# Employment Location Patterns in Economic Regions: Modeling Complex Dynamics

sanda kaufman & mark salling    miron kaufman
levin college of urban affairs        dept. of physics
cleveland state university

## we will talk about

Kaufman, Kaufman, & Salling (2019).

Anticipating employment location patterns in economic regions: modeling complex dynamics.

*Applied Network Science, 4*(1), 1-17.

❑ generating regional anticipatory scenarios to inform local policy decisions

❑ an example:
a validated spatial model
for regional employment location

❑ test case: the NE Ohio region

❑ policy intervention scenarios – NE Ohio

❑ future developments

# anticipatory scenarios

**y. bar yam**
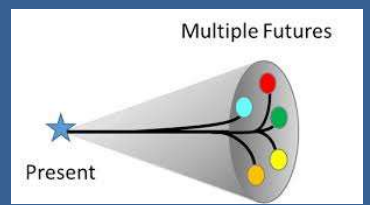
"if you make the implications clear, they will change decision making."

- not explanatory
- not normative

**scenarios:**
**tools for exploring**
**what might happen if**

- we do nothing, or
- we intervene through various decisions

Multiple Futures

Present

**levin: regionalism**

# managing the regional (networked) commons

an example

## business location decisions

- affect a region's economy, environment, and quality of life
- are interdependent

## planners try to enhance well-being through:

- policies & regulations
- incentives to locate in specific urban areas
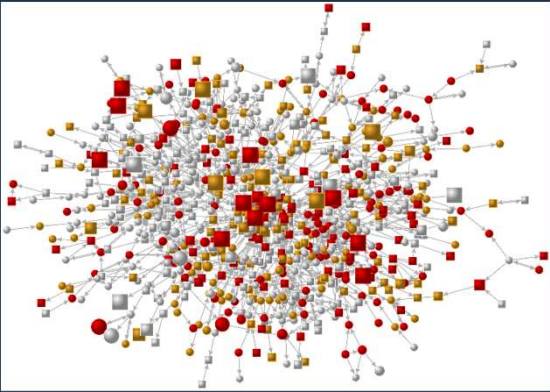- disincentives to locate in green fields and in environmentally sensitive areas

