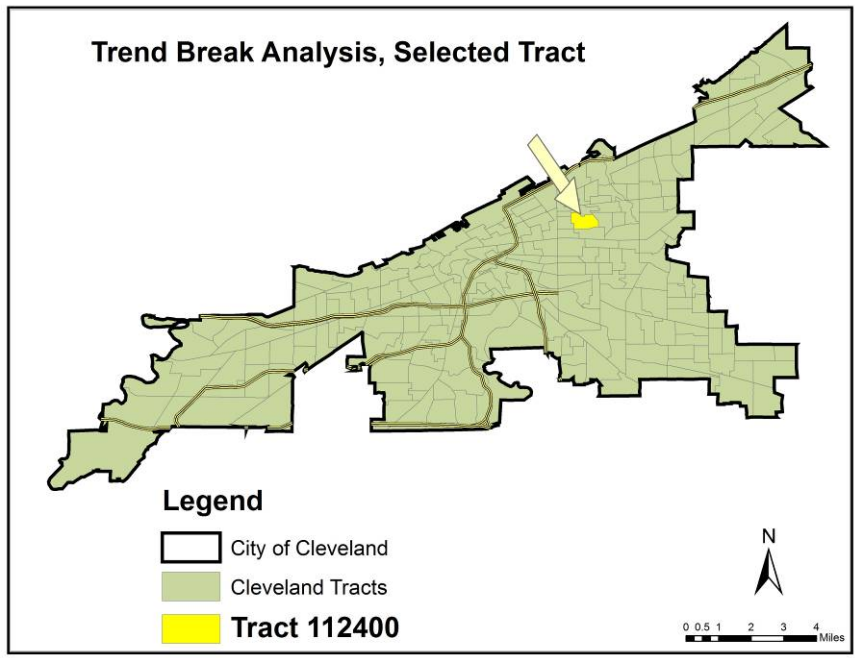
Dallas, Southeast Side



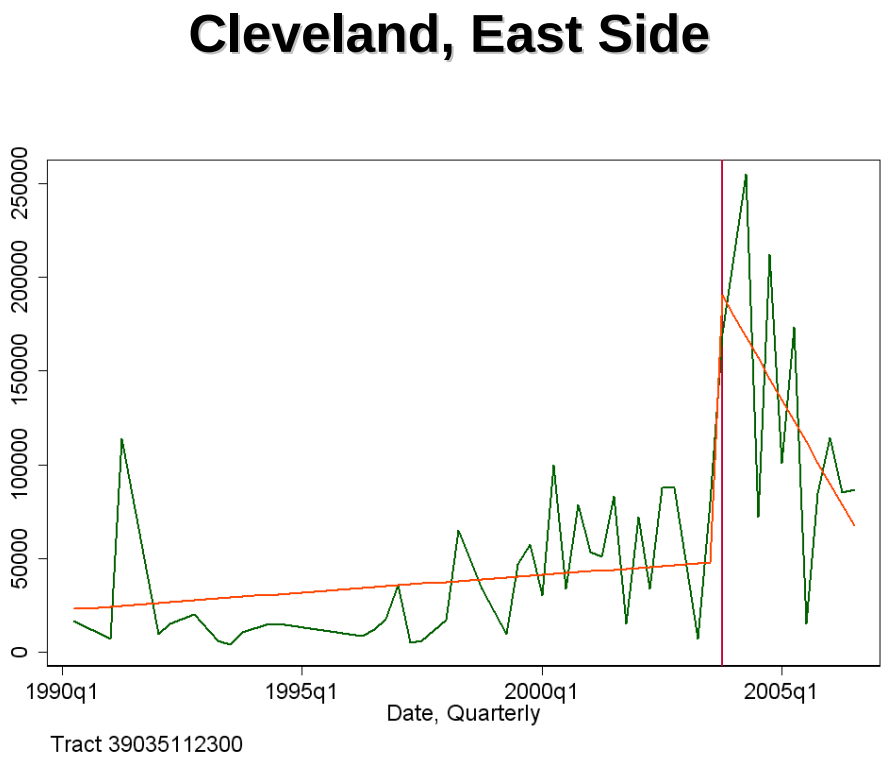


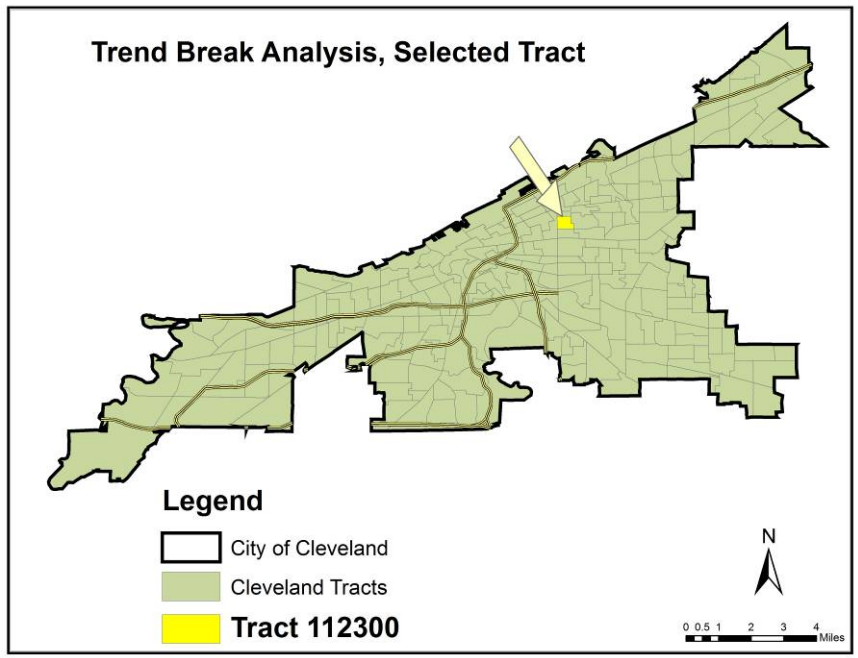
Patterns of Interest: Neighborhood Decline





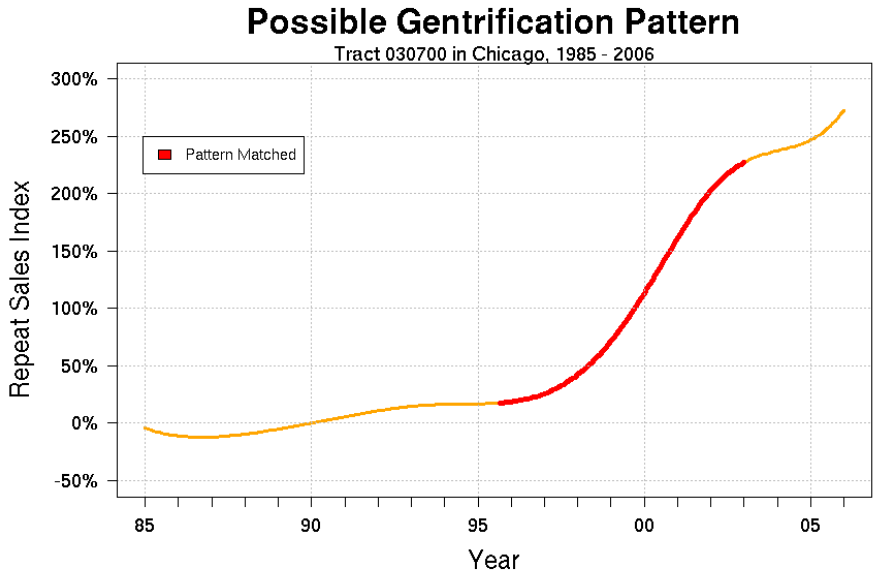
Patterns of Interest: Speculation?





Pattern Search Example: Gentrification in Chicago

- **Goal:** Anticipating Neighborhood Change
- **How it Works:** Define a Pattern and Find Matching Cases
- **Example:** Possible Gentrification Pattern Defined Based on a Neighborhood in Chicago



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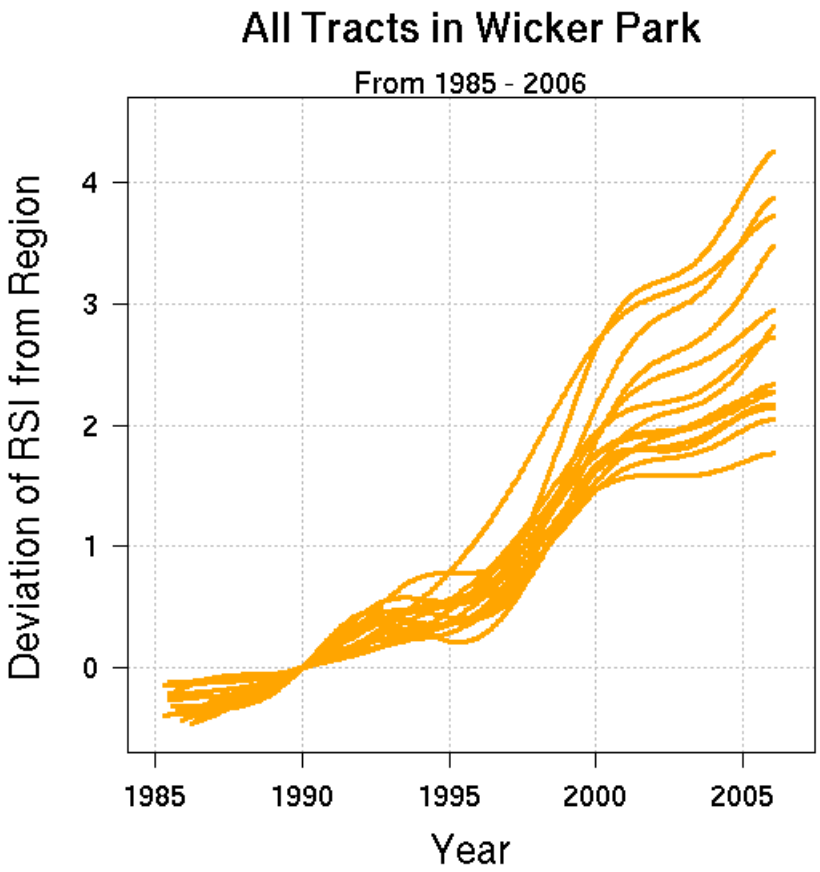
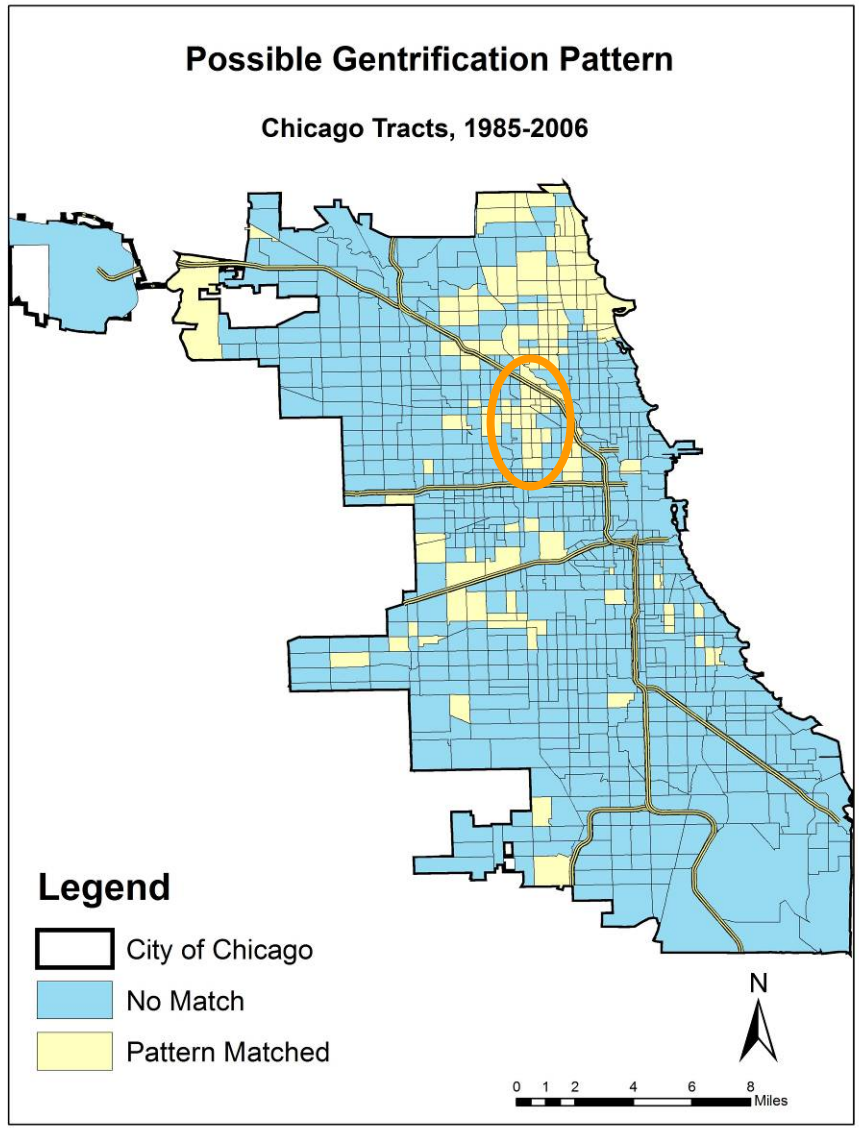
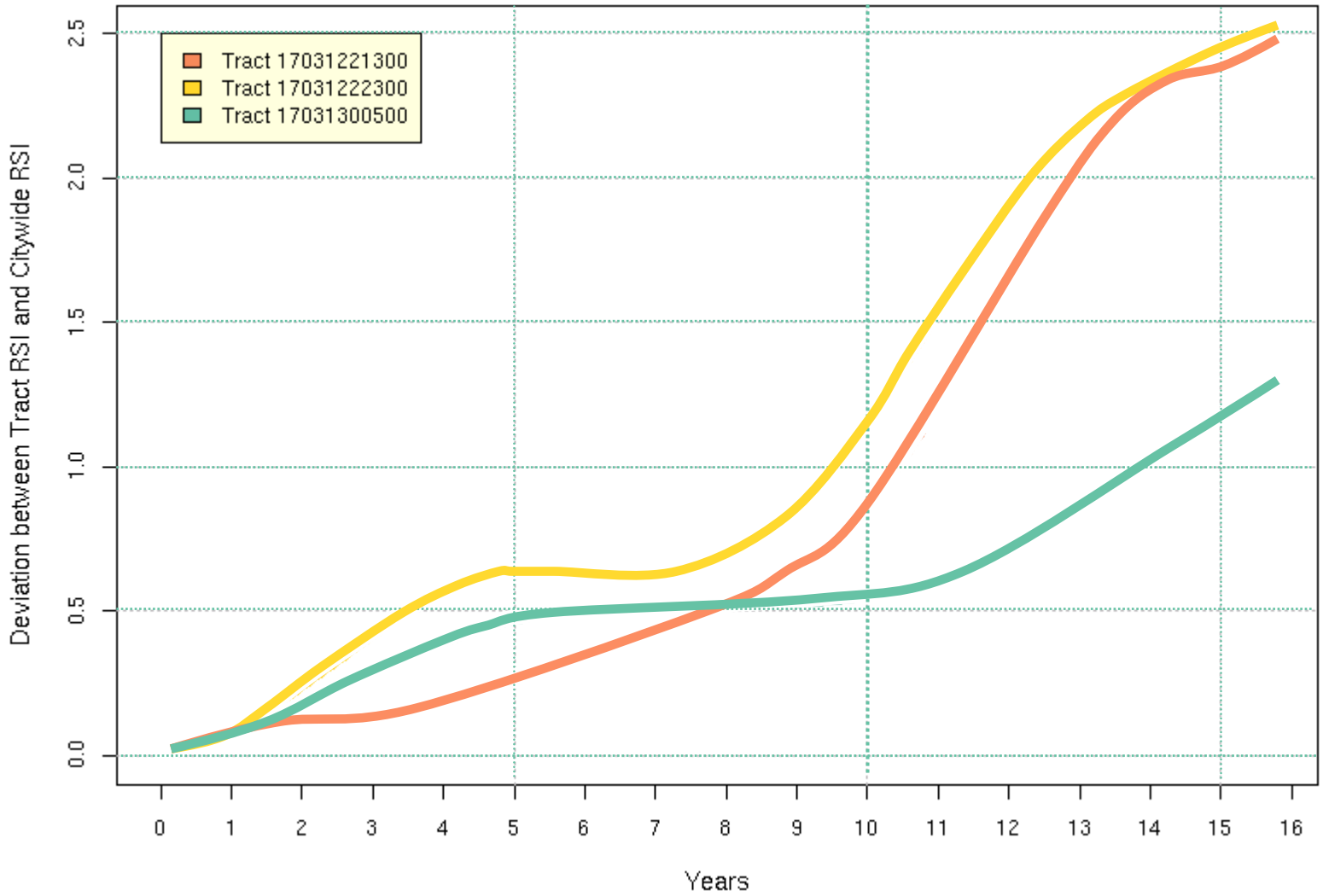
Zooming In: Wicker Park Area

