COMMUNITY ECONOMIC RECOVERY TOOL

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PROJECT CONTEXT

- Where are the best places to invest in broadband **infrastructure** and **access**?
- Where will this have the greatest **return on investment**?
- Where will it close gaps and **reduce inequities**?

CONTENTS

Problem assessment, problem definition

Literature Review

Data collection, curation, integration

Data analysis and interpretation

Policy Implications

Information visualization and communication

Risk mitigation and alternatives implementation

Problem Assessment & Problem Definition

PROBLEM DEFINITION

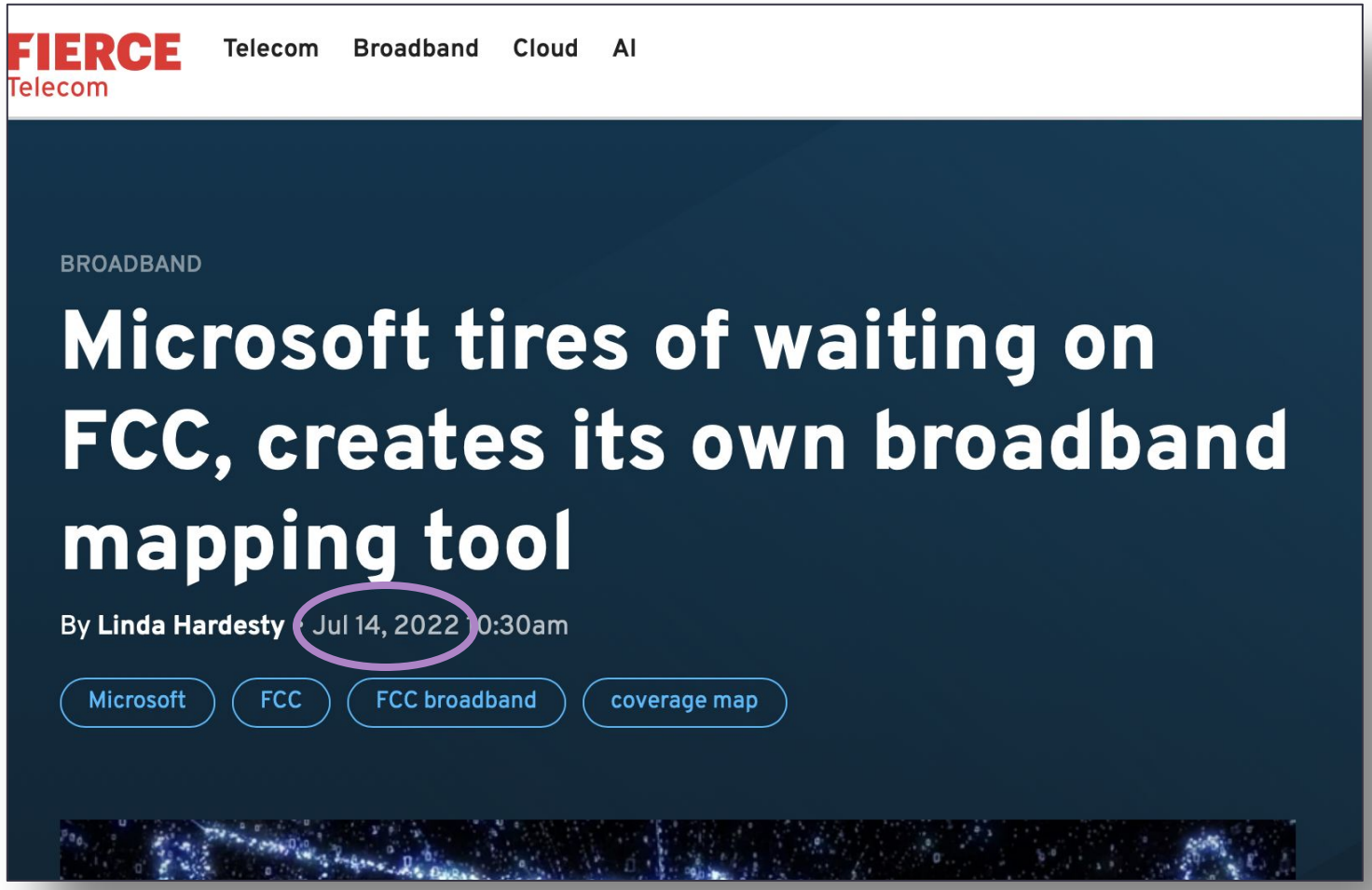
Understanding of the **economic effects** and **inequities** in **broadband access** is limited by the lack of any publicly available datasets linking broadband and economic performance

PROBLEM DEFINITION

Our first task:

identify, align, normalize, and **combine** broadband and economic data sources

how do we know there is a need?



FIERCE Telecom

Telecom Broadband Cloud AI

BROADBAND

Microsoft tires of waiting on FCC, creates its own broadband mapping tool

By **Linda Hardesty** · Jul 14, 2022 10:30am

Microsoft FCC FCC broadband coverage map

PROBLEM DEFINITION

Then:

Analyze **connections** between broadband expansion and economic improvements

Evaluate **disparities** and **inequities** in broadband access

Literature Review

Broadband speed and unemployment rates: Data and measurement issues

Publication: *Telecommunications Policy, Volume 44, Issue 1, February 2020, 101829*

Unemployment rates are about 0.26 percentage points lower in counties with high speeds compared to counties with low speeds.

Broadband metrics and job productivity: a look at county-level data

Publication: *The Annals of Regional Science volume 66, pages 161–184 (2021)*

Found broadband adoption predicted job productivity better than broadband speed or availability.

The Roles of Broadband Availability and Financial Constraints

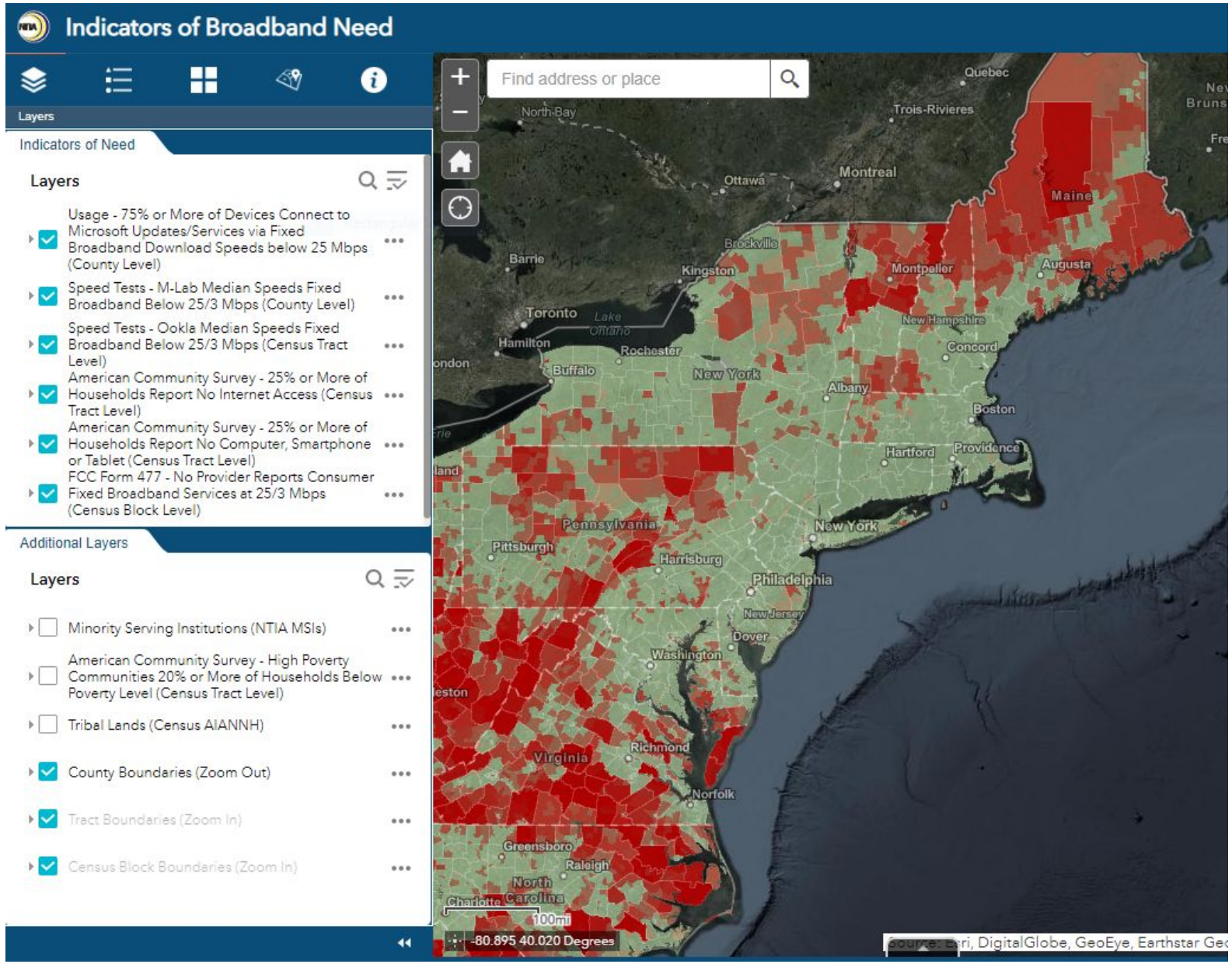
Publication: *Entrepreneurship in Minority Areas, December 15, 2020*

Broadband infrastructure facilitates entrepreneurship.

