From Digital Infrastructure to Transformation

Roberto Gallardo, Ph.D.
Director, Purdue Center for Regional Development

October 7th, 2020

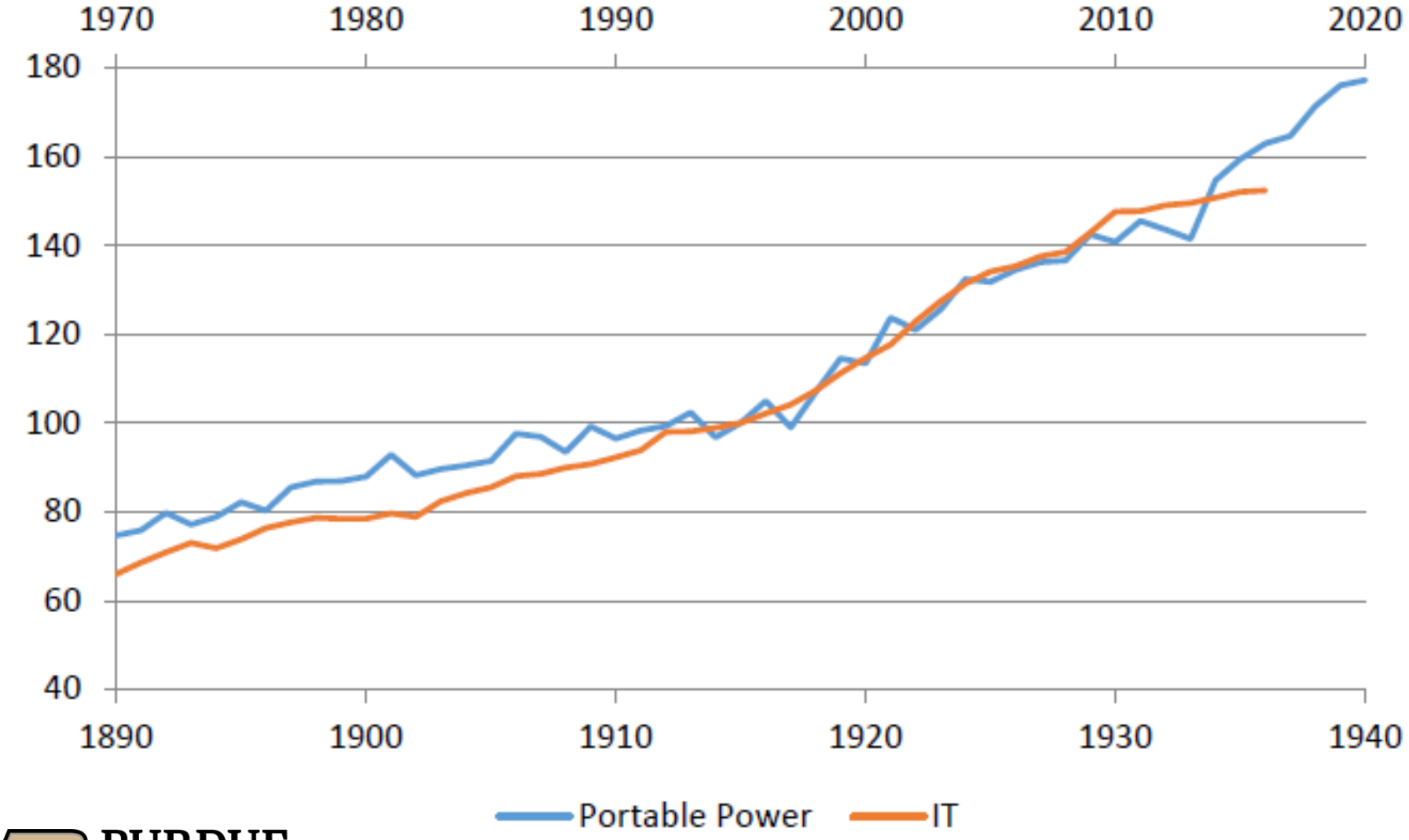
Digital Age Characteristics

- Exponential
- Digital
- Combinatorial
- Disruptive

Sources:
McQuivey, J. (2013). Digital Disruption – Unleashing the Next Wave of Innovation
Brynjolfsson & McAfee (2014). The Second Machine Age