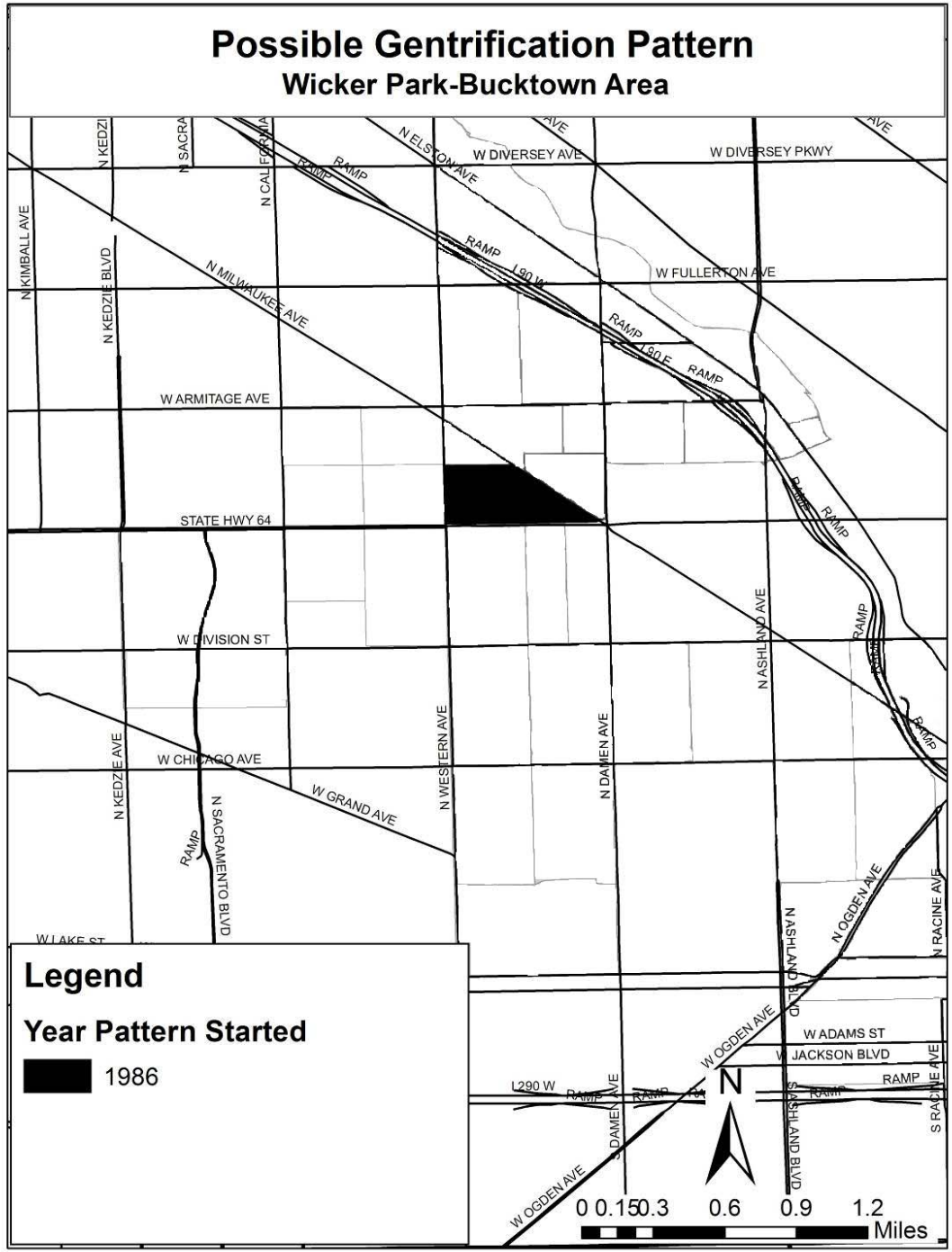




Possible Application:
Anticipating and Managing Gentrification



Pattern “Spreading” to Nearby Tracts



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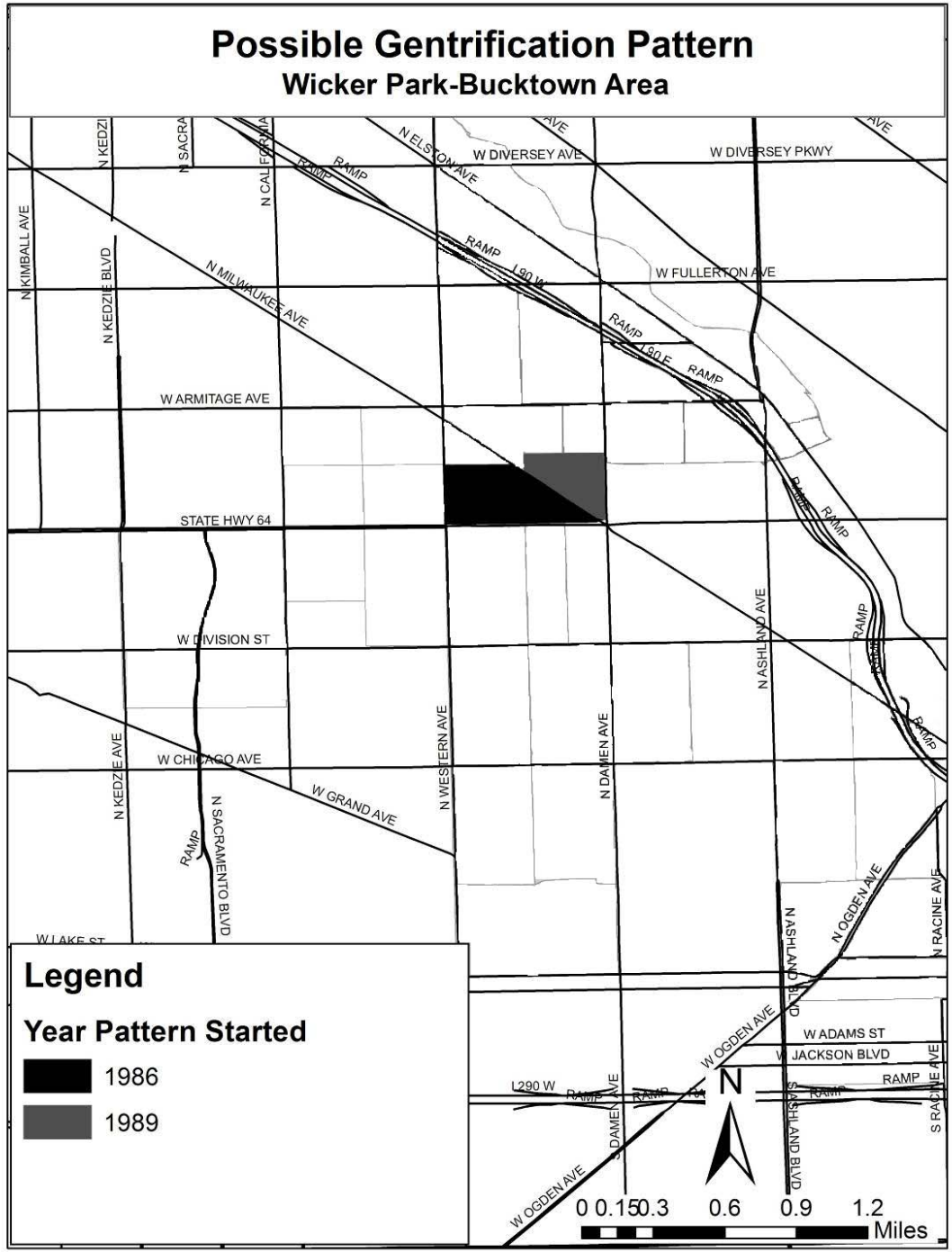

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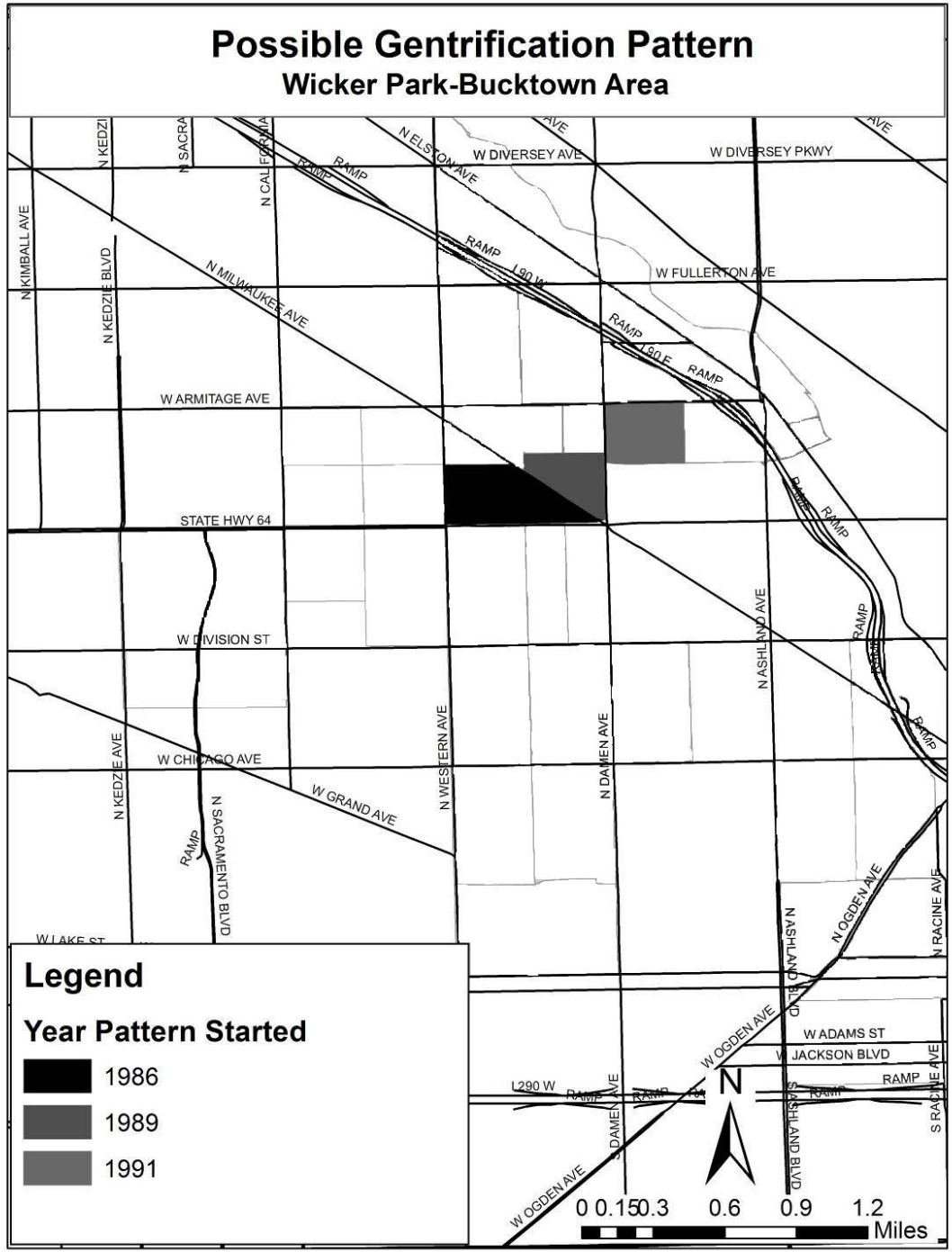