Literature Review

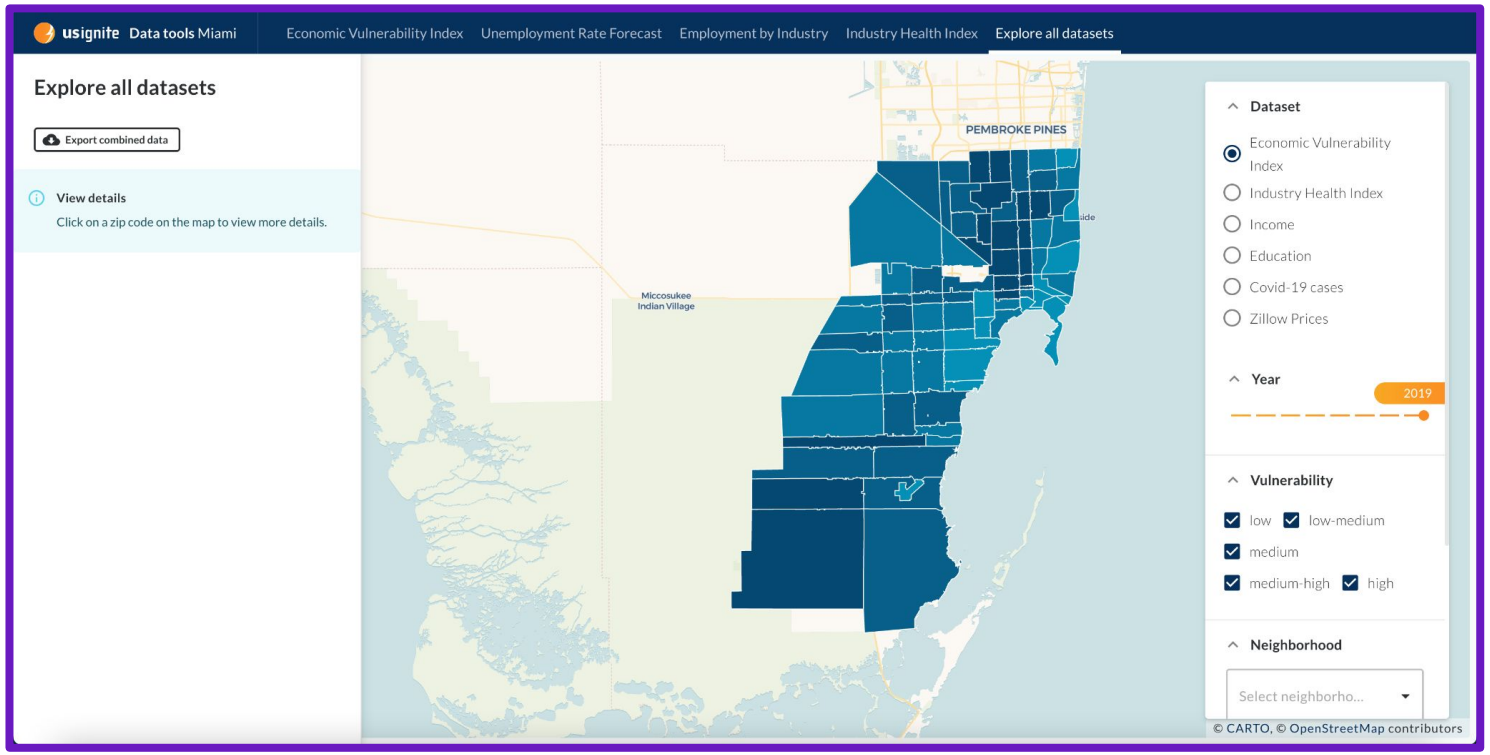
1. Prior academic research

2. Related projects


Indicators of Broadband Need
Layers
Indicators of Need
Layers
Usage - 75% or More of Devices Connect to Microsoft Updates/Services via Fixed Broadband Download Speeds below 25 Mbps (County Level)
Speed Tests - M-Lab Median Speeds Fixed Broadband Below 25/3 Mbps (County Level)
Speed Tests - Ookla Median Speeds Fixed Broadband Below 25/3 Mbps (Census Tract Level)
American Community Survey - 25% or More of Households Report No Internet Access (Census Tract Level)
American Community Survey - 25% or More of Households Report No Computer, Smartphone or Tablet (Census Tract Level)
FCC Form 477 - No Provider Reports Consumer Fixed Broadband Services at 25/3 Mbps (Census Block Level)
Additional Layers
Layers
Minority Serving Institutions (NTIA MSIs)
American Community Survey - High Poverty Communities 20% or More of Households Below Poverty Level (Census Tract Level)
Tribal Lands (Census AIANNH)
County Boundaries (Zoom Out)
Tract Boundaries (Zoom In)
Census Block Boundaries (Zoom In)
Find address or place
Quebec
North Bay
Trois-Rivieres
Ottawa
Montreal
Maine
Barrie
Brockville
Kingston
Montpelier
Augusta
Toronto
Lake Ontario
New Hampshire
Hamilton
Rochester
Concord
Buffalo
New York
Albany
Boston
Hartford
Providence
Pennsylvania
New York
Pittsburgh
Harrisburg
Philadelphia
New Jersey
Dover
Washington
Richmond
Virginia
Norfolk
Greensboro
Raleigh
North Carolina
Charlotte
100mi
-80.895 40.020 Degrees

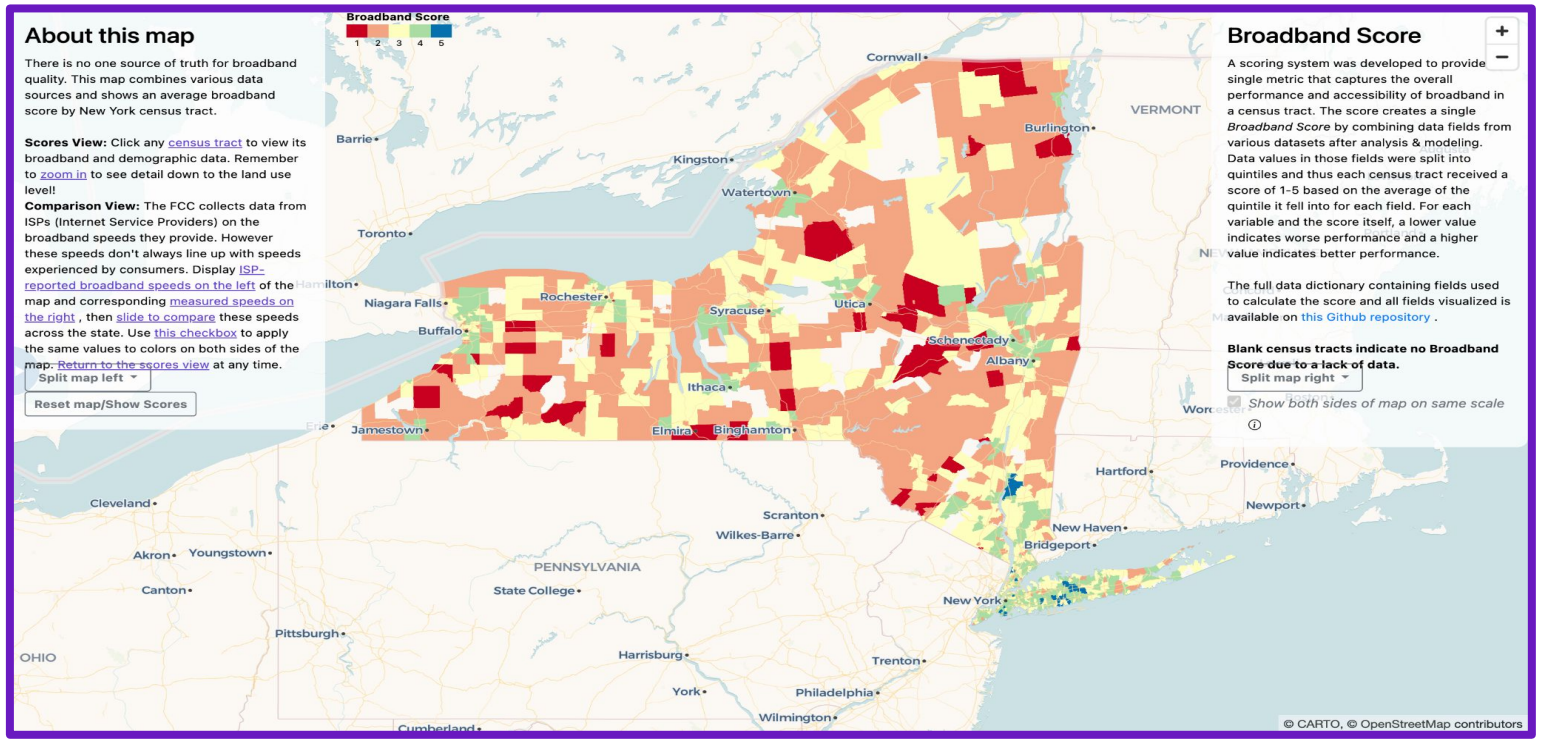
US IGNITE RELATED WORK

Miami Economic Vulnerability Dashboard



US IGNITE RELATED WORK

New York Broadband Dashboard



Data collection, curation, integration

Data collection, curation, integration

1. sources

ECONOMIC DATA

- American Community Survey(ACS)
- Zillow Housing Data
- Bureau of Labor Statistics
- COVID Sentiment Analysis (University of Chicago)