## what if?

- how will a region be affected by local policies / plans?
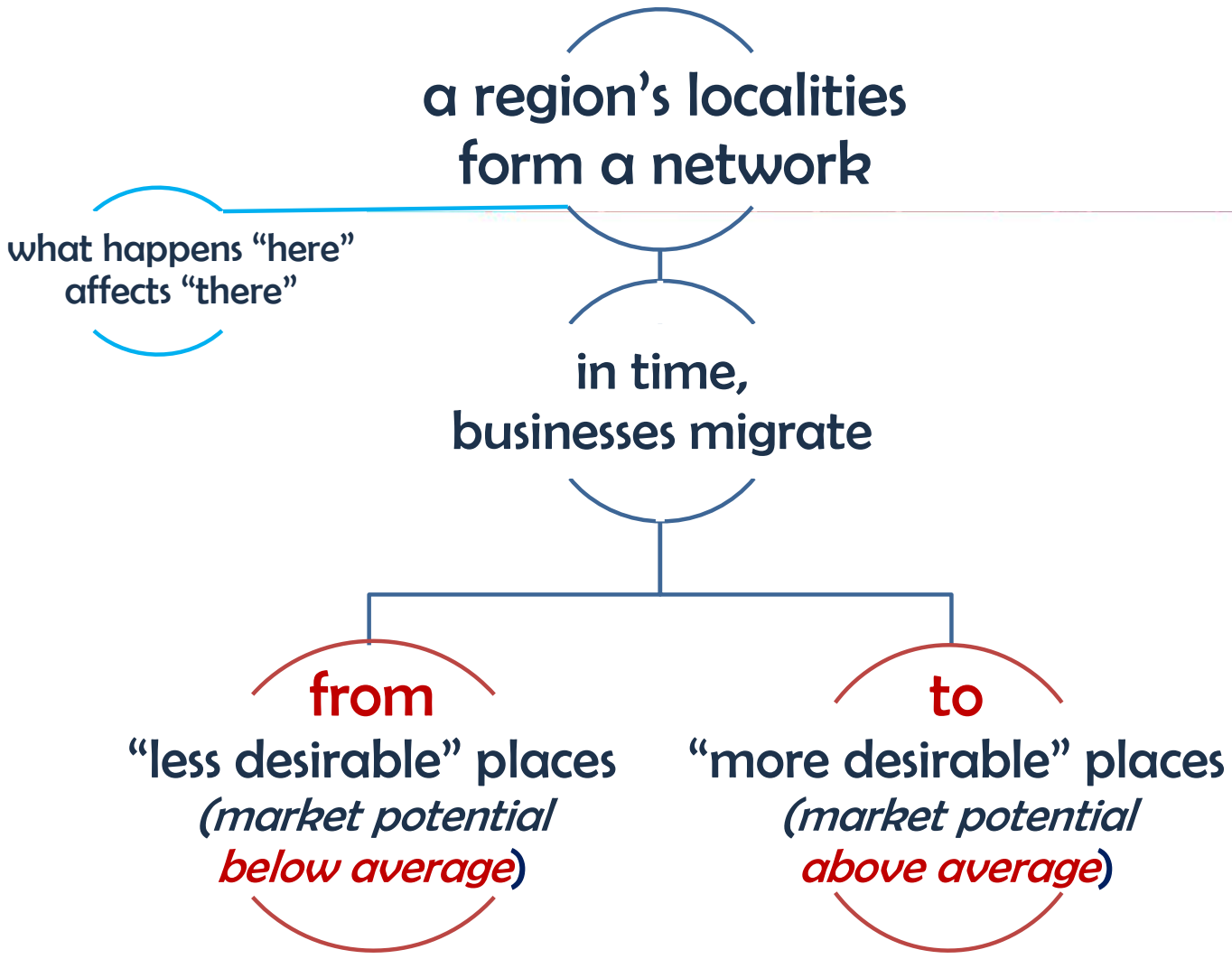- is it possible / useful to anticipate "predictable surprises"?

# a spatial location model

compute yearly