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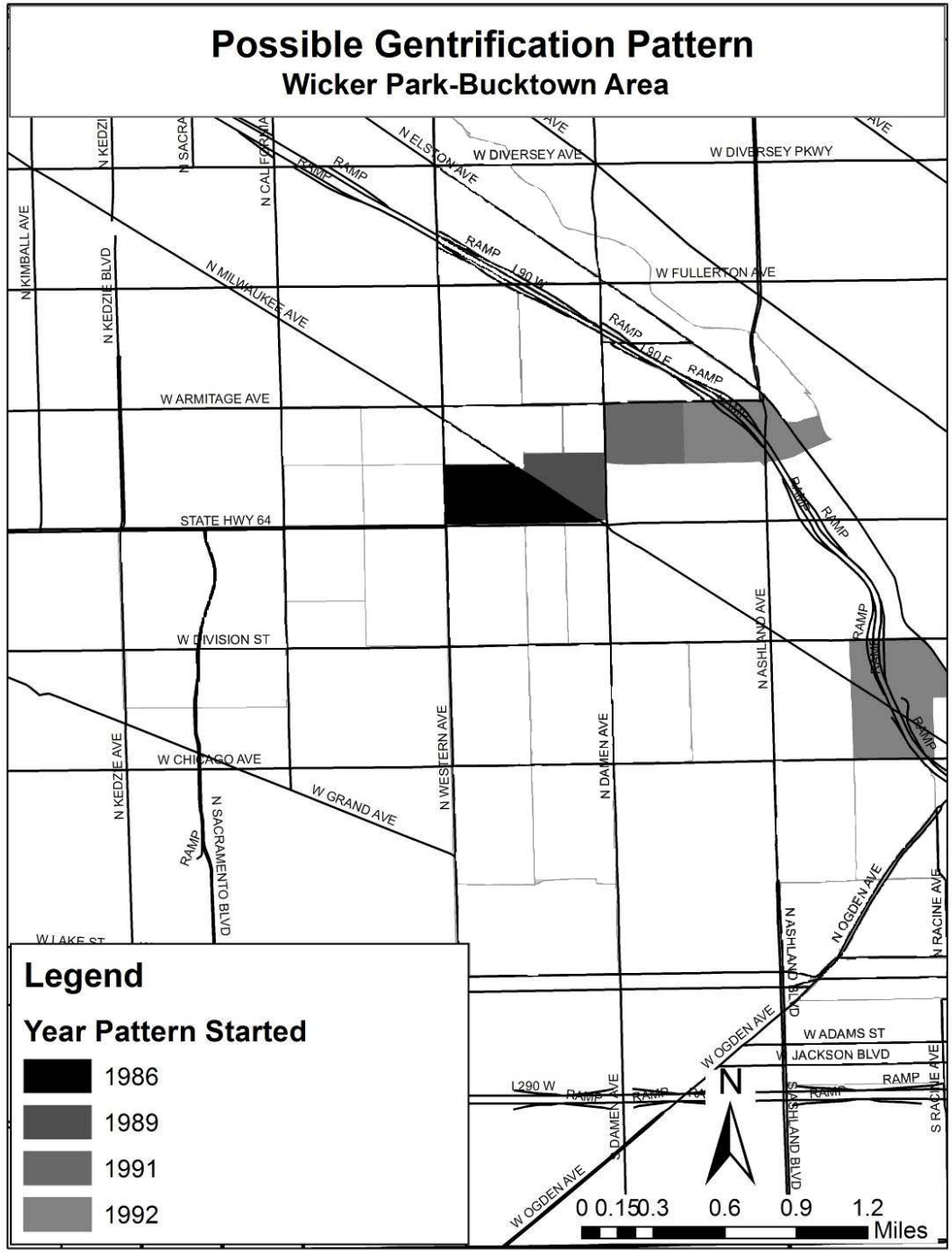

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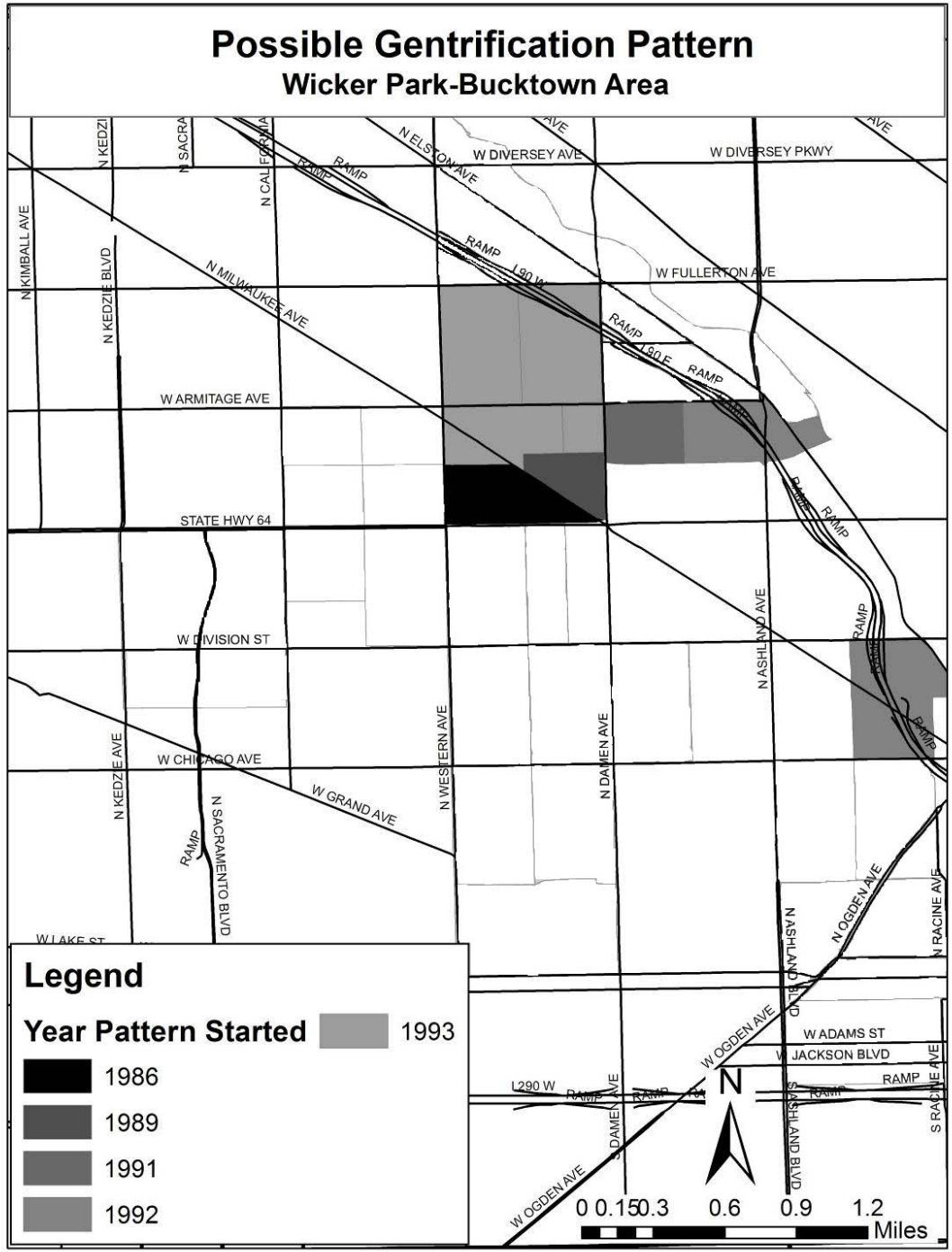

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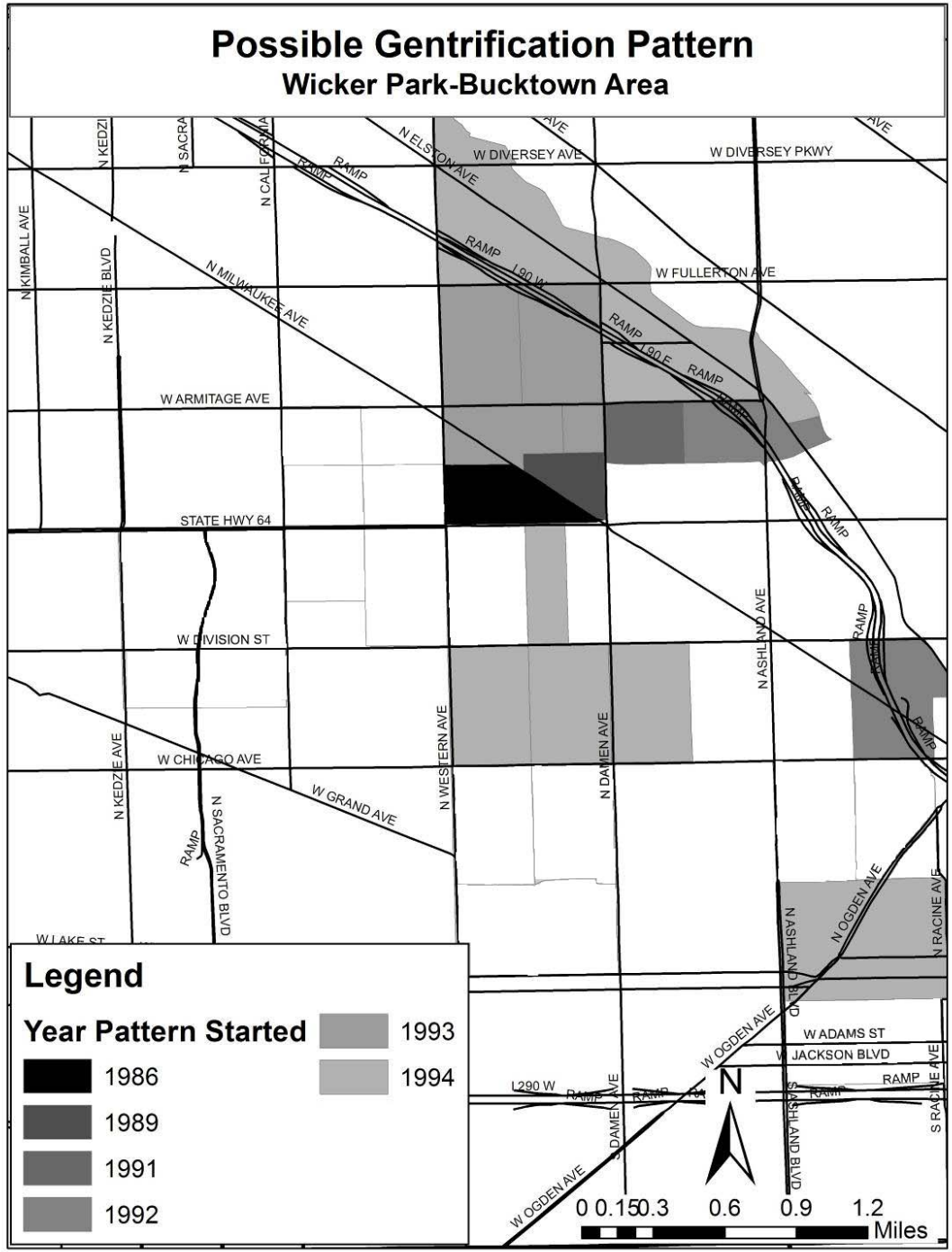

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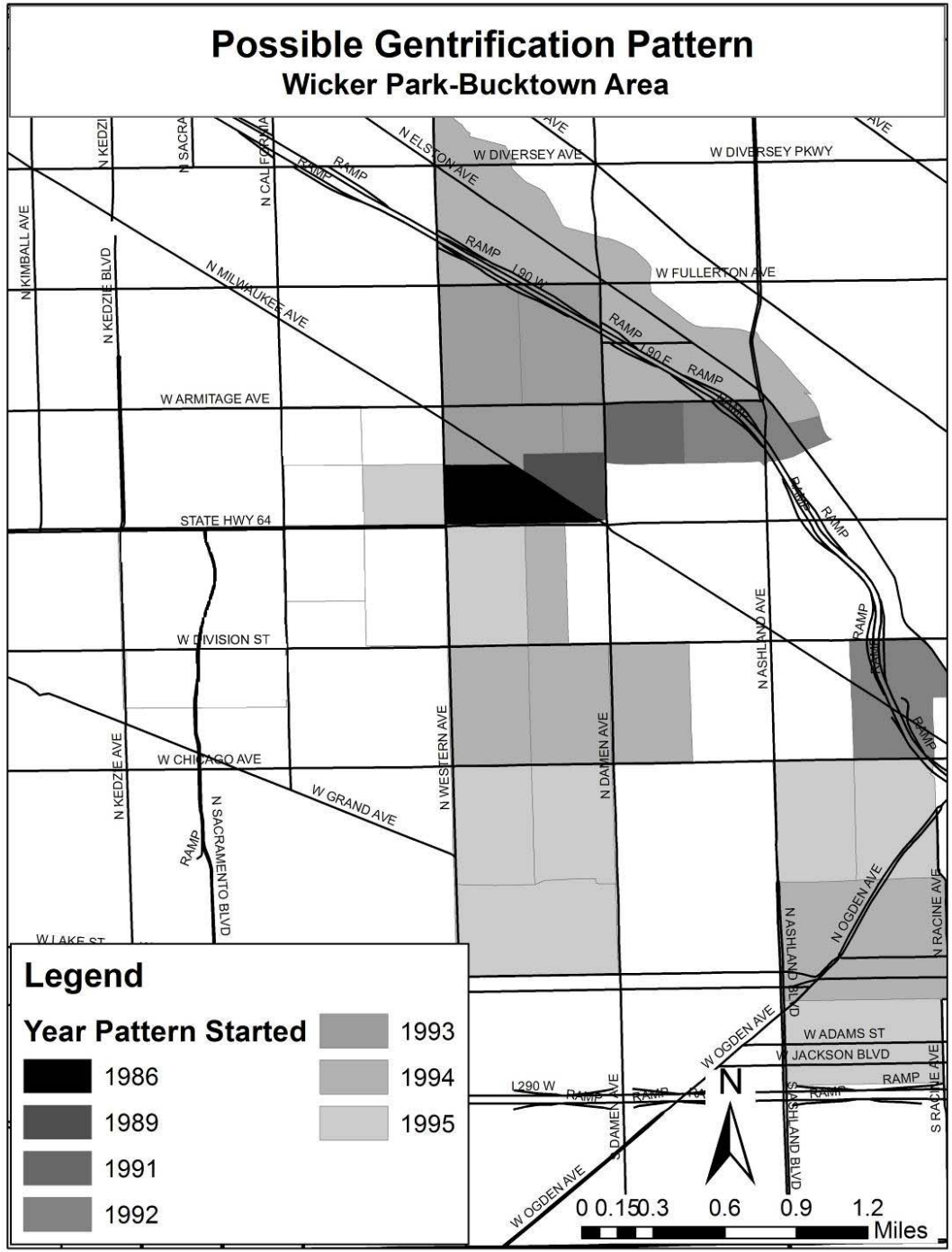