PURDUE UNIVERSITY

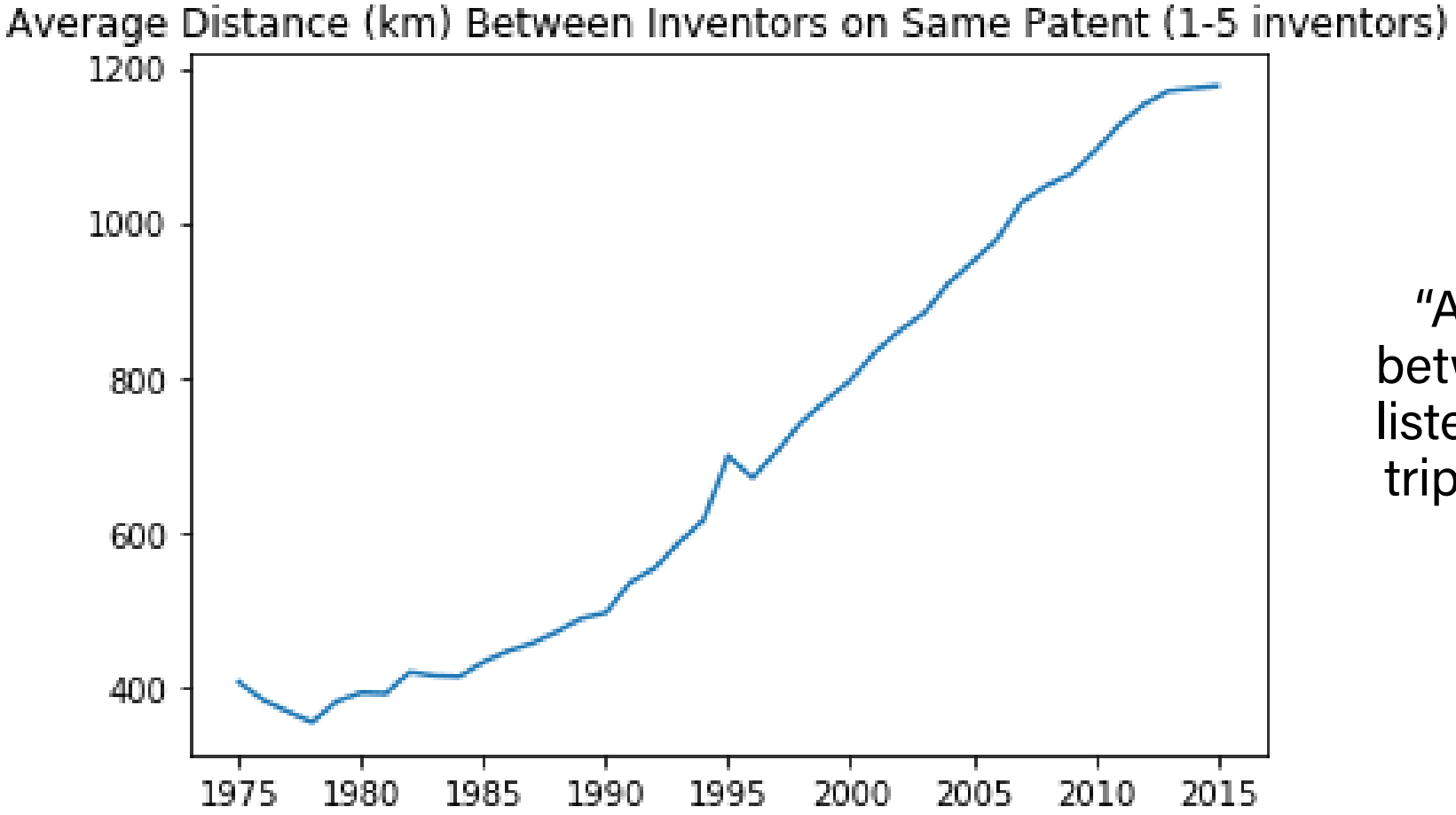
Digital Age productivity surge?