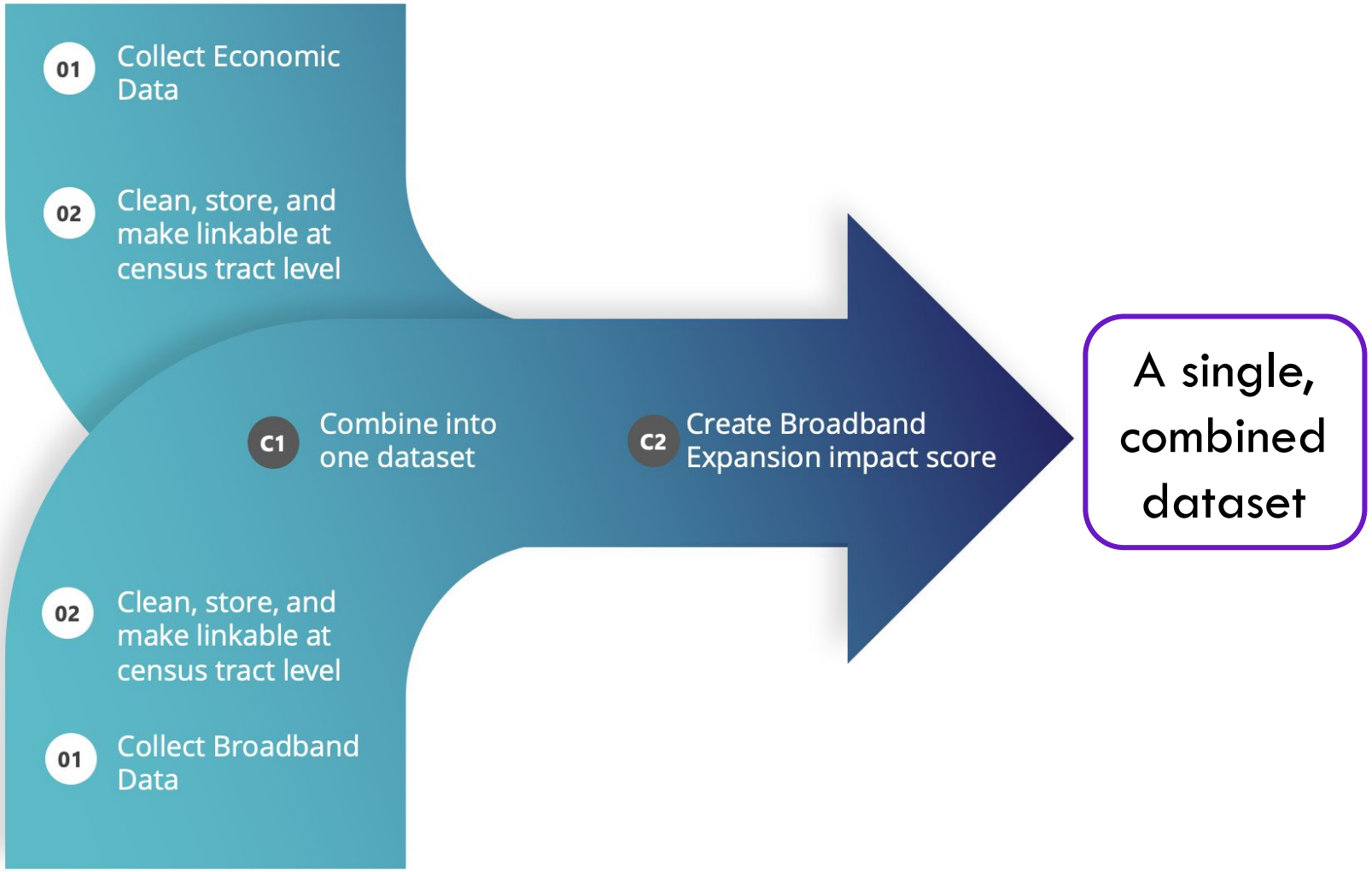
BROADBAND DATA

- Broadband providers survey (FCC)
- Household access survey (Census American Community Survey ACS)
- Detected download speed (Microsoft)
- Speed tests (Ookla and M-Lab)

Data collection, curation, integration

2. merging

DATA SYNTHESIS



A single, combined dataset

DATA SYNTHESIS

In order to build this master data set, we Joined all data sources by Census Tract GEOID + year.

After the integration the master dataset are easy to used for further analysis and building the scores.

SPATIAL INTERPOLATION

- Needed to rescale all data to common Census Tract geometries
- Applied area-weighted reallocation to interpolate rates

SPATIAL INTERPOLATION

image: Din & Wilson

SINGLE BROADBAND SCORE

Use several broadband indicators to create a single broadband score, it shows the broadband assess level in different tract areas.

The score can help predicted impact of broadband expansion, and help make further decisions.

Data collection, curation, integration

3. storage

CARTO

Data stored in CARTO database (account provided by US Ignite)

Data analysis and interpretation

BROADBAND & ECONOMIC CORRELATIONS

We found that in some cases there is a correlation between increased access to broadband and economic growth.

The correlations tend to get stronger as more time passes, signifying a possible lagging but causal relationship

BROADBAND & ECONOMIC CORRELATIONS

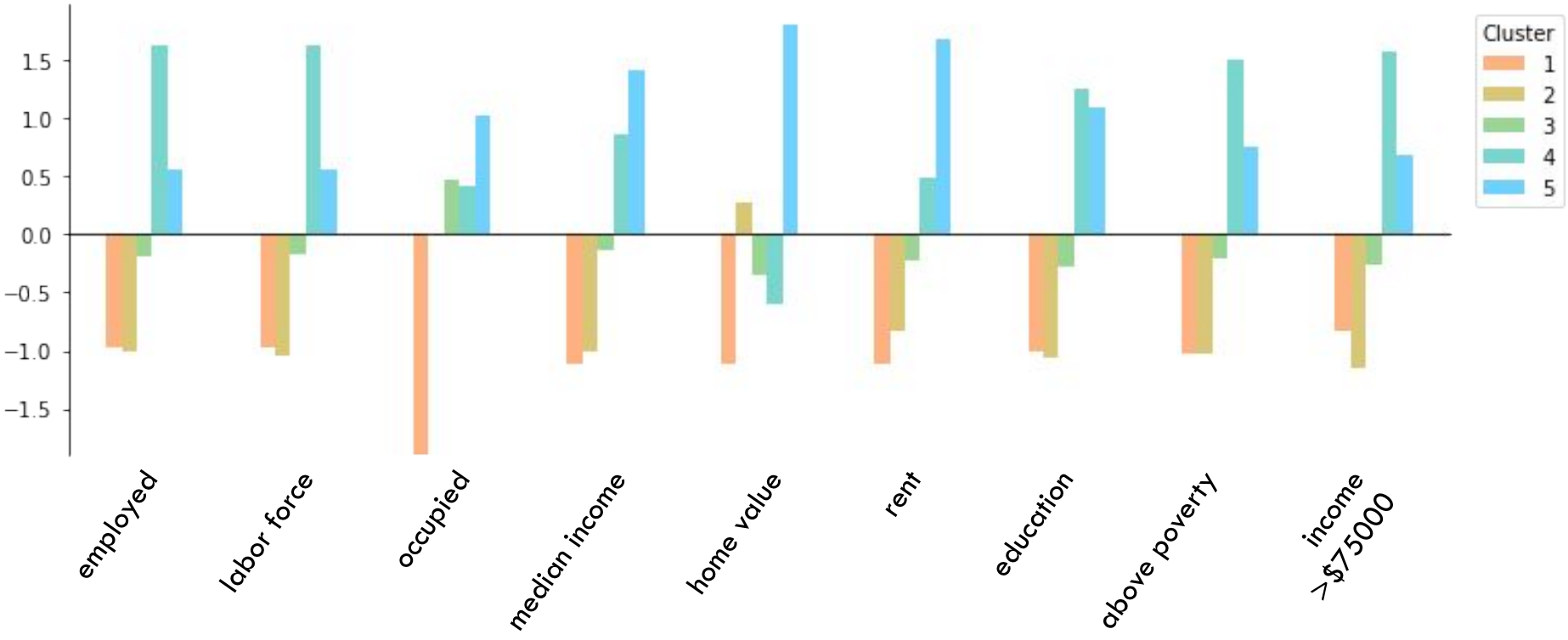
Steps:

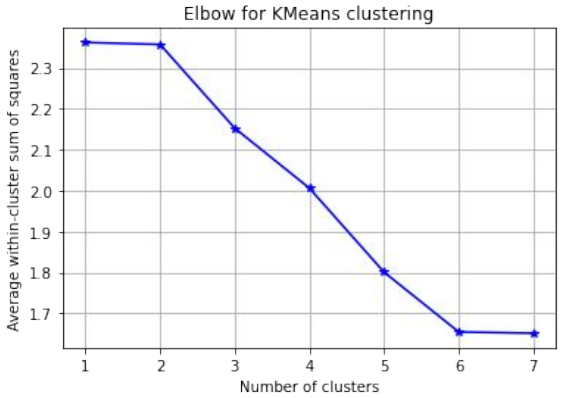
Creating a Broadband Score

Defining Types of Economic Change

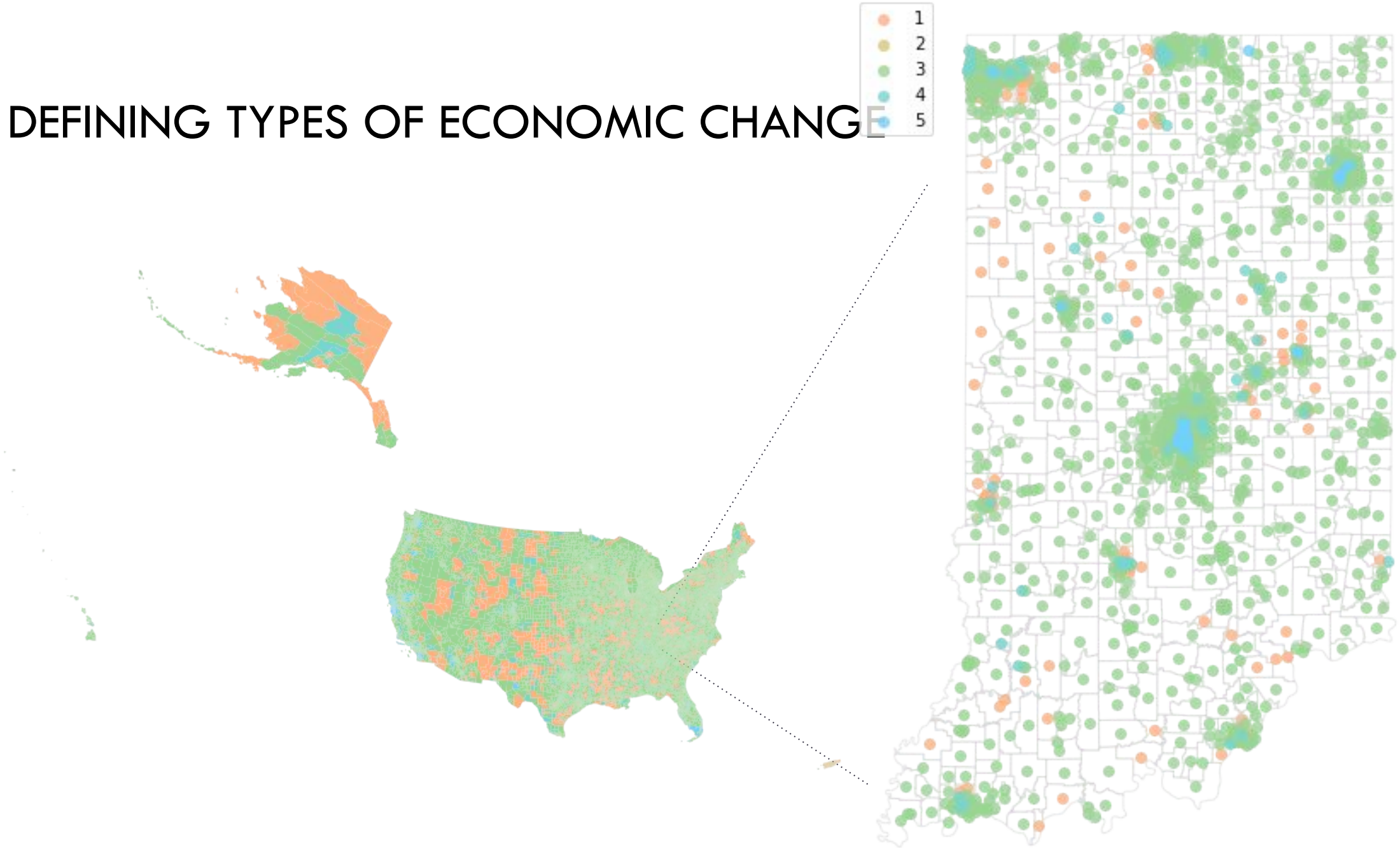
Comparing Change in Broadband Score to Economic Change