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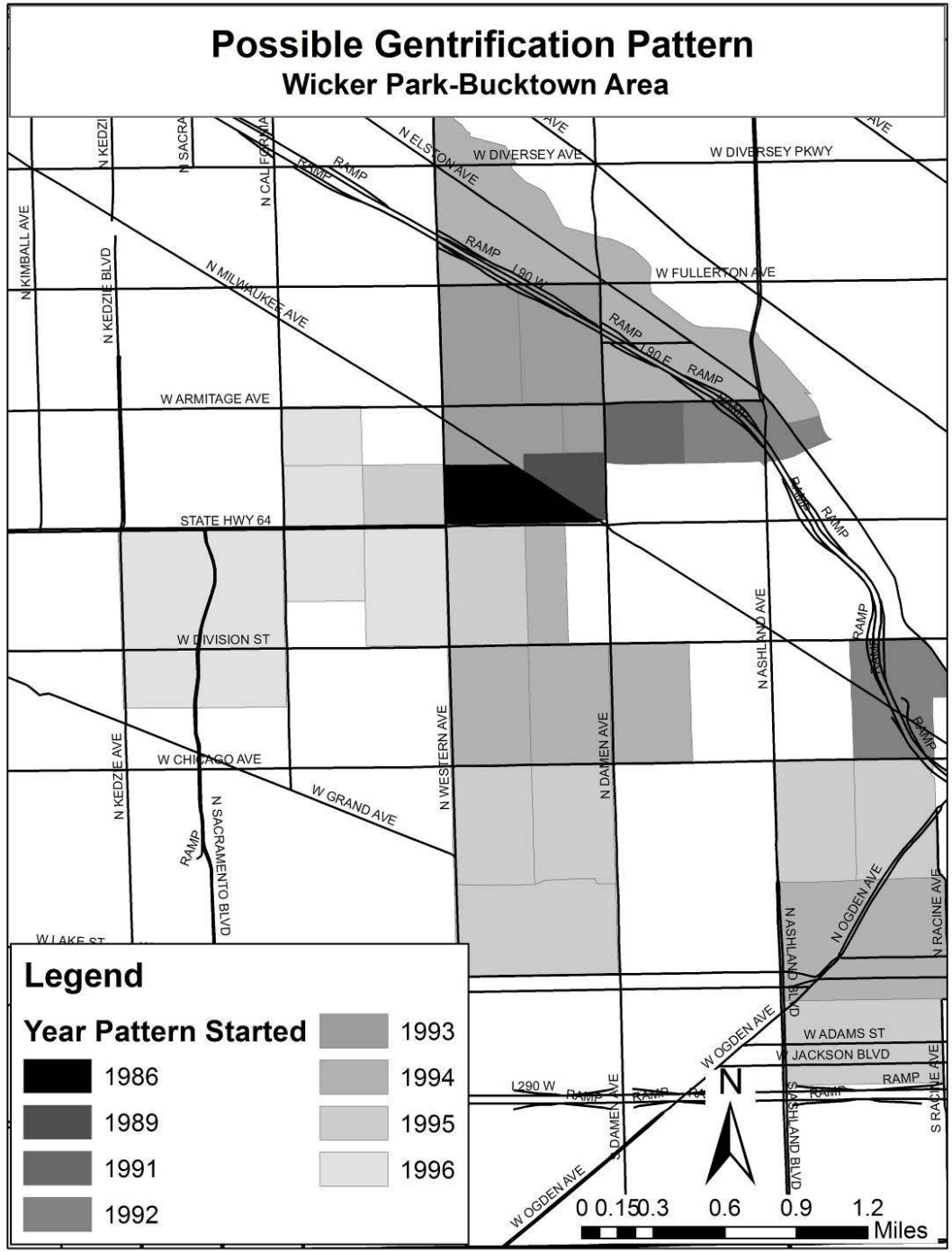

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Developing New Tools for the Field

Question/Goal	Tool
Enabling Investment in Inner City Real Estate Markets	RSI → REIT
Track Affordability and Neighborhood Housing Mix	Housing Diversity Metric
Anticipate and Manage Gentrification	Early Warning System
Planning Community Development Interventions	Neighborhood Change Simulation
What neighborhoods are similar along multiple dimensions of interest?	Similarity Index/ Custom Typology
What drivers differentiate neighborhoods with respect to a specific outcome of interest?	CART
How will a specific intervention affect its surrounding area?	Impact Estimator
What locations will maximize the impact of an intervention?	Spatial Multiplier
What is my “real” neighborhood?	Semivariogram

Housing Diversity Metric

What It Does:

- Tracks the affordability and mix of the housing stock (distribution, not just median)

Applications:

- Enables tracking the range of housing available in the neighborhood
- Better indicator of possible displacement than median prices alone

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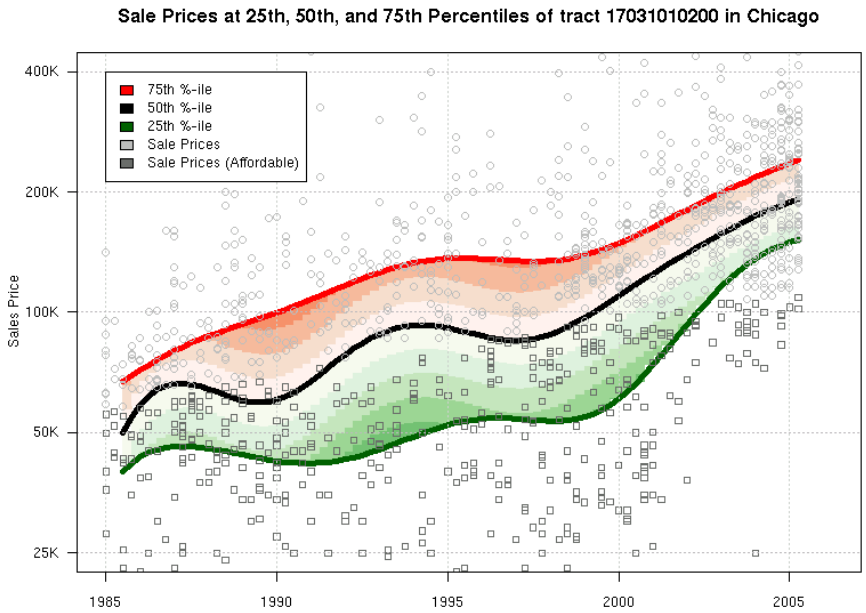
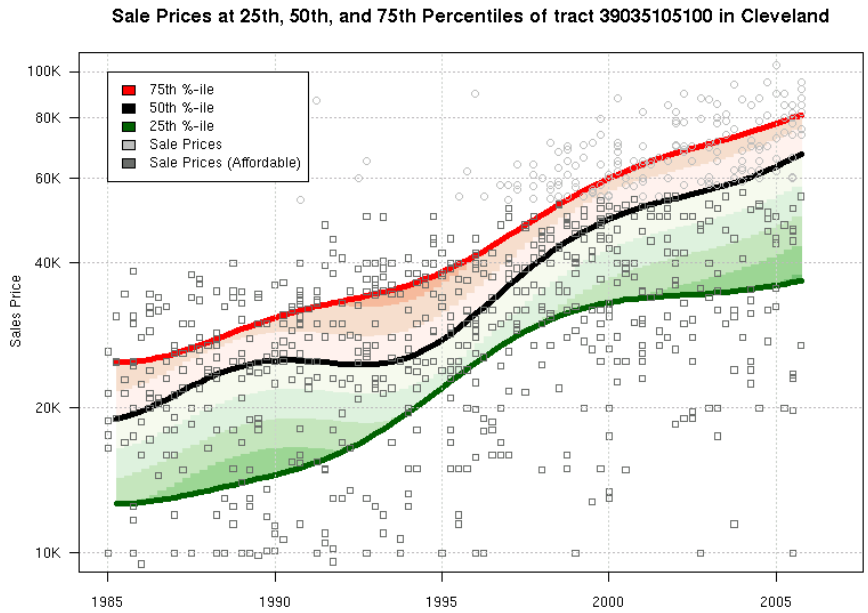
Example: Tracking the Price Mix



Strong Overall Appreciation, Range of Housing Options Is Narrowing

Lack of Affordable Housing



Strong Overall Appreciation, but Range of Housing Options Is Still Wide

Large Share of Housing Remains Affordable

Classification and Regression Tree (CART)

What It Does:

- Identify similar neighborhoods with respect to an outcome of interest and its drivers

Applications:

- Identify leverage points to affect the desired outcome
- Meaningful comparison of trends and best practices across neighborhoods

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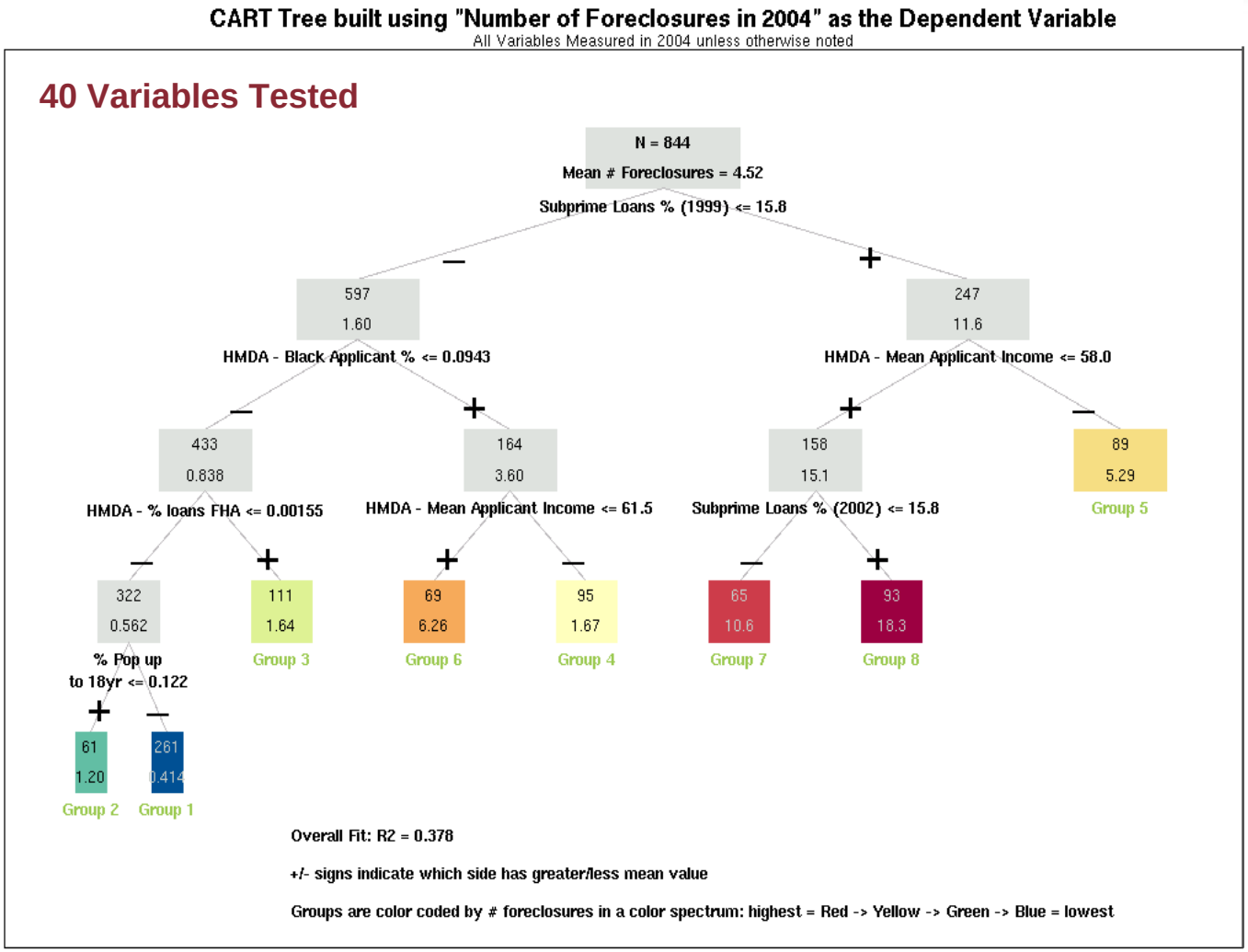
Sample CART: Foreclosures



Outcome:

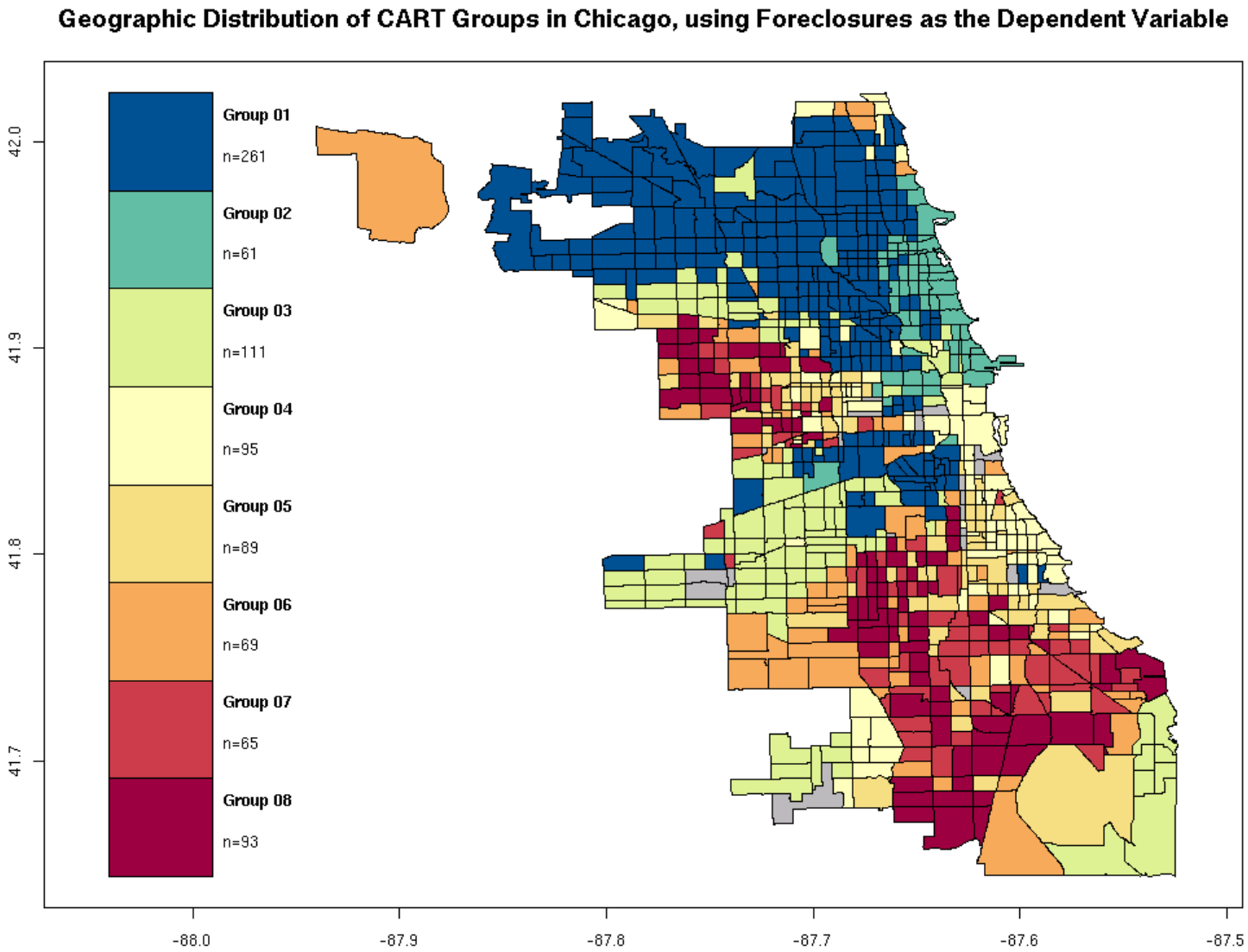
- Number of Foreclosures (2004)

Drivers:

- % Subprime Loans in Previous Years
- Mean Loan Applicant Income
- % FHA Loans
- % Black Borrowers

What Neighborhoods Have Similar Numbers of Foreclosures, and Why?

CART Output: Chicago Segments



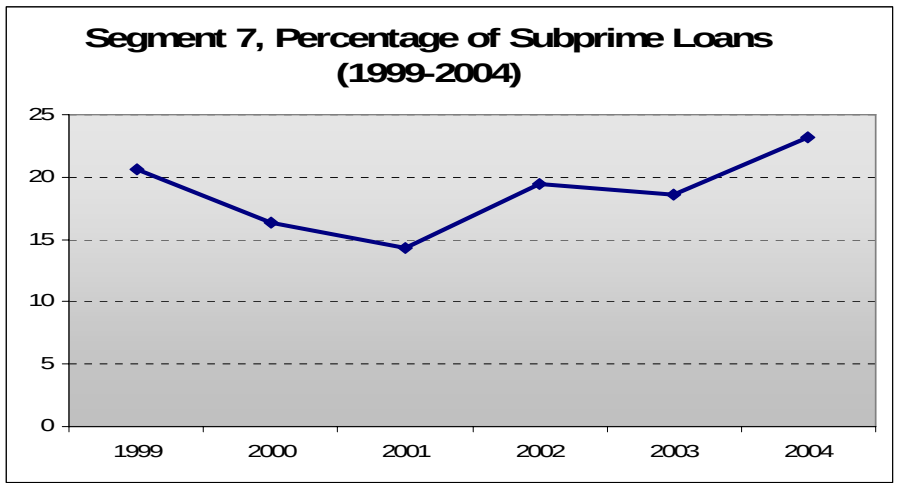
Cluster 7: Defining Traits and Risk Factors

Segment Profile:

- Isolated, underserved, predominantly African American communities. High rates of unemployment and subprime lending activity.

Primary Risk Factor:

- Percentage of subprime loans (primary driver of foreclosures) is at its highest and still on the rise



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Impact Estimator

What It Does:

- Estimate impact of an intervention on surrounding housing values (or on other outcome, e.g. crime)

Possible Applications:

- Evaluate the impact of a development policy
- Choose among alternative interventions based on estimated benefits to the surrounding community
- Advocate for a specific intervention

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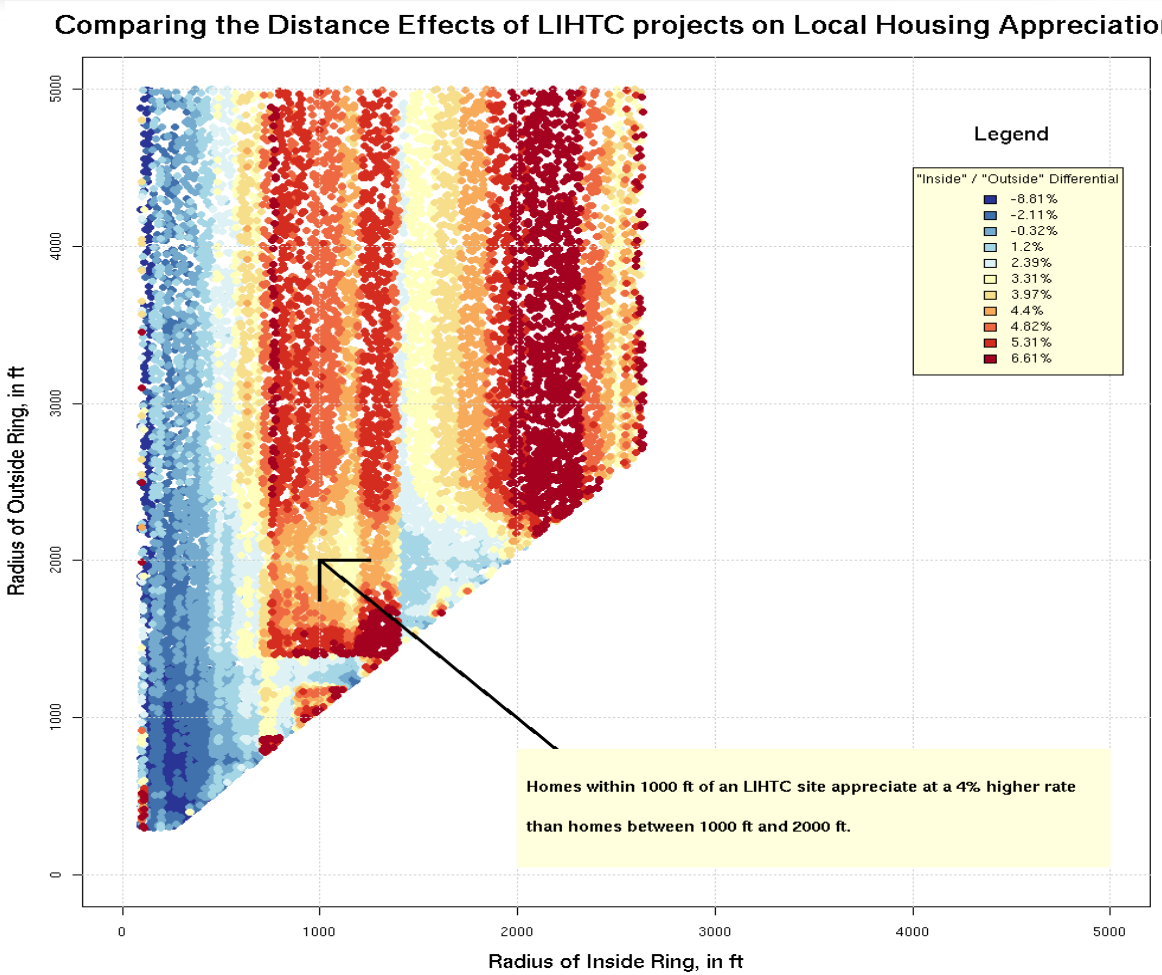
Example: What is the effect over time and space of LIHTC housing?



Monte Carlo Simulation to Estimate Impact Variation with Distance

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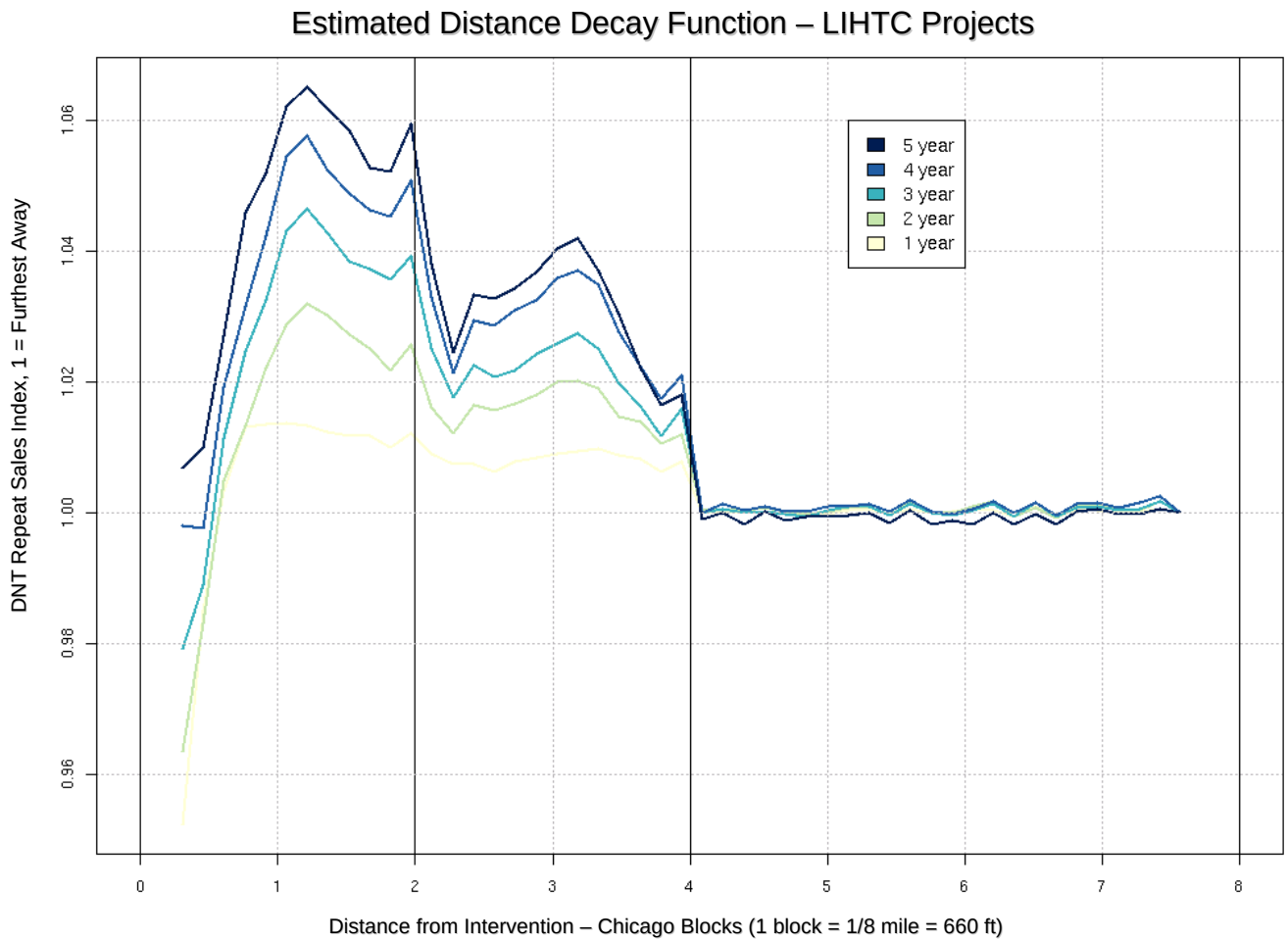
Preliminary – For Illustration Purposes Only