the proportion of
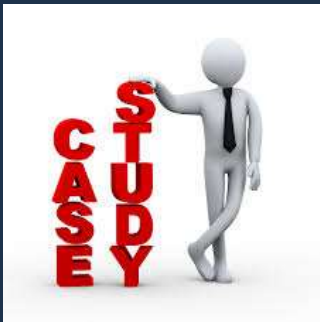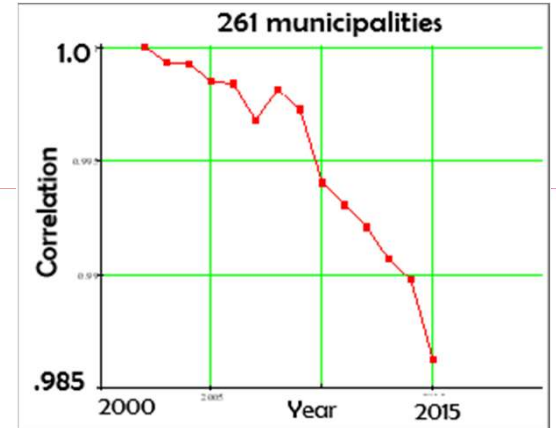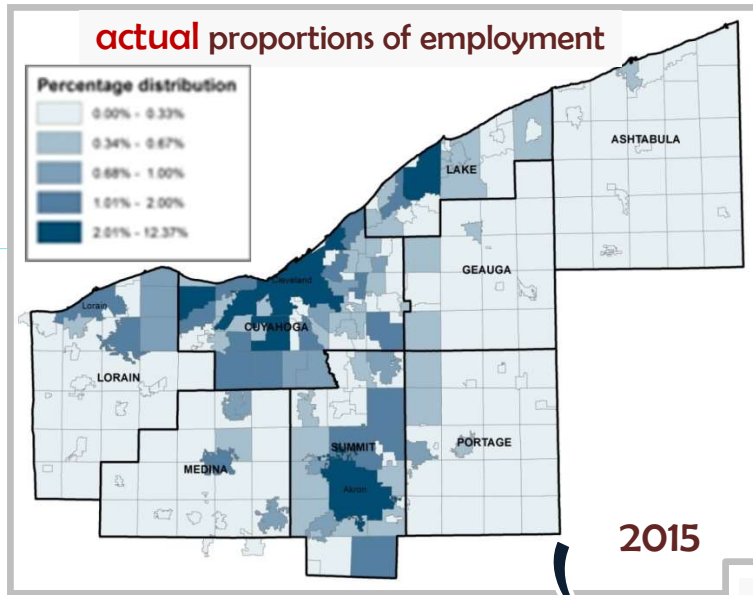the total number of jobs
in each municipality
in a region