DEFINING TYPES OF ECONOMIC CHANGE



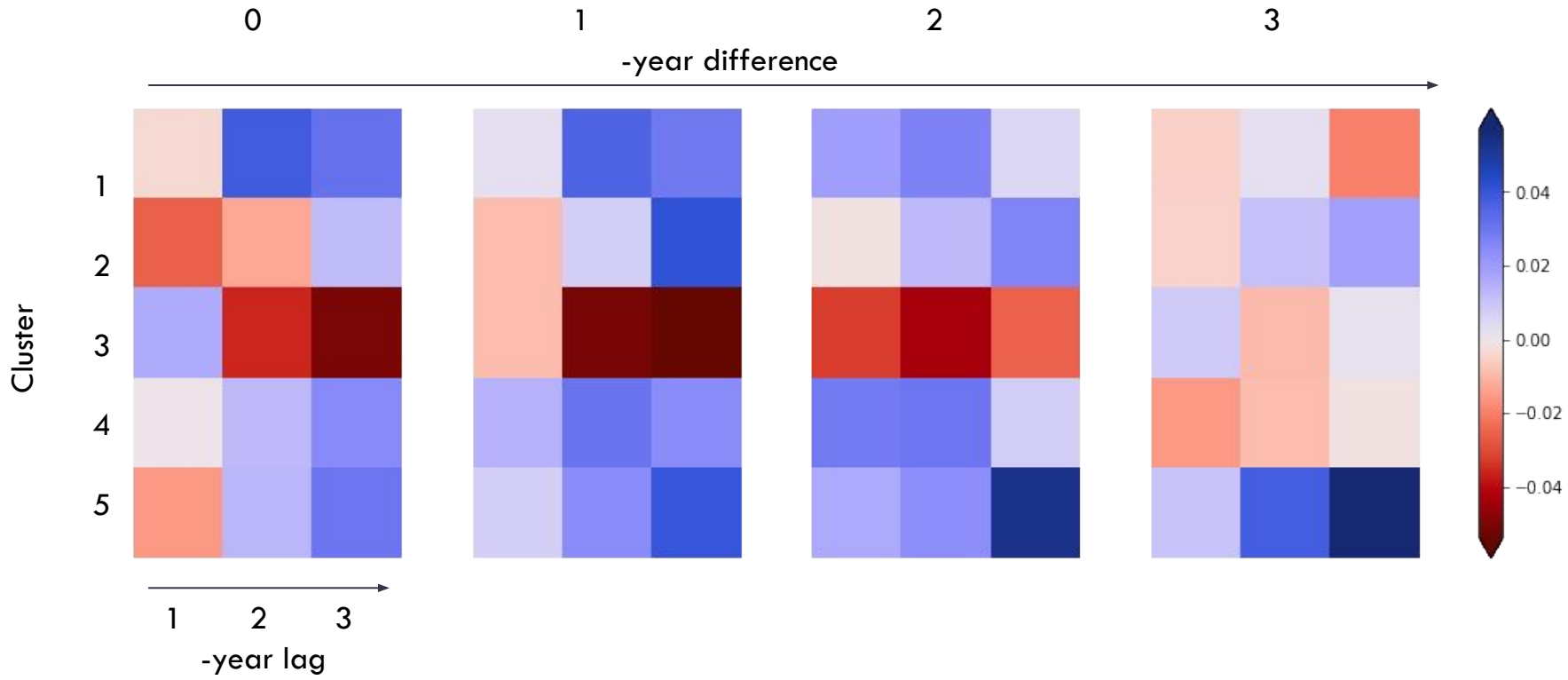


DEFINING TYPES OF ECONOMIC CHANGE



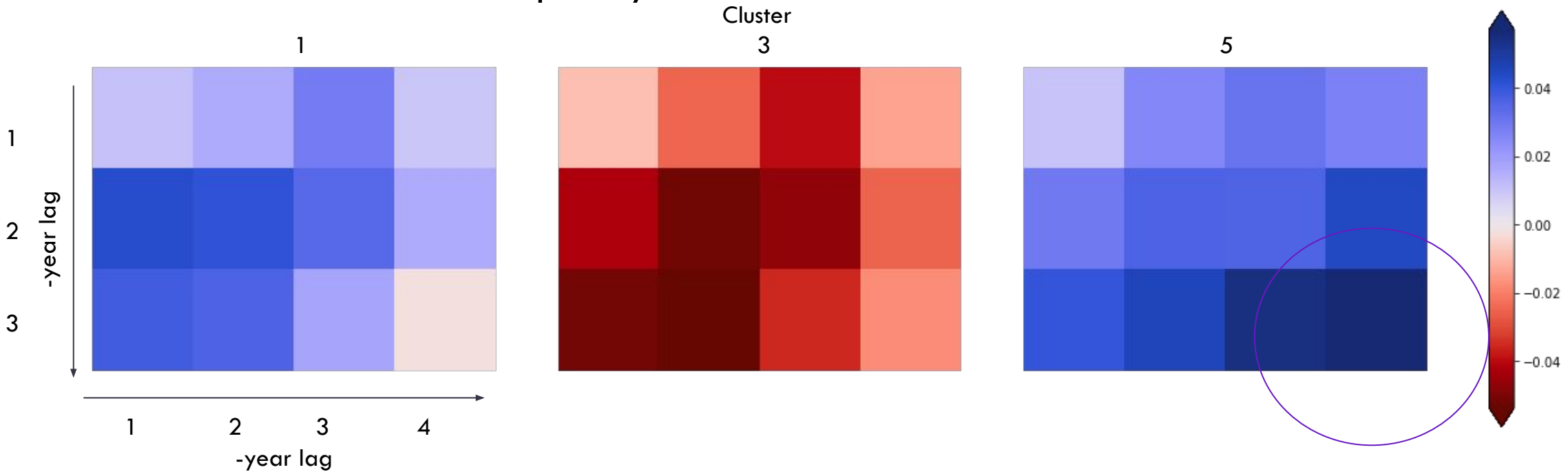
COMPARING CHANGE IN BROADBAND SCORE TO ECONOMIC CHANGE

The correlation matrices suggest that positive shocks in broadband are felt most strongly as time passes.

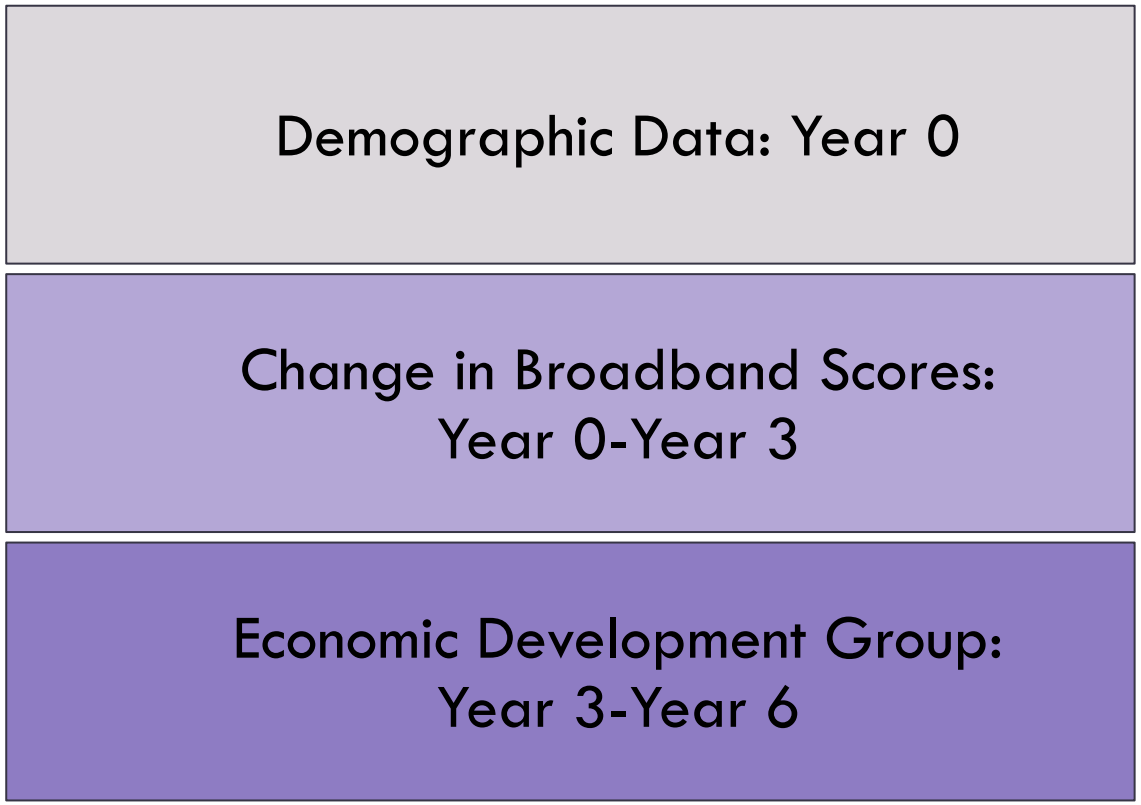


COMPARING CHANGE IN BROADBAND SCORE TO ECONOMIC CHANGE

We find the strongest positive correlation
between an increase in broadband and an increase in economic scores
in Cluster 5 after three elapsed years.