Impact of LIHTC on Surrounding Properties



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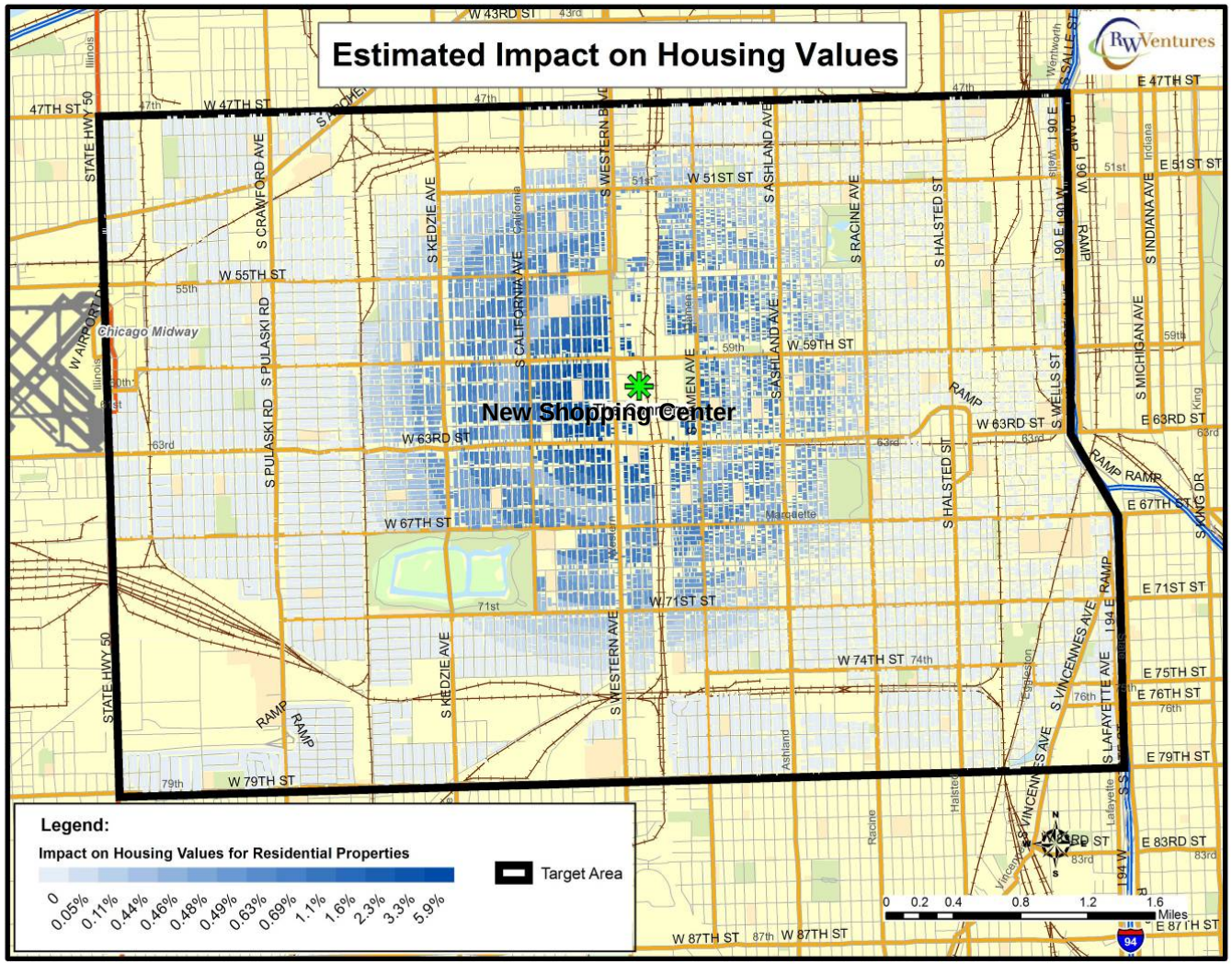
Preliminary – For Illustration Purposes Only

Applying the Estimator to a Specific Project: New Shopping Center in Chicago



Estimated benefits to the community: $29 million in increased property values, or an average of $1,300 per home owner

Ongoing and Inclusive Process

- **Positioning in the Field**
  - Project based on learning from other initiatives
  - Results intended to contribute to their work
- **Ongoing Process**
  - Project is iterative
  - Results need to be used and continually refined
- **Inclusiveness**
  - Multiple partners in various roles
  - Open Source

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Discussion

- General Comments and Questions?
- Patterns of Change of Particular Interest?
- What are People Trying to Better Understand About Neighborhoods?
- What Tools and Applications Would Be Most Useful?
- Partners: Corollary Research, Tool Development and Testing, Other?

Dynamic Neighborhood Taxonomy

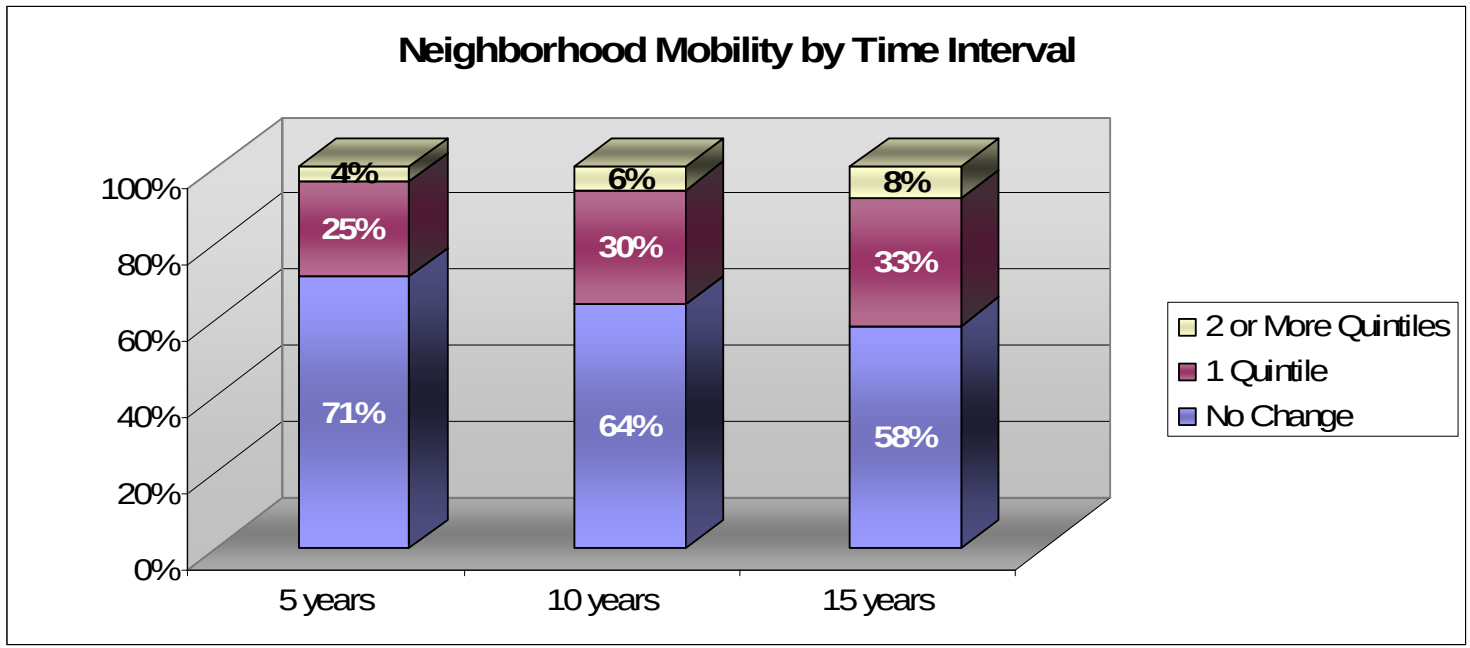
For more information, please visit:

www.rw-ventures.com/RWteam

A Project of **Living Cities**

by
RW Ventures, LLC

Neighborhood Change Is a Slow Process



Over 15 years, most neighborhoods do not change their position relative to other neighborhoods in the region.

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Target Analysis to Neighborhoods with Different Degrees of Change

Median Sales Price Transition Matrix Cleveland, 1990-2004					
	Final Quintile				
Initial Quintile	**1**	**2**	**3**	**4**	**5**
1	76.9%	15.4%	7.7%	0.0%	0.0%
2	5.1%	51.3%	25.6%	15.4%	2.6%
3	2.6%	26.3%	26.3%	39.5%	5.3%
4	7.7%	2.6%	28.2%	23.1%	38.5%
5	**7.7%**	**5.1%**	10.3%	23.1%	53.8%

In Cleveland, 13% of all the tracts at the bottom of the distribution in 1990 moved up to the top 2 quintiles 15 years later.

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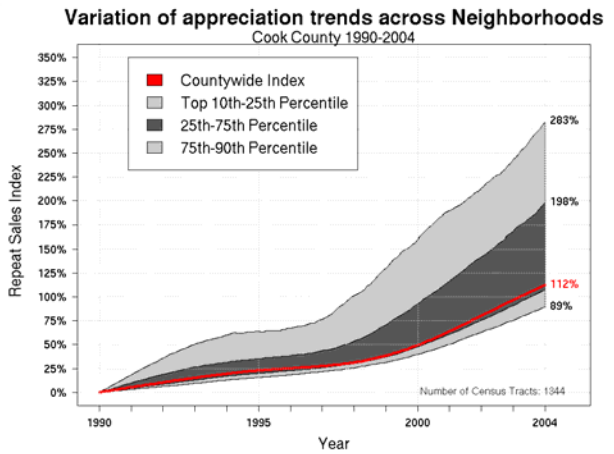
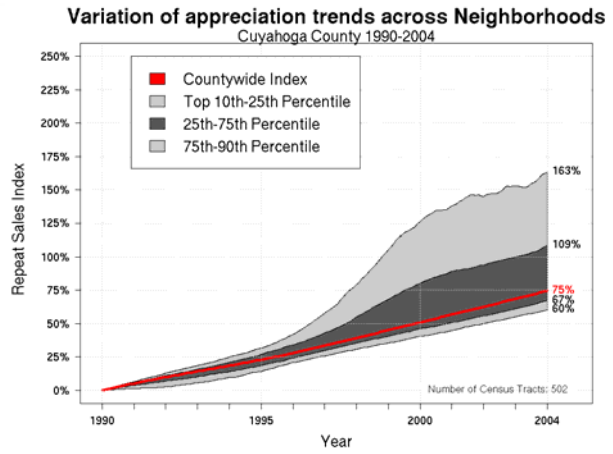
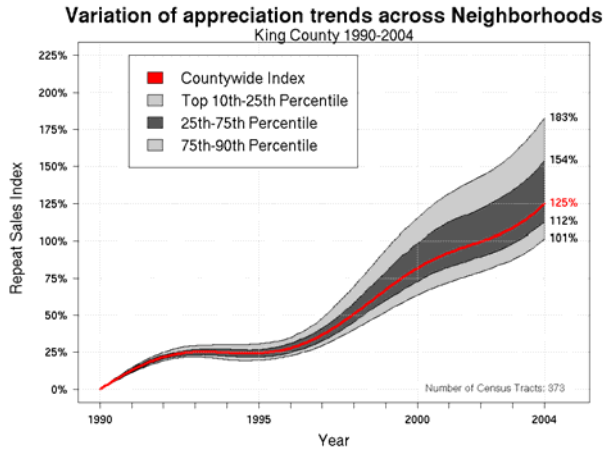
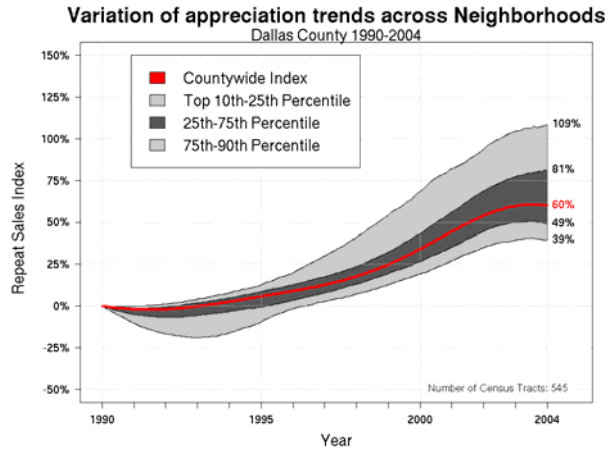
Neighborhoods and Regions





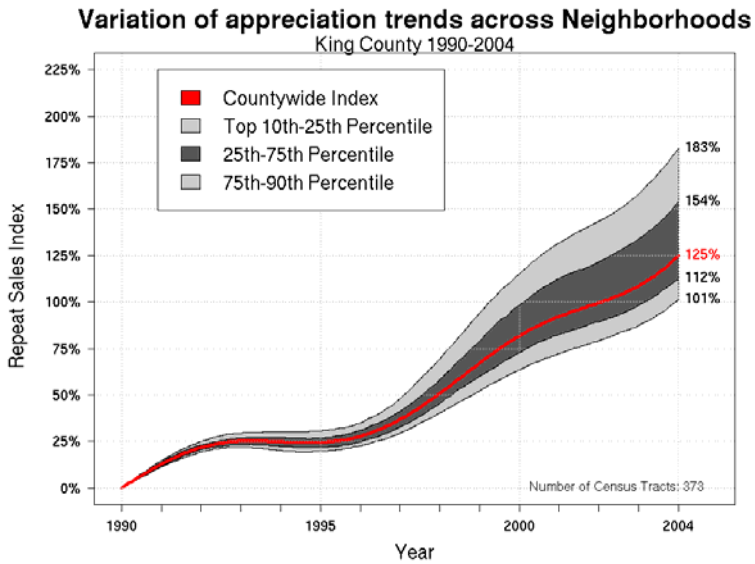


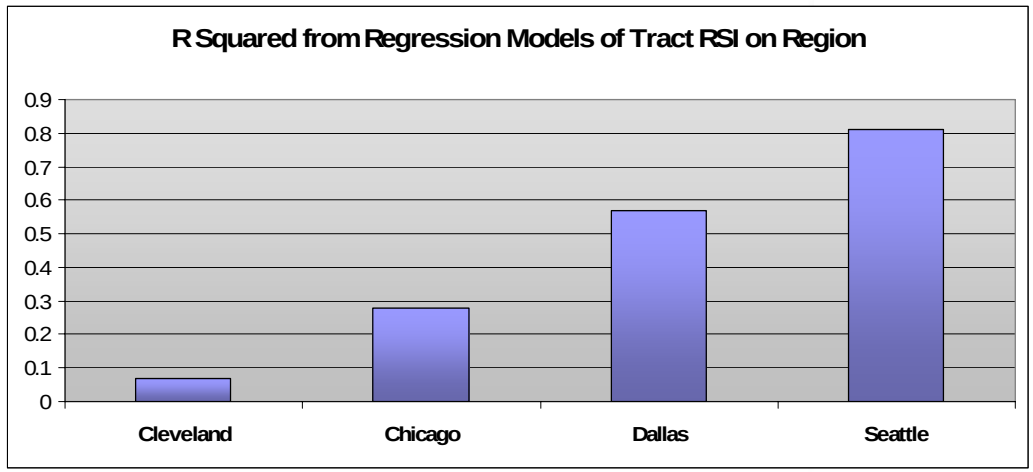


Most neighborhoods follow their region closely, but there are some exceptions

Neighborhoods and Regions

- Across Cities, 35% of Neighborhood Change is Accounted for by Regional Shifts
  - Regional shifts are more important in some regions than others