## a region's localities form a network

what happens "here" affects "there"

## in time, businesses migrate

**from**
"less desirable" places
*(market potential below average*)

**to**
"more desirable" places
*(market potential above average*)

# model validation: NEO

- parameter estimates with 2001-2002 data
- predictions for 2003-2015

11/12/2020

**actual** proportions of employment

Percentage distribution
- 0.00% - 0.33%
- 0.34% - 0.67%
- 0.68% - 1.00%
- 1.01% - 2.00%
- 2.01% - 12.37%

ASHTABULA
LAKE
GEAUGA
CUYAHOGA
LORAIN
SUMMIT
PORTAGE
MEDINA
Akron

2015

261 municipalities

close?

**model** proportions of employment

Percentage distribution
model15
- 0.00% - 0.33%
- 0.34% - 0.67%
- 0.68% - 1.00%
- 1.01% - 2.00%
- 2.01% - 13.60%

ASHTABULA 2015
LAKE
GEAUGA
CUYAHOGA
LORAIN
SUMMIT
PORTAGE
MEDINA
Akron

2015

Quarterly Census of Employment
& Wage data (QCEW):
98% of the total employment
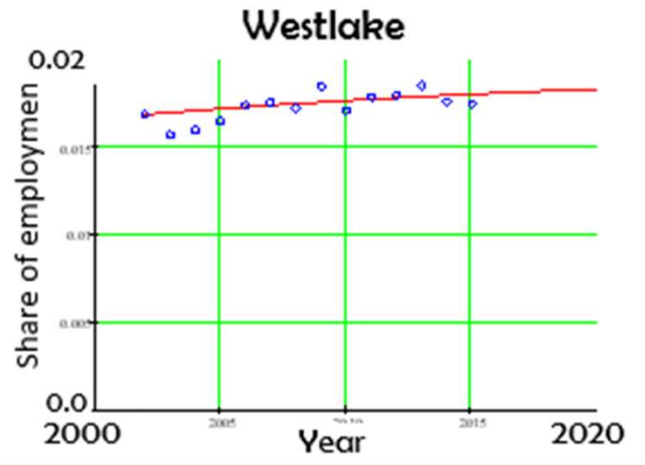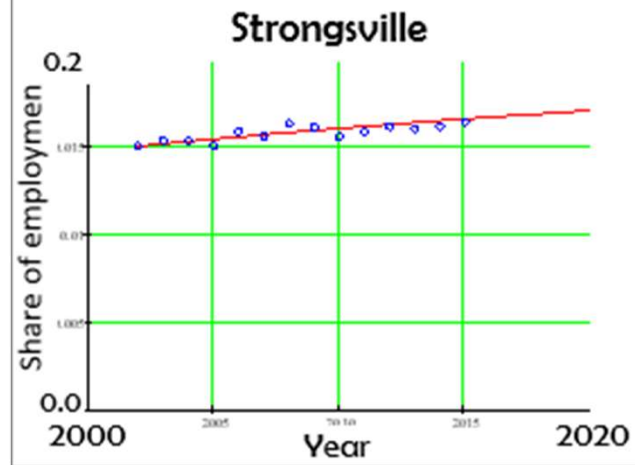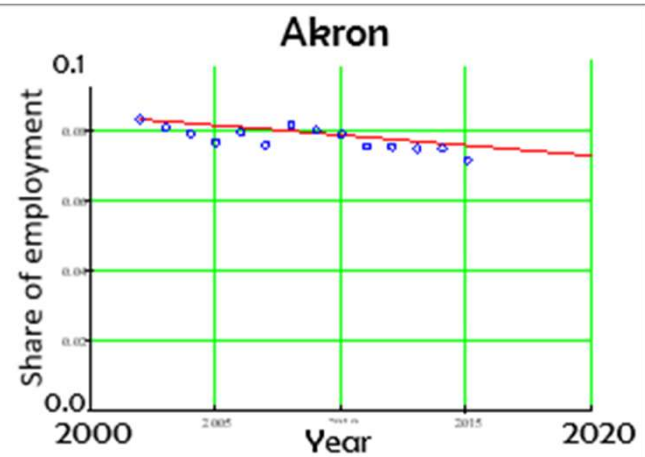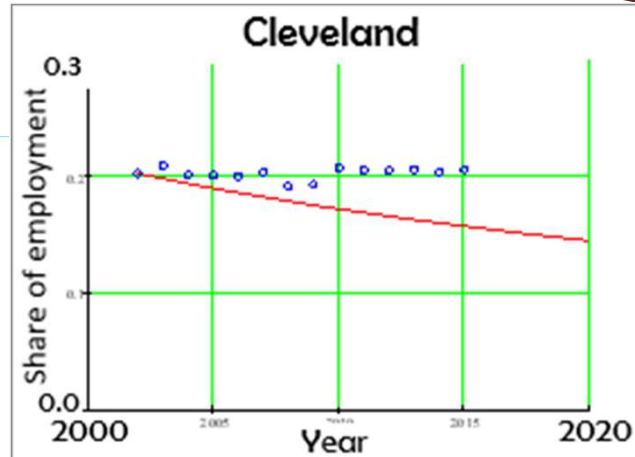and wages in Ohio.