Dealing with Data Lags

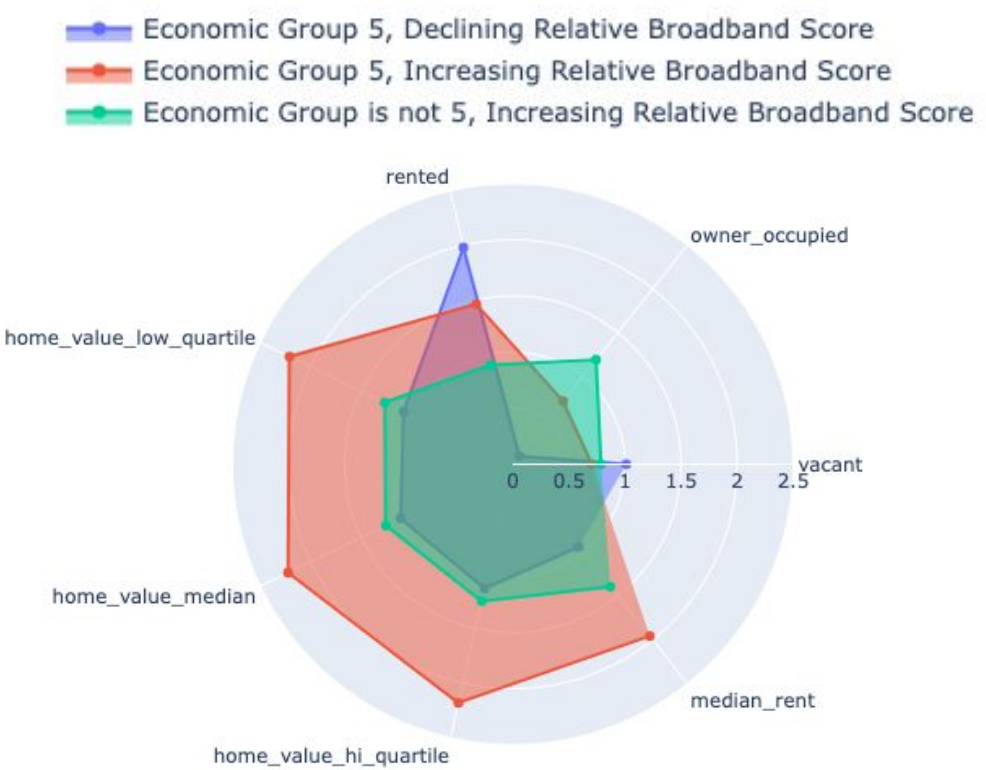


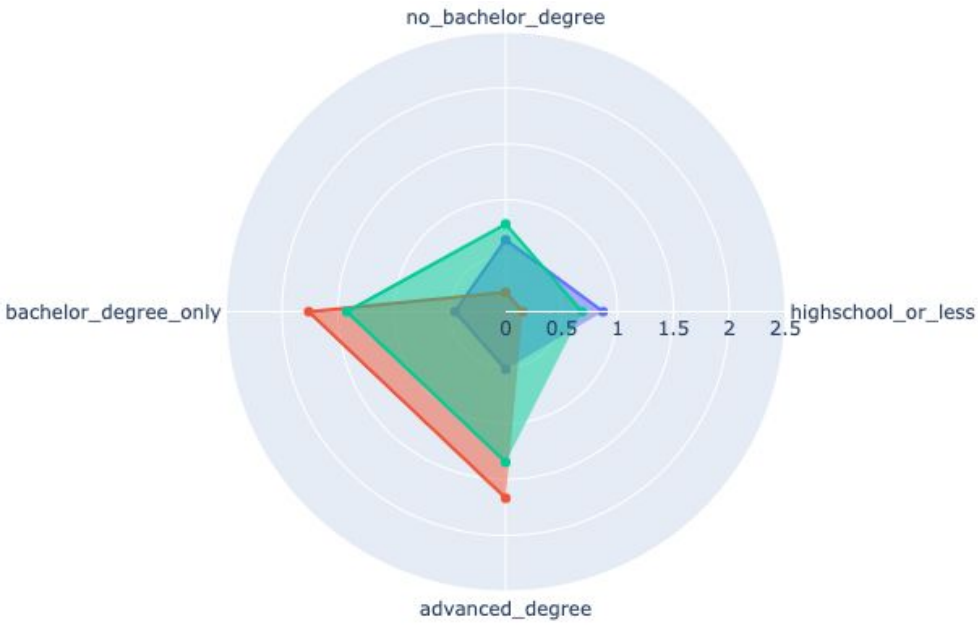
Analyzing Results

We broke sorted each tract into a category that increased broadband and developed their economy, which tract increased broadband but did not grow their economy, and which tracts grew their economy but did not develop new broadband.

We looked at age, ethnic, education, housing, job, and income demographics amongst others.

Housing and education were best correlated with both broadband and economic increases





Inequities to Address

Tracts with disproportionately low access to broadband often contain higher percentages of these groups:

Racial: Black, Hispanic, and Native People

Geographic: Rural areas, particularly those in the South

Age: Older people in rural areas and younger people in urban areas

Income: Poorer people, especially in areas with higher cost of access

Policy implications

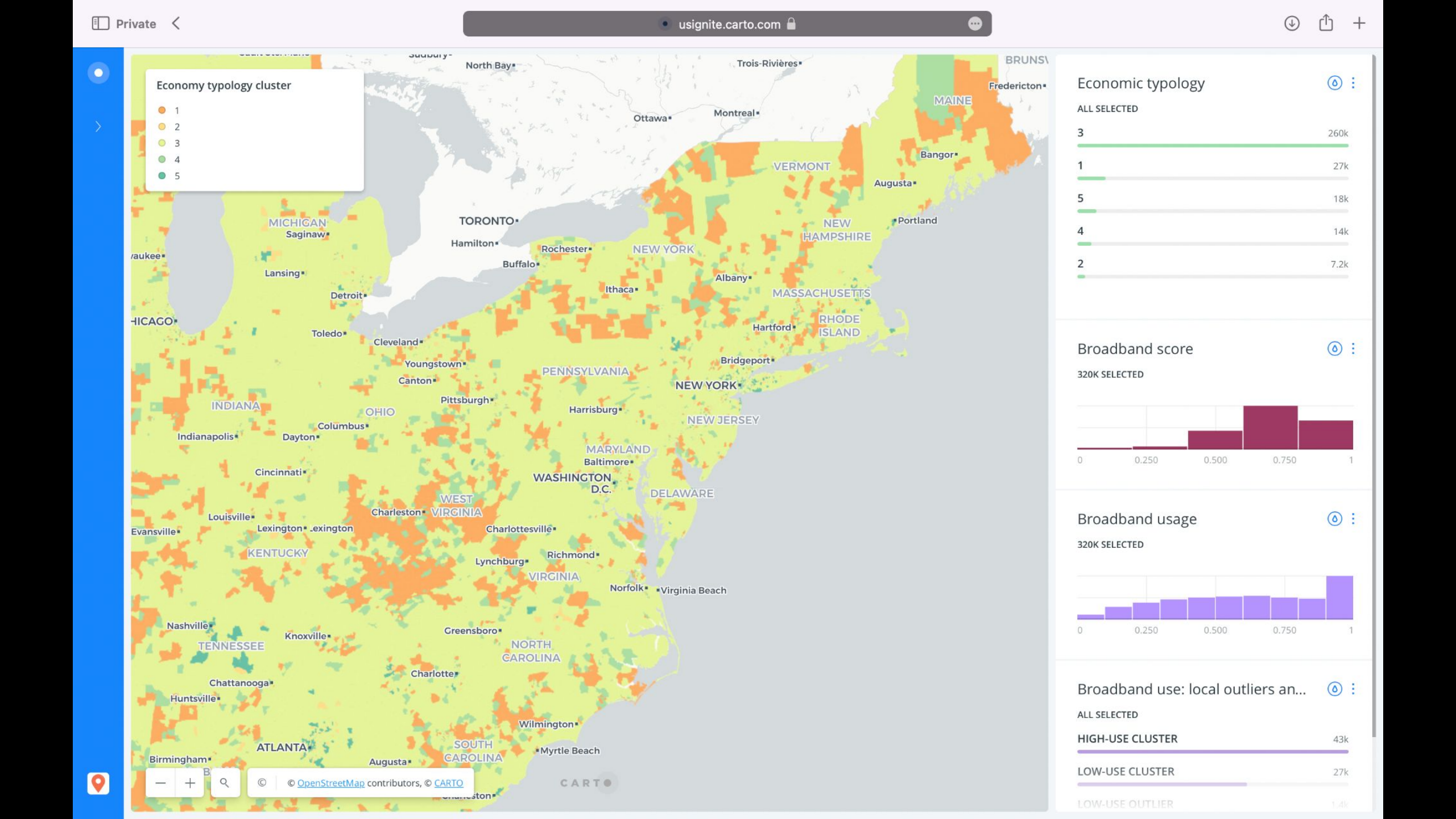
POLICY IMPLICATIONS

Funds for broadband expansion are now available through the infrastructure bill

We can use this data to prioritize communities for broadband expansion

Focus on equity in broadband infrastructure is important because past biases in placement can perpetuate into placement recommendations for the future