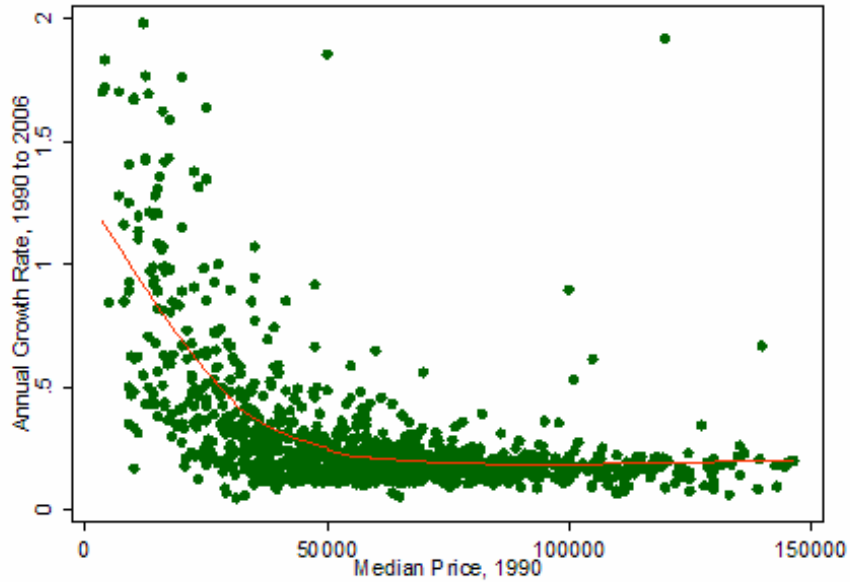


Localized movement in Cleveland; large regional impact in Seattle

Neighborhood Convergence

Sigma and Beta Convergence in Cook County, 1990-2006

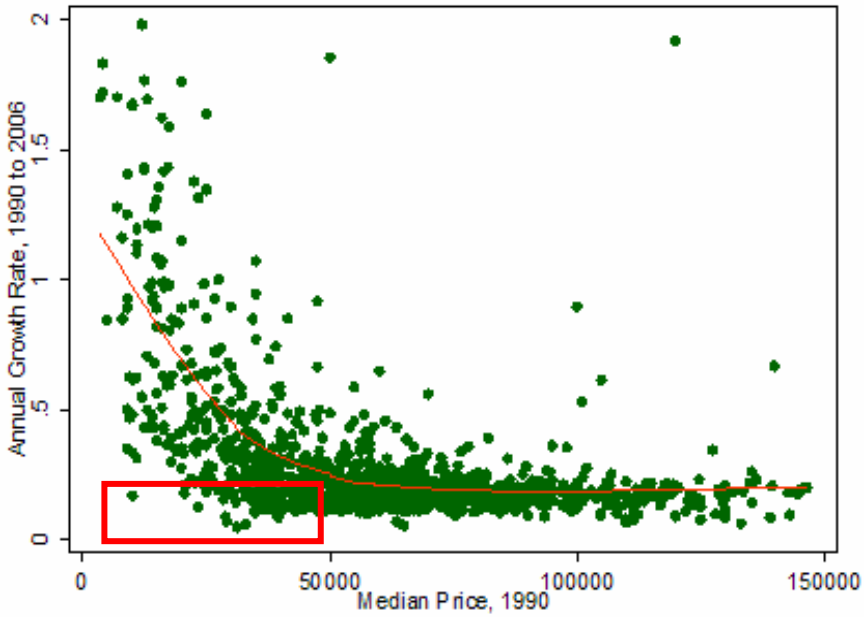
Variables	Obs.	Mean	Std. Err.	Std. Dev.	[95% Conf. Int.]	
ln_med_1990	1231	11.326	.01781	.62516	11.291	11.361
ln_med_2006	1307	12.419	.01414	.51126	12.391	12.447
Combined	2538	11.889	.01566	.78921	11.858	11.919
Ratio = sd (ln_median_y1990) / sd (ln_median_y2006)					f = 1.4952	
Ho: Ratio = 1				Degrees of freedom = 1230, 1306		
Ha: ratio < 1		Ha: ratio != 1			**Ha: ratio > 1**	
Pr(F < f) = 1.0000		2*Pr(F > f) = 0.0000			**Pr(F > f) = 0.000**	



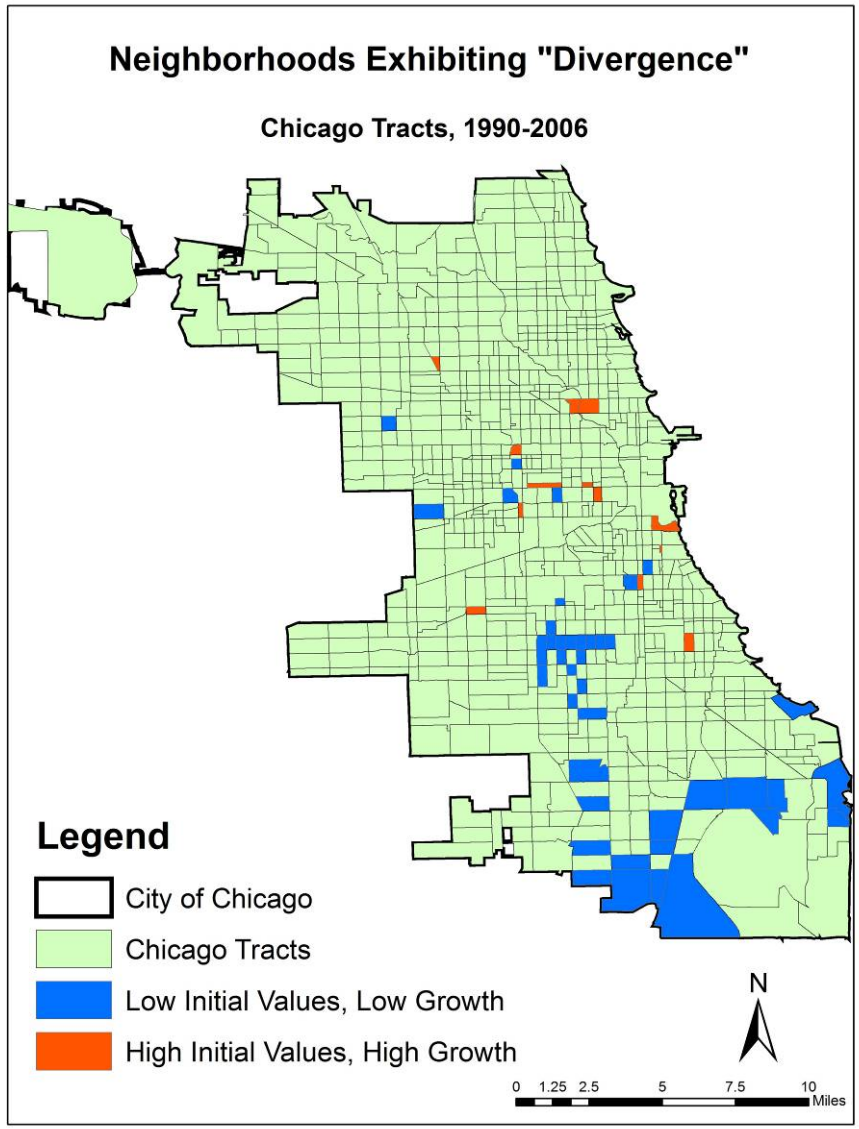
The economic theory of convergence appears to apply at the neighborhood level as well, as neighborhoods tend to "catch up" with each other.

Neighborhood Convergence

Beta Convergence in Cook County, 1990-2006



Why Do Some Neighborhoods Converge while Others Don't?

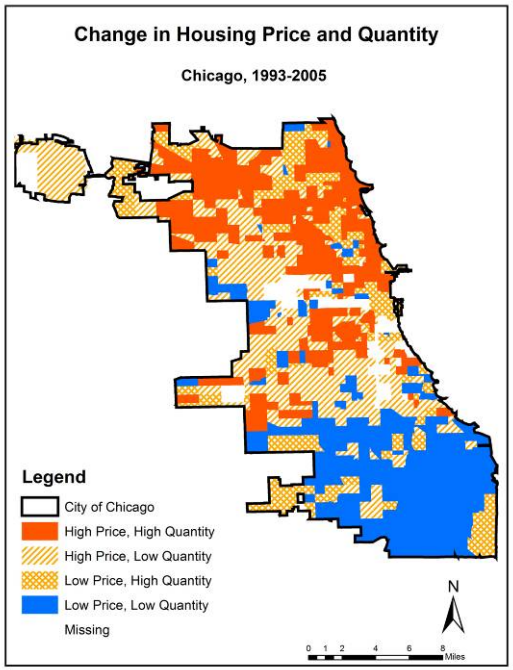


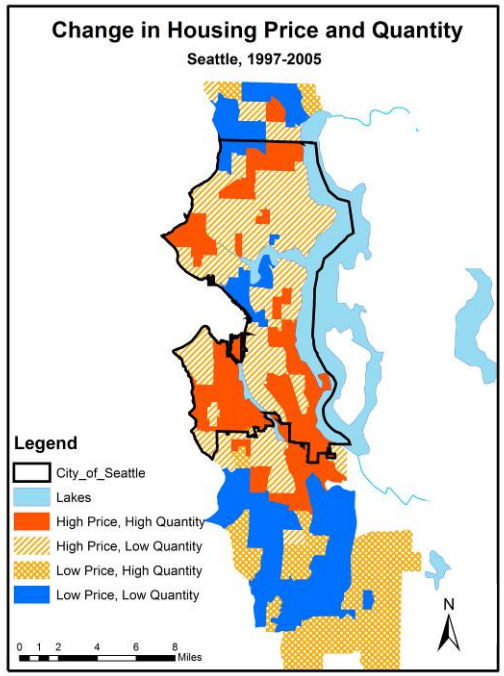
Neighborhood Change in 3D

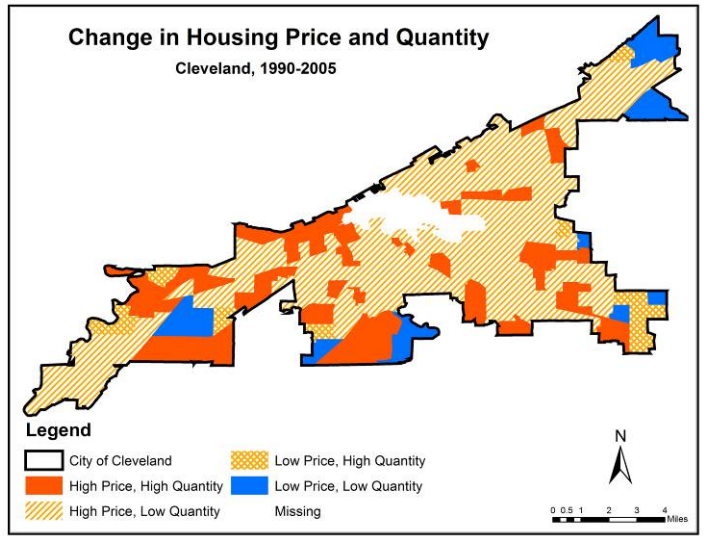
- **Change in Demand for a Neighborhood will Result in:**
  - Change in Price
  - Change in Quantity
  - Change in Quality

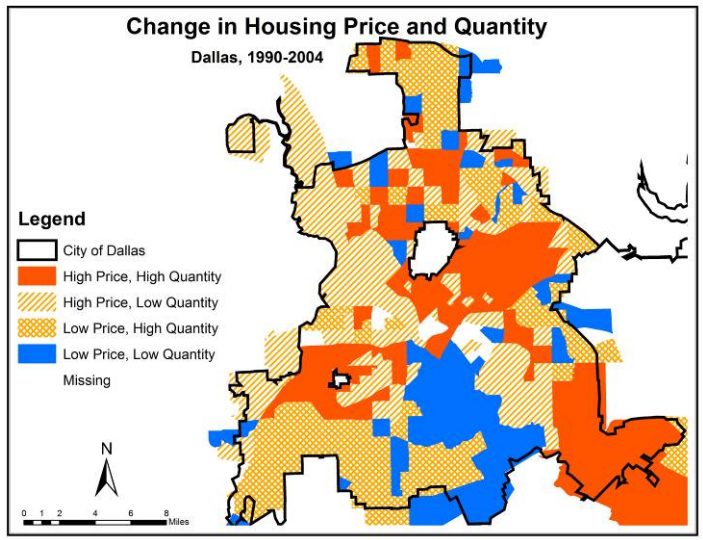
- **The Combination of these Three Dimensions Gives Rise to Different Types of Neighborhood Change**

Combining the Dimensions









Why Do Some Poor Neighborhoods Show Explosive Growth While Others Remain "Cold"?