kaufman, kaufman & salling

6

**levin:**
**regionalism**

# model
# vs. reality

## selected NEO cities

kaufman, kaufman & salling

large cities

smaller cities

actual
model

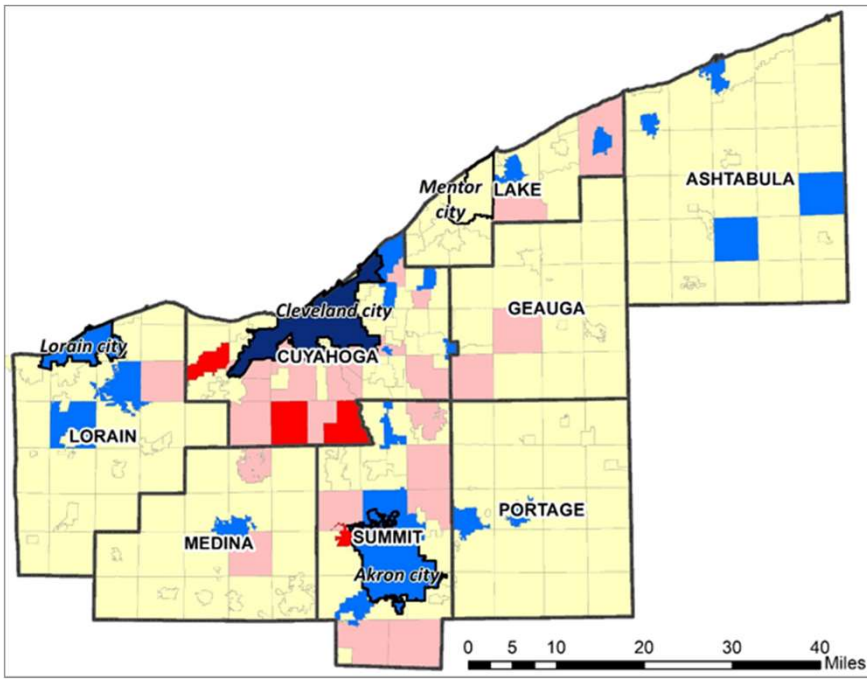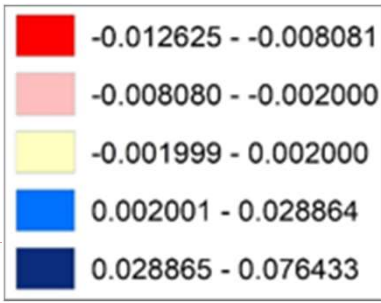# illustrative policy scenario 1

increase cleveland's share of the job market by 2% in 4 time periods (2003-2007)

■ all other cities lose the same 2% collectively
• some cities benefit (e.g. akron, lorain)
• very small places "disappear"

| | |
|---|---|
| -0.012625 - -0.008081 | |
| -0.008080 - -0.002000 | |
| -0.001999 - 0.002000 | |
| 0.002001 - 0.028864 | |
| 0.028865 - 0.076433 | |

model change in proportions of employment, 2003-2015

model "do nothing" change, 2003-2015

levin: regionalism

# illustrative policy scenario 1
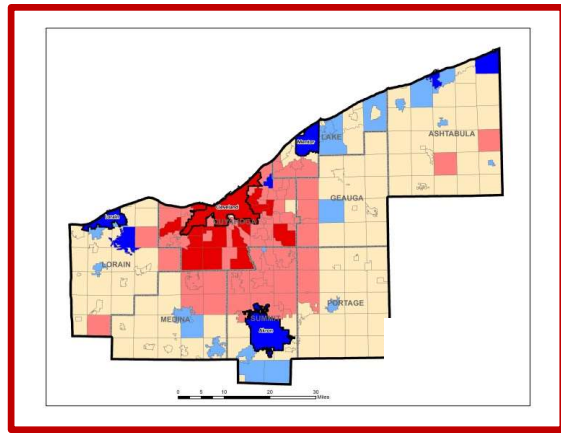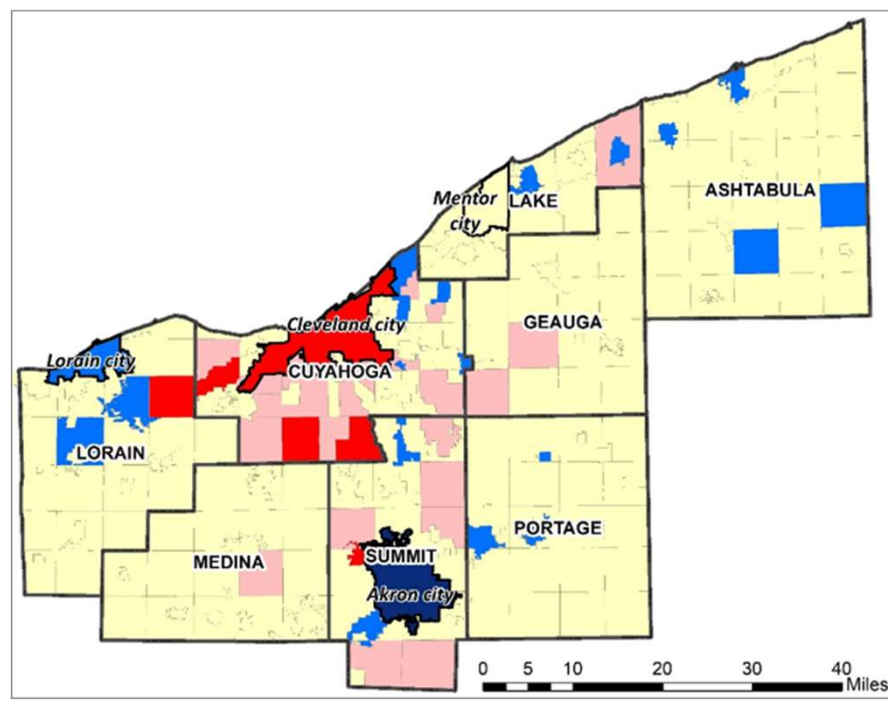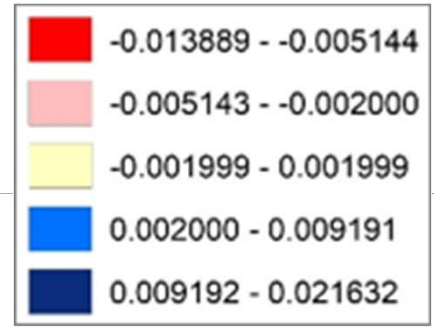
## city examples