Information visualization


Private
usignite.carto.com
Economy typology cluster
1
2
3
4
5
North Bay
Trois-Rivières
Ottawa
Montreal
Fredericton
MAINE
VERMONT
Bangor
Augusta
Portland
NEW HAMPSHIRE
TORONTO
MICHIGAN
Saginaw
Hamilton
Rochester
NEW YORK
Buffalo
Albany
Lansing
Ithaca
Detroit
MASSACHUSETTS
RHODE ISLAND
Hartford
Toledo
Cleveland
Youngstown
Bridgeport
PENNSYLVANIA
Canton
NEW YORK
Pittsburgh
INDIANA
OHIO
Harrisburg
NEW JERSEY
Columbus
Indianapolis
Dayton
MARYLAND
Baltimore
Cincinnati
WASHINGTON D.C.
DELAWARE
WEST VIRGINIA
Charleston
Louisville
Lexington
Charlottesville
Evansville
KENTUCKY
Richmond
Lynchburg
VIRGINIA
Norfolk
Virginia Beach
Nashville
Knoxville
Greensboro
TENNESSEE
NORTH CAROLINA
Charlotte
Chattanooga
Huntsville
Wilmington
ATLANTA
SOUTH CAROLINA
Myrtle Beach
Birmingham
Augusta
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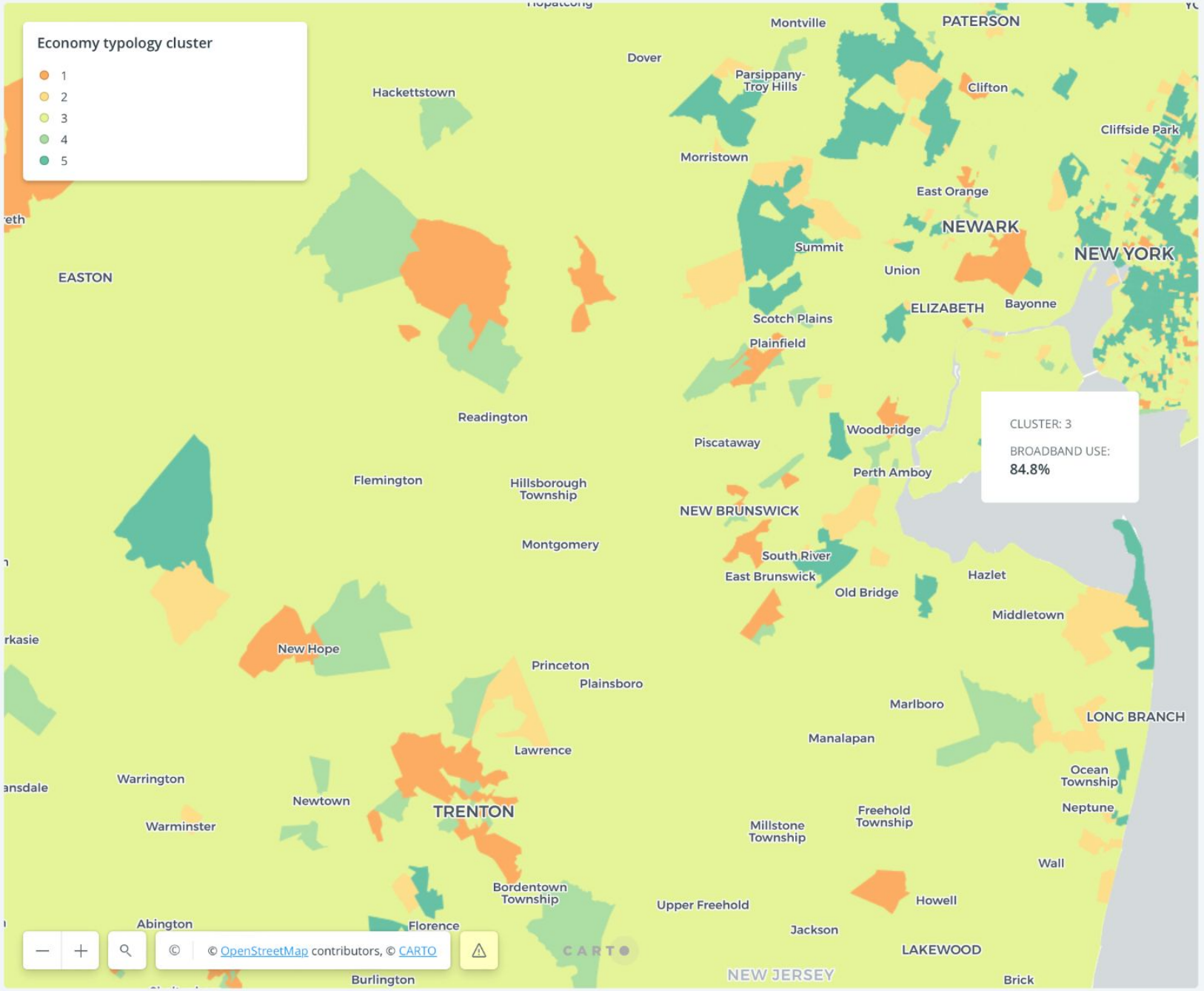
CARTO
Economic typology
ALL SELECTED
3 260k
1 27k
5 18k
4 14k
2 7.2k
Broadband score
320K SELECTED
0 0.250 0.500 0.750 1
Broadband usage
320K SELECTED
0 0.250 0.500 0.750 1
Broadband use: local outliers an...
ALL SELECTED
HIGH-USE CLUSTER 43k
LOW-USE CLUSTER 27k



Economic typology

ALL SELECTED

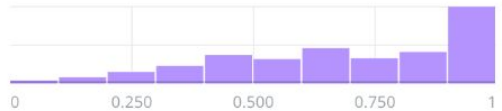
3	18k
5	4.5k
2	1.4k
1	1.0k
4	523

Broadband score

25K SELECTED

Broadband usage

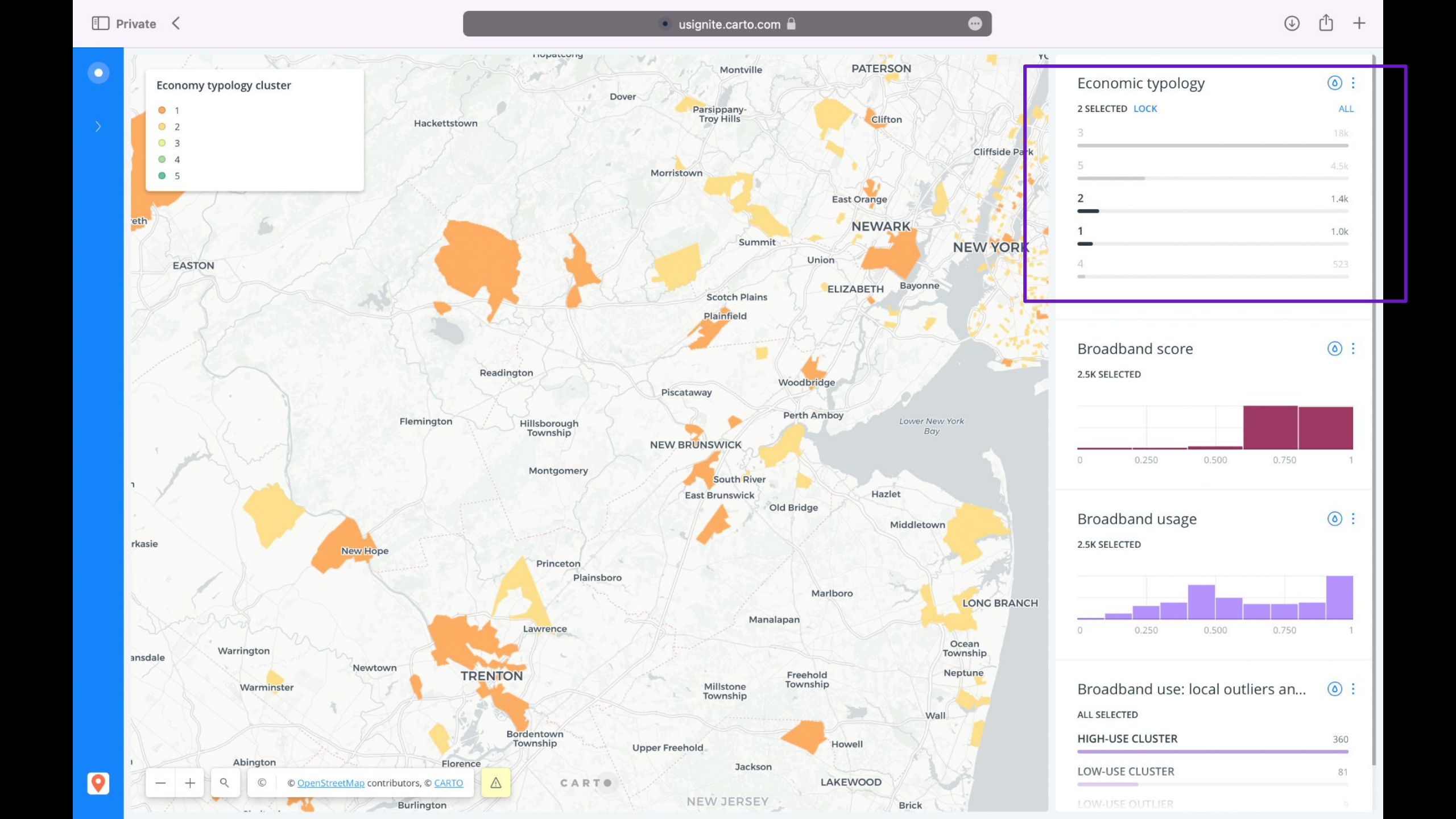
25K SELECTED



Broadband use: local outliers an...