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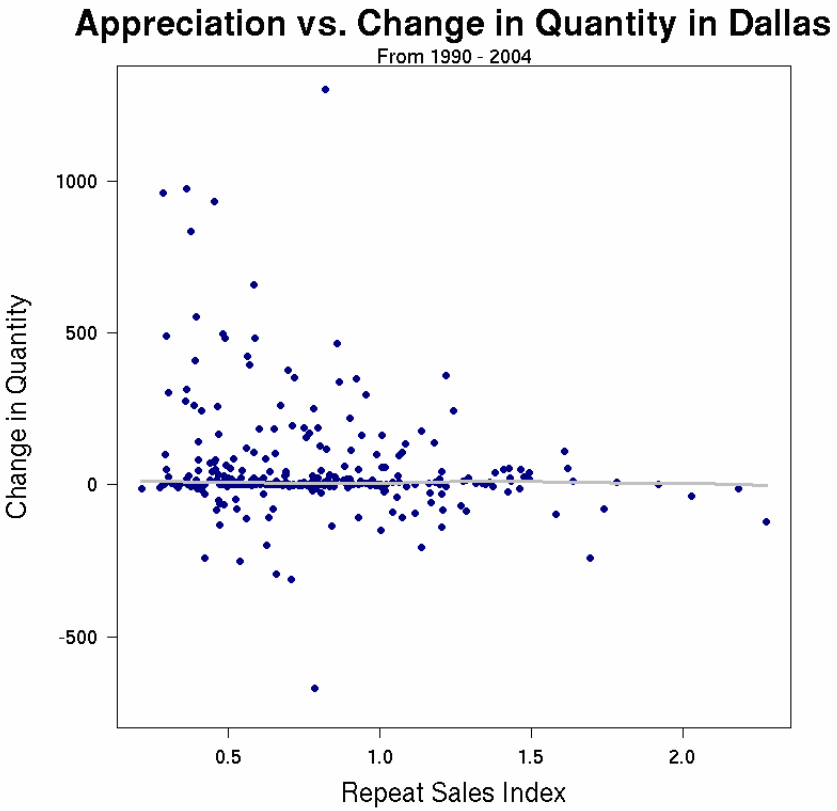
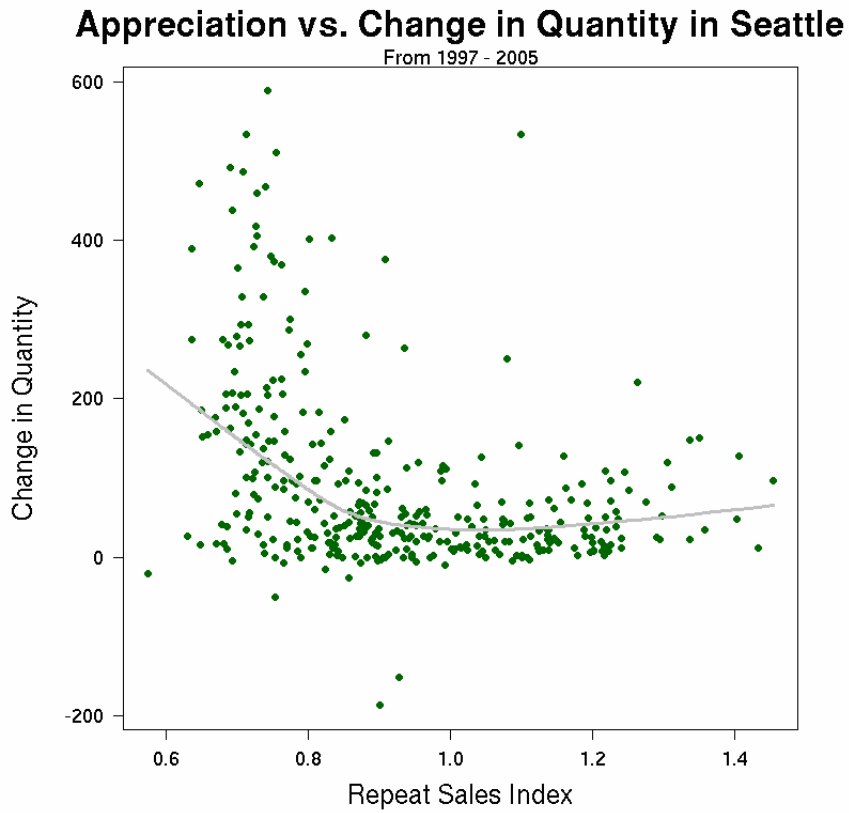
Relationship of Price and Quantity





Price and quantity are more negatively correlated in places where there are greater constraints on the supply of new housing units

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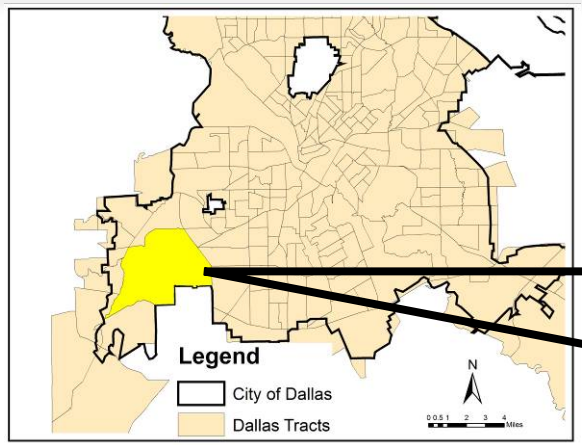
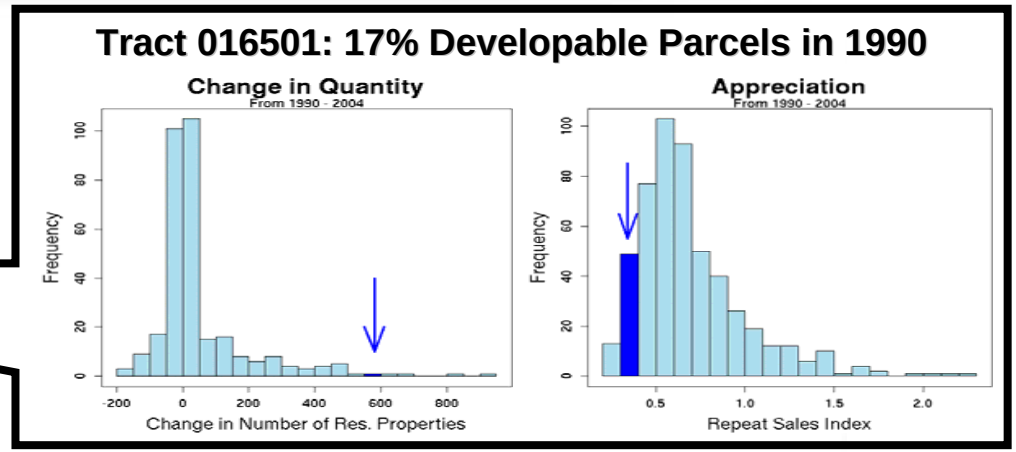
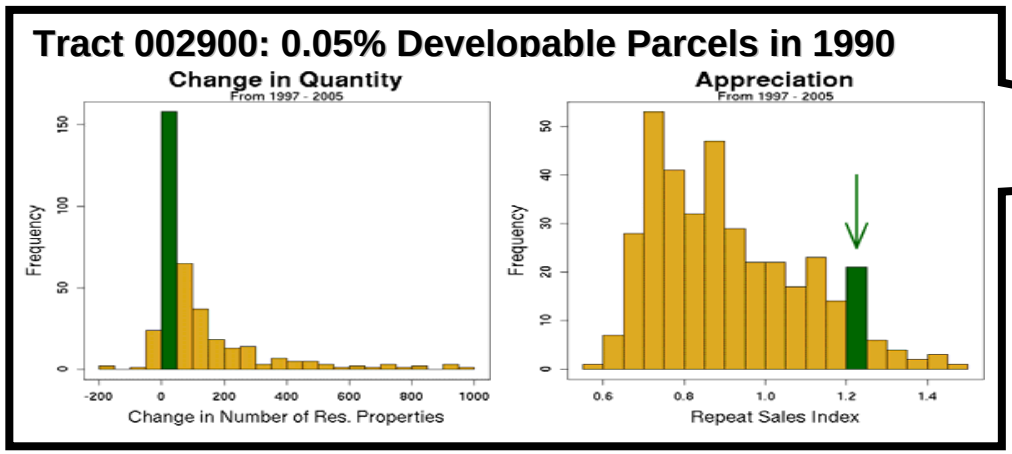
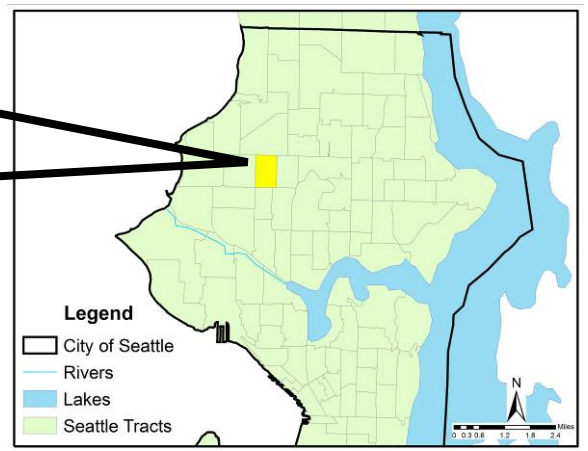
New Development can Help Preserve Affordability



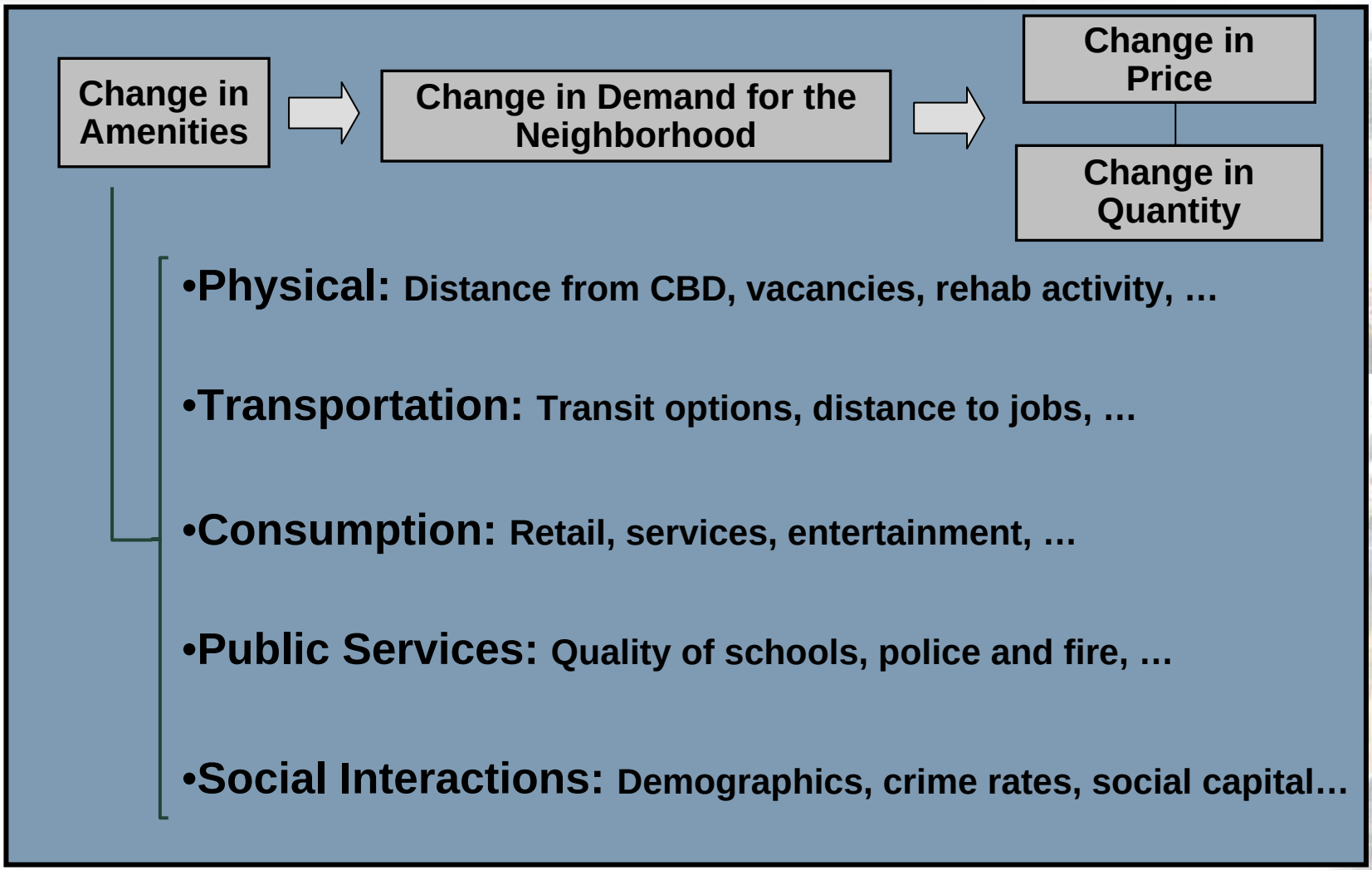


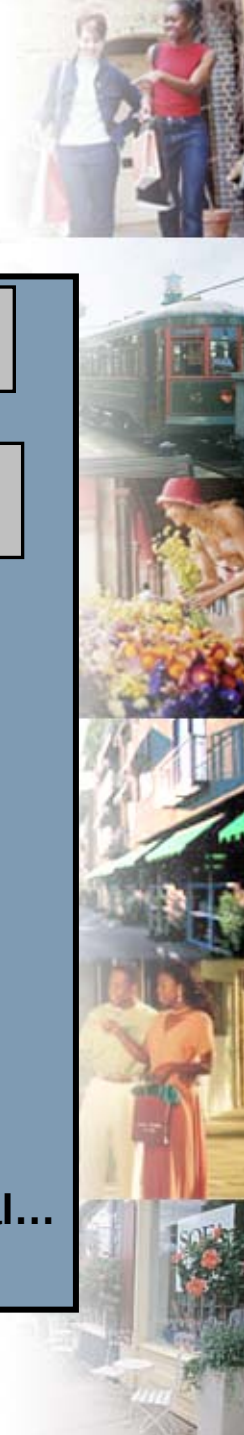




Neighborhoods with lower supply elasticity are at greater risk of displacement, as housing prices will increase faster than in areas where more housing units can easily be developed

Drivers Model and Data





Drivers Analysis:
Emerging Context and Story Lines

- Cities and urban neighborhoods are coming back
  - In this period of transition, the drivers of neighborhood change are evolving
- Neighborhood change occurs primarily through mobility
- Density matters
- Race is still a factor
- Neighborhood spillovers are important
- Context matters (starting point, type, …)

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