scenario
do-nothing
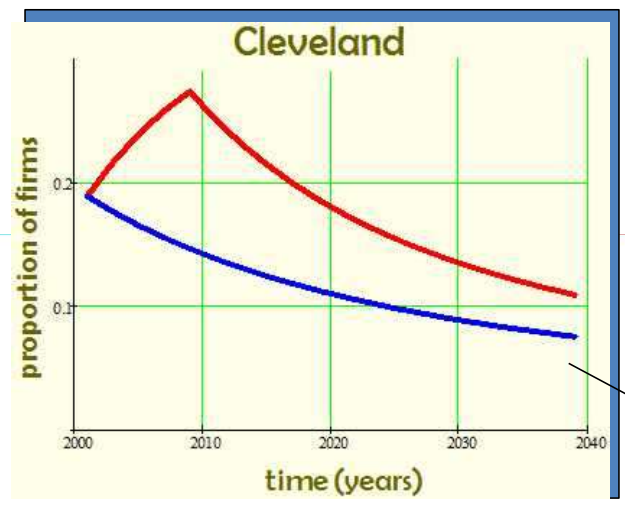
# illustrative
# policy scenario 3

limit small cities along
the cuyahoga river
to current job shares,
for 4 time periods

- akron, ashtabula benefit slightly
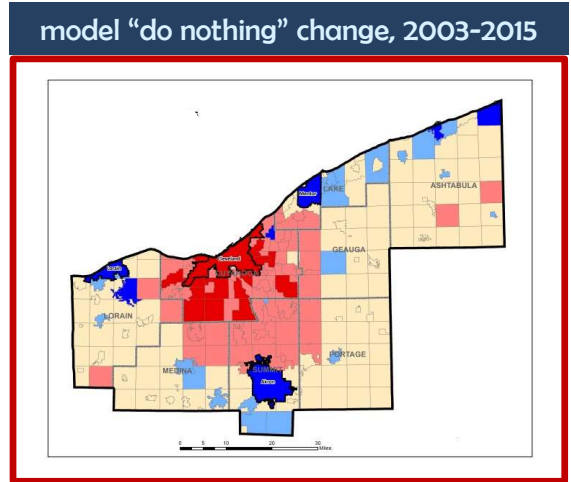  - other places mostly unaffected

| | |
|---|---|
| ■ (red) | -0.013889 - -0.005144 |
| (pink) | -0.005143 - -0.002000 |
| (yellow) | -0.001999 - 0.001999 |
| (blue) | 0.002000 - 0.009191 |
| (dark blue) | 0.009192 - 0.021632 |