ALL SELECTED

HIGH-USE CLUSTER	5.2k
LOW-USE CLUSTER	657
LOW-USE OUTLIER	126


Private
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Economy typology cluster
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Economic typology
2 SELECTED LOCK
ALL
3 18k
5 4.5k
2 1.4k
1 1.0k
4 523
Broadband score
2.5K SELECTED
0 0.250 0.500 0.750 1
Broadband usage
2.5K SELECTED
0 0.250 0.500 0.750 1
Broadband use: local outliers an...
ALL SELECTED
HIGH-USE CLUSTER 360
LOW-USE CLUSTER 81
LOW-USE OUTLIER
Montville
PATERSON
Dover
Parsippany-Troy Hills
Clifton
Hackettstown
Cliffside Park
Morristown
East Orange
NEWARK
NEW YORK
Summit
Union
EASTON
ELIZABETH
Bayonne
Scotch Plains
Plainfield
Readington
Woodbridge
Piscataway
Perth Amboy
Flemington
Hillsborough Township
Lower New York Bay
NEW BRUNSWICK
Montgomery
South River
East Brunswick
Hazlet
Old Bridge
Middletown
New Hope
Princeton
Plainsboro
Marlboro
LONG BRANCH
Manalapan
Lawrence
Warrington
Ocean Township
Newtown
TRENTON
Neptune
Warminster
Freehold Township
Millstone Township
Wall
Bordentown Township
Upper Freehold
Howell
Abington
Florence
Jackson
LAKEWOOD
Burlington
NEW JERSEY
Brick
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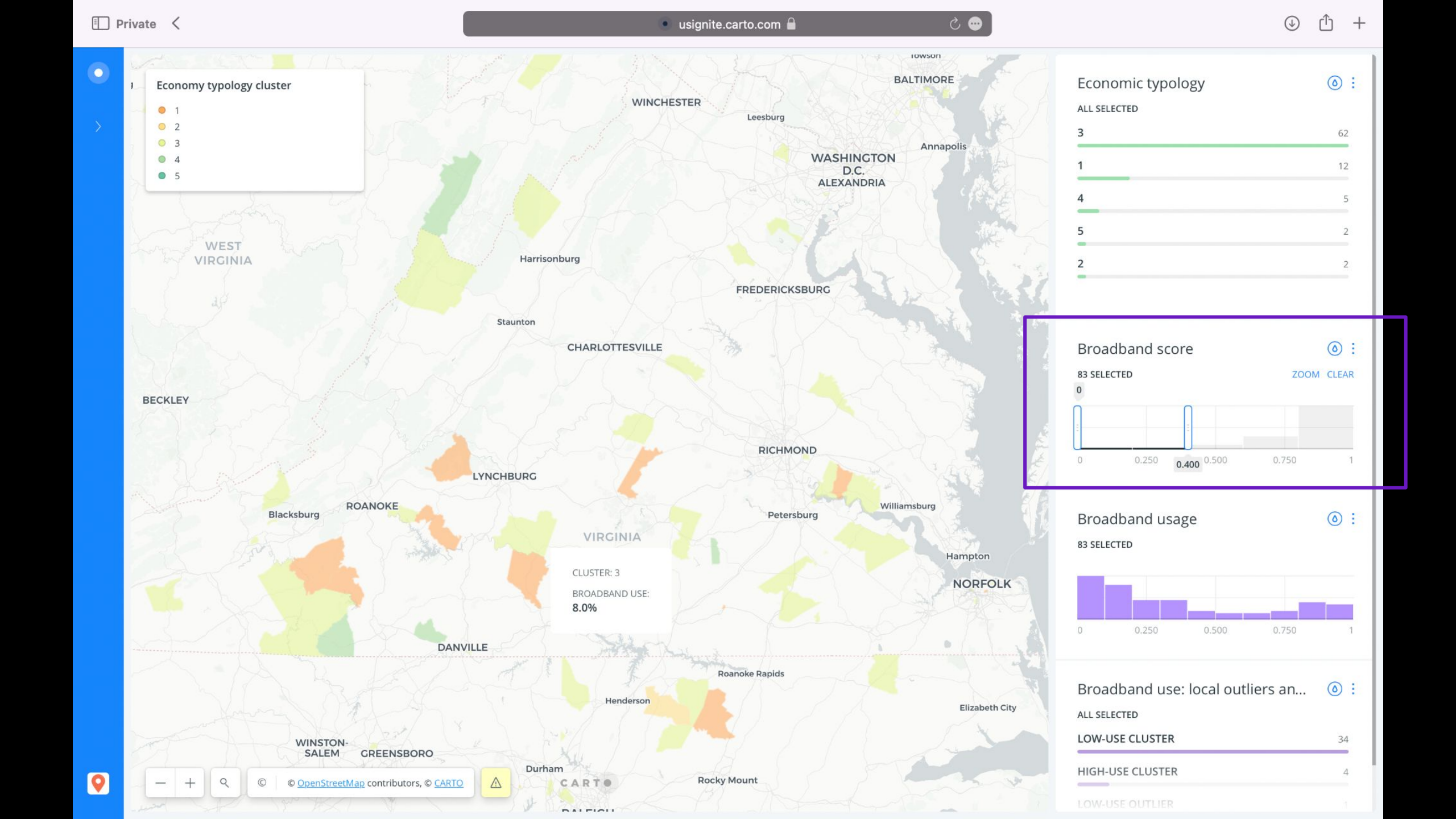
Private
usignite.carto.com
Economy typology cluster
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WINCHESTER
Leesburg
BALTIMORE
Towson
Annapolis
WASHINGTON
D.C.
ALEXANDRIA
WEST
VIRGINIA
Harrisonburg
FREDERICKSBURG
Staunton
CHARLOTTESVILLE
BECKLEY
RICHMOND
LYNCHBURG
ROANOKE
Blacksburg
Petersburg
Williamsburg
VIRGINIA
CLUSTER: 3
BROADBAND USE:
8.0%
Hampton
NORFOLK
DANVILLE
Roanoke Rapids
Henderson
Elizabeth City
WINSTON-
SALEM
GREENSBORO
Durham
Rocky Mount
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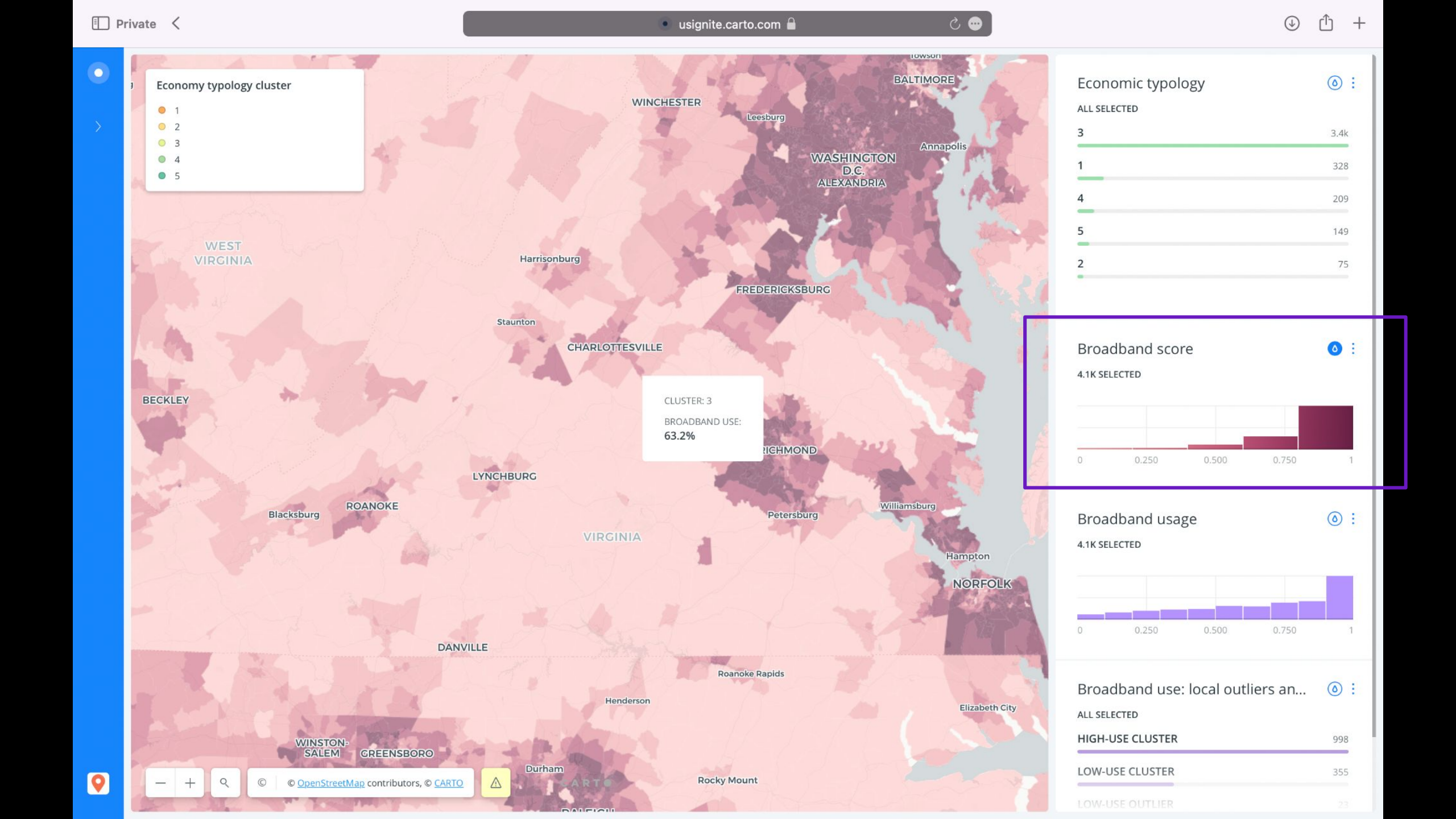
Economic typology
ALL SELECTED
3 62
1 12
4 5
5 2
2 2
Broadband score
83 SELECTED
ZOOM CLEAR
0
0 0.250 0.400 0.500 0.750 1
Broadband usage
83 SELECTED
0 0.250 0.500 0.750 1
Broadband use: local outliers an...
ALL SELECTED
LOW-USE CLUSTER 34
HIGH-USE CLUSTER 4
LOW-USE OUTLIER