PURDUE UNIVERSITY

Source: Brynjolfsson et al; National Bureau of Economic Research

Distance and Innovation

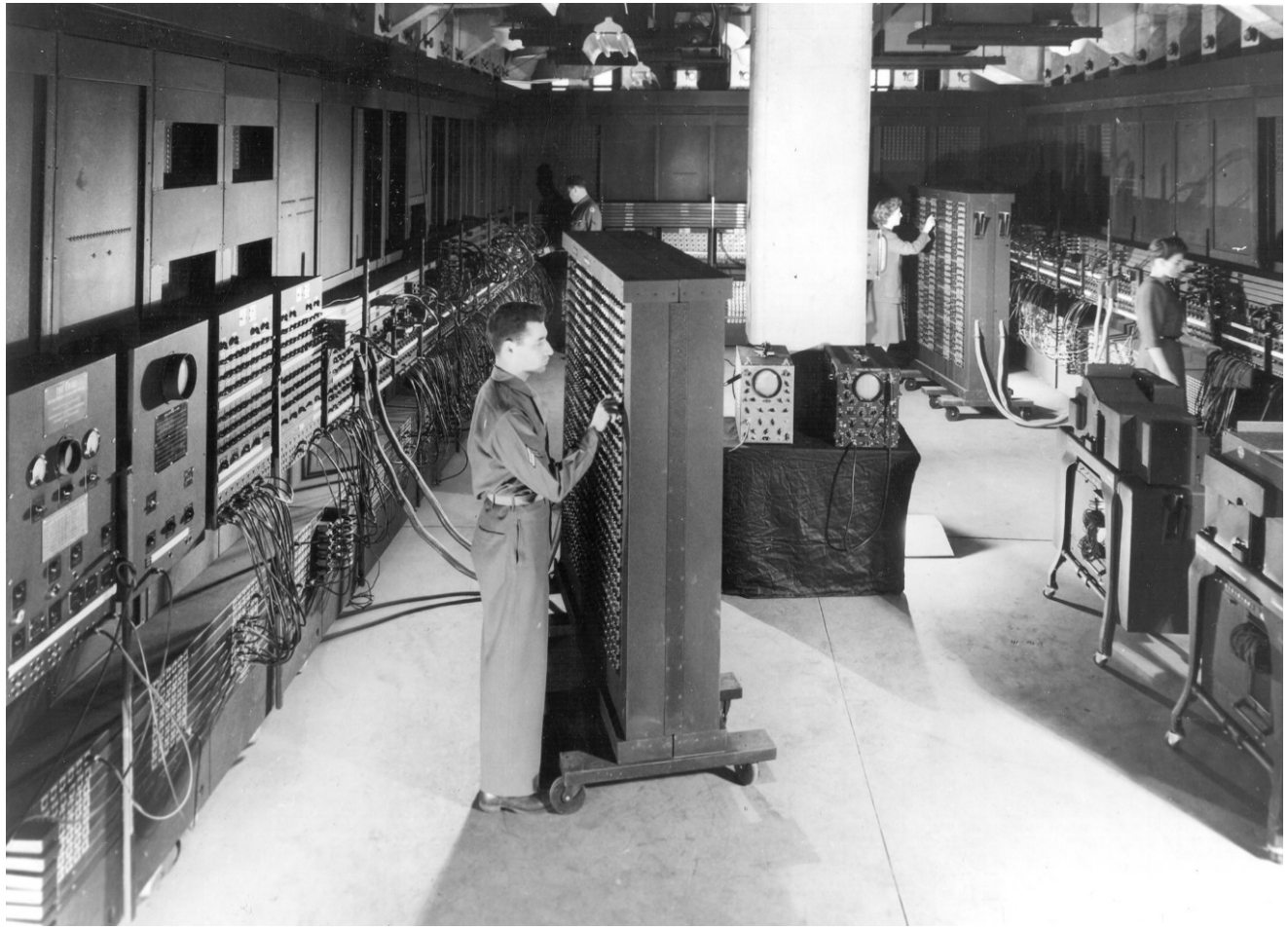