model change in proportions of establishments, 2003-2015

model "do nothing" change, 2003-2015



kaufman, kaufman & salling

10

# illustrative policy scenario 3

## city examples


scenario
do-nothing

kaufman, kaufman & salling

Boston Township


Cuyahoga Falls


East Cleveland


Cleveland
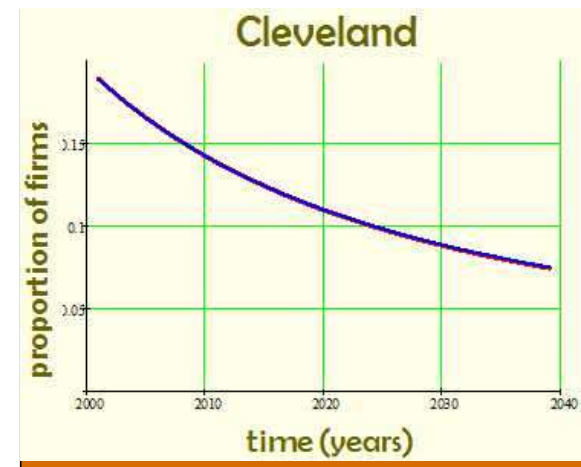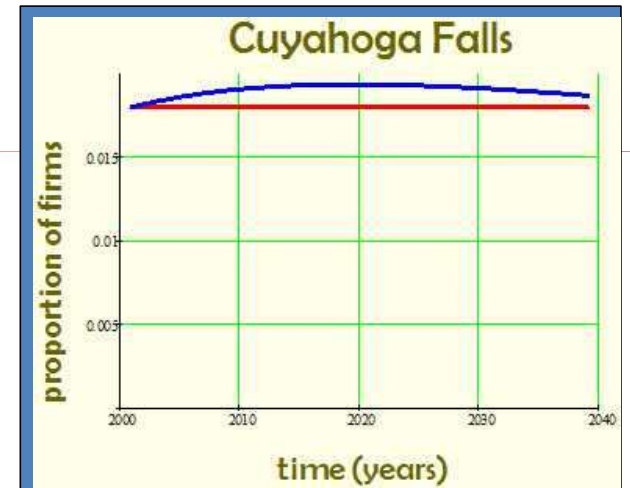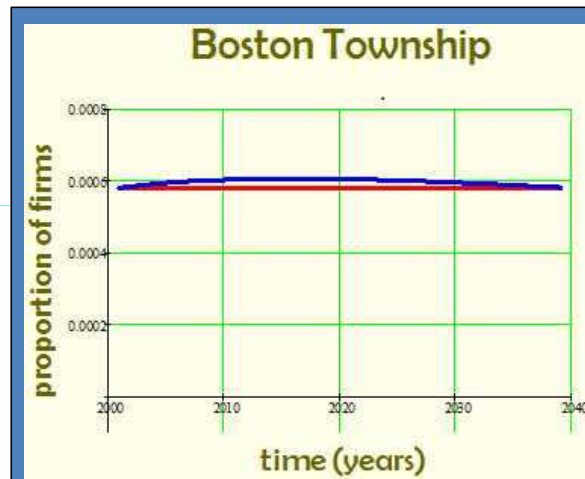
# summary