Private
usignite.carto.com
Economy typology cluster
1
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3
4
5
WINCHESTER
Leesburg
BALTIMORE
Annapolis
WASHINGTON D.C. ALEXANDRIA
WEST VIRGINIA
Harrisonburg
FREDERICKSBURG
Staunton
CHARLOTTESVILLE
BECKLEY
CLUSTER: 3
BROADBAND USE:
63.2%
LYNCHBURG
ROANOKE
Blacksburg
Petersburg
Williamsburg
VIRGINIA
Hampton
NORFOLK
DANVILLE
Roanoke Rapids
Henderson
Elizabeth City
WINSTON-SALEM
GREENSBORO
Durham
Rocky Mount
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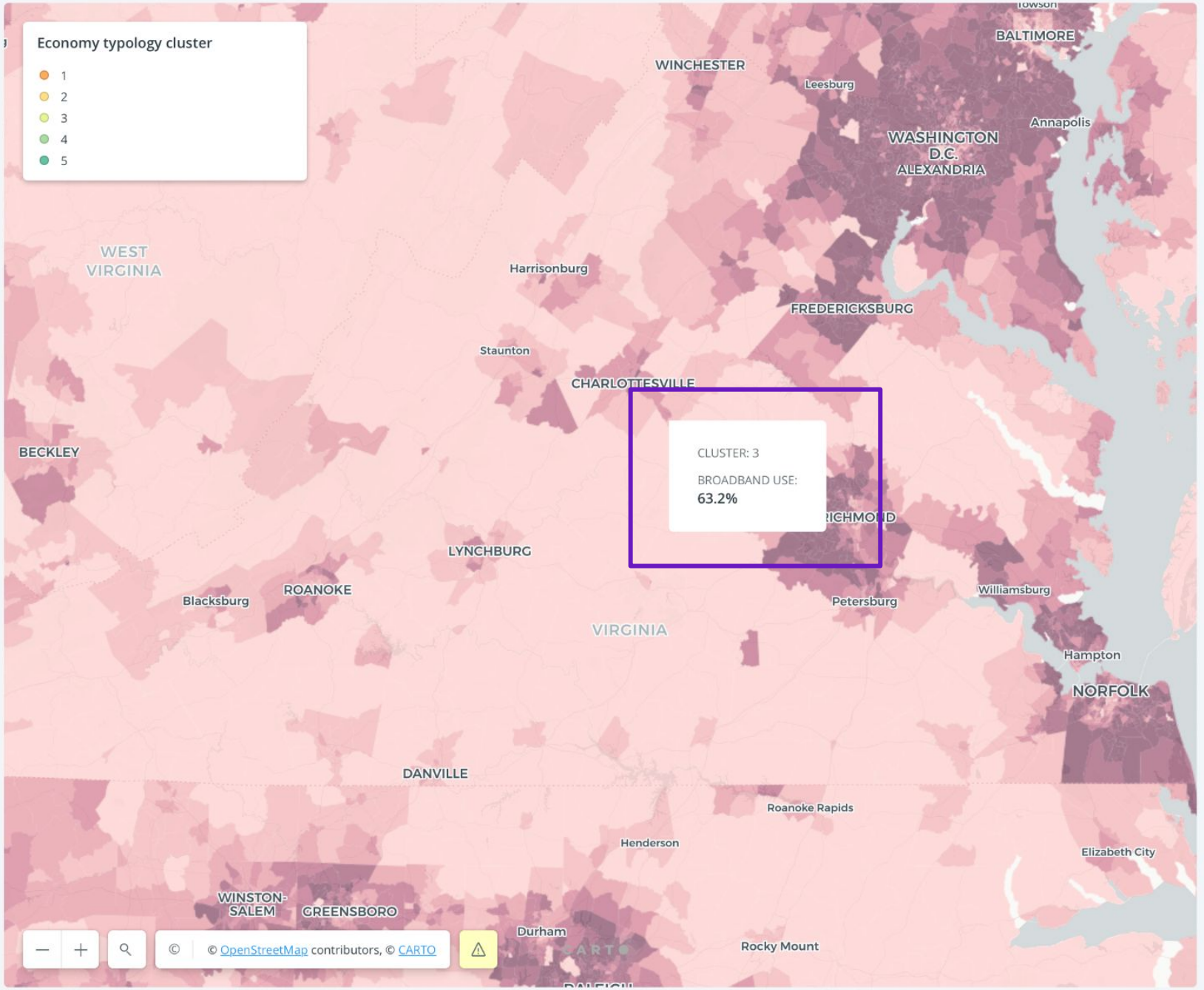
Economic typology
ALL SELECTED
3 3.4k
1 328
4 209
5 149
2 75
Broadband score
4.1K SELECTED
0 0.250 0.500 0.750 1
Broadband usage
4.1K SELECTED
0 0.250 0.500 0.750 1
Broadband use: local outliers an...
ALL SELECTED
HIGH-USE CLUSTER 998
LOW-USE CLUSTER 355



Economic typology

ALL SELECTED

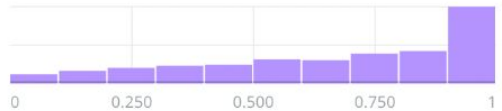
3	3.4k
1	328
4	209
5	149
2	75

Broadband score

4.1K SELECTED

Broadband usage

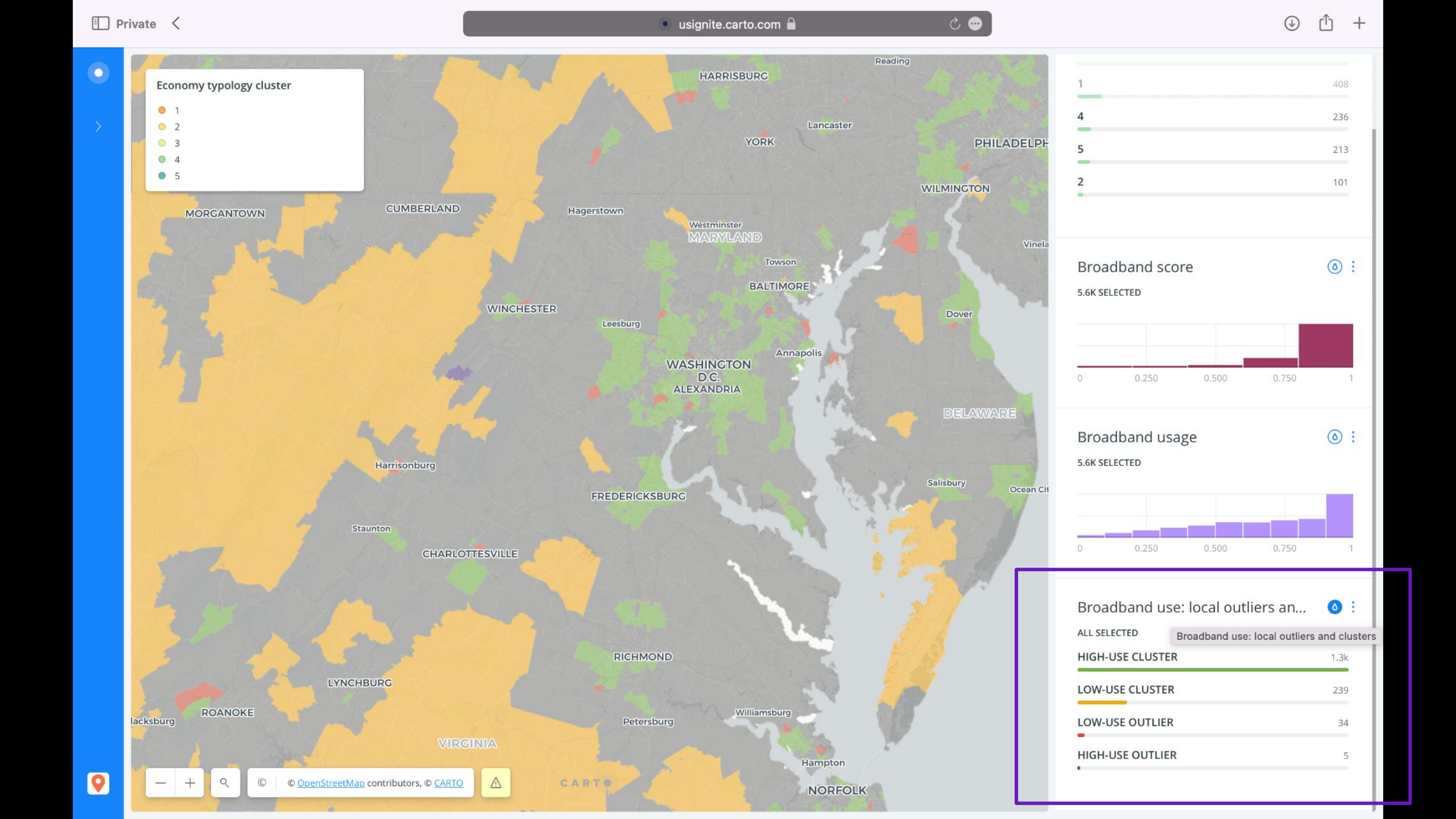
4.1K SELECTED



Broadband use: local outliers an...

ALL SELECTED

HIGH-USE CLUSTER	998
LOW-USE CLUSTER	355
LOW-USE OUTLIER	23


Private
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Economy typology cluster
1
2
3
4
5
HARRISBURG
Reading
Lancaster
YORK
PHILADELPH
WILMINGTON
MORGANTOWN
CUMBERLAND
Hagerstown
Westminster
MARYLAND
Towson
BALTIMORE
Vinela
WINCHESTER
Leesburg
Dover
Annapolis
WASHINGTON
D.C.
ALEXANDRIA
DELAWARE
Harrisonburg
Salisbury
FREDERICKSBURG
Staunton
CHARLOTTESVILLE
RICHMOND
LYNCHBURG
ROANOKE
Petersburg
Williamsburg
VIRGINIA
Hampton
NORFOLK
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CARTO
1 408
4 236
5 213
2 101
Broadband score
5.6K SELECTED
0 0.250 0.500 0.750 1
Broadband usage
5.6K SELECTED
0 0.250 0.500 0.750 1
Broadband use: local outliers an...
ALL SELECTED
Broadband use: local outliers and clusters
HIGH-USE CLUSTER 1.3k
LOW-USE CLUSTER 239
LOW-USE OUTLIER 34
HIGH-USE OUTLIER 5

Risk mitigation & adaptation

PHASED APPROACH

- We first exhaustively explored data available and delivered independently useful dataset
- Then we suggested useful analyses

EVALUATING INEQUITY

- We evaluated both need and economic and demographic disparities
- This can select areas to close multiple gaps

MEETING CLIENT NEEDS

- Ongoing dialogue with US Ignite
- We suggested valuable analyses with the data available
- Understanding the importance of historic data, we added that to our scope

Thank you!

Q&A