## do-nothing
## and 3 scenarios:

### change in employment location, 2003-2015



do-nothing

scenario 1

boost
Cleveland

scenario 2

boost 4 cities

scenario 3

conservation
set-asides
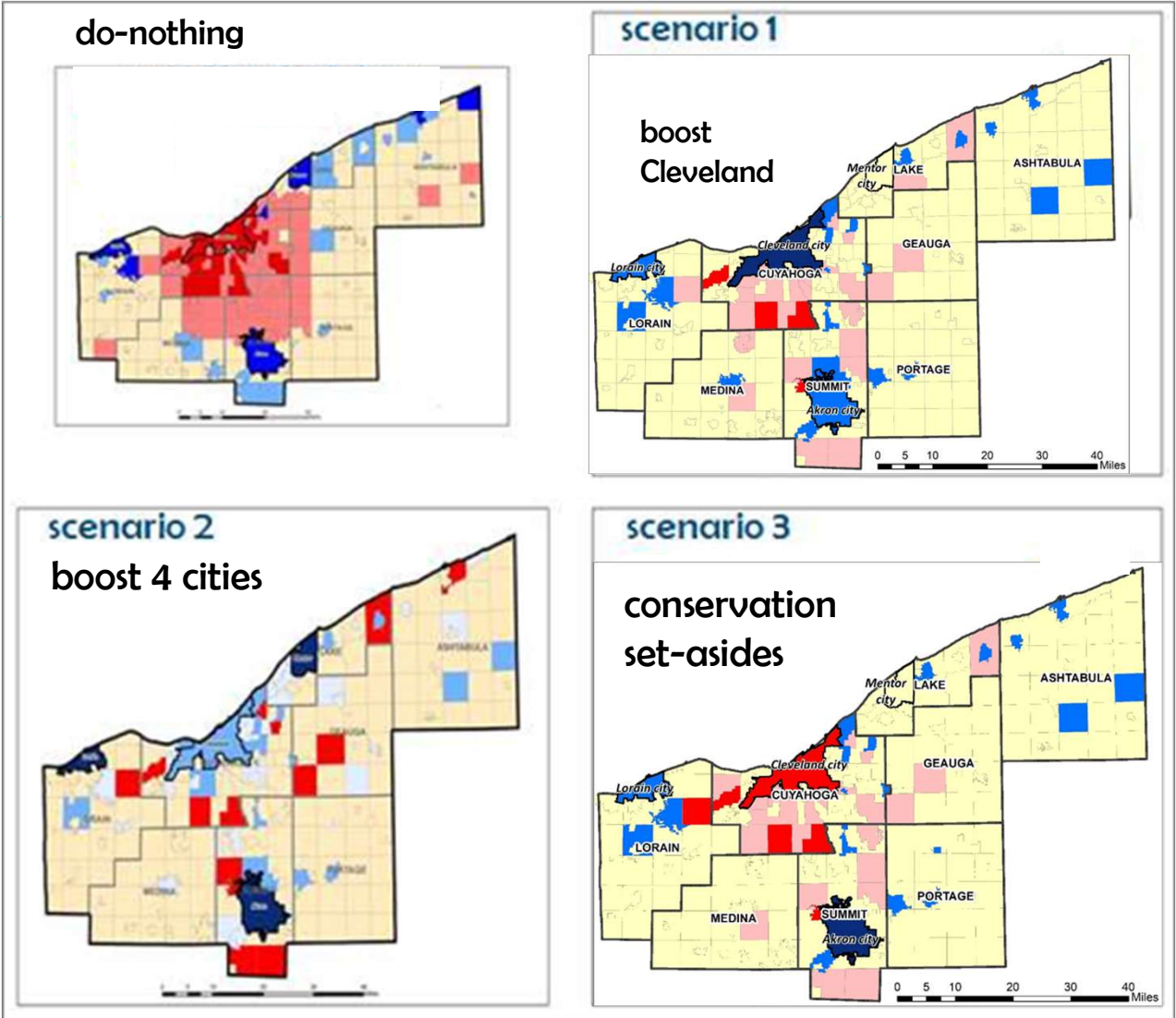
kaufman, kaufman & salling

## conclusions and future directions

**we found**

the spatial network model holds well over at least 15 years

- policy insights from (test) scenarios
- ability to produce ranges of impact

drawbacks:
- it takes a planner, a physicist and a geographer...

**we will**

forestation in NEO in the works

- test other types & extents of intervention
- produce ranges of impact

test the model with only consumer establishments

design an interface to enable public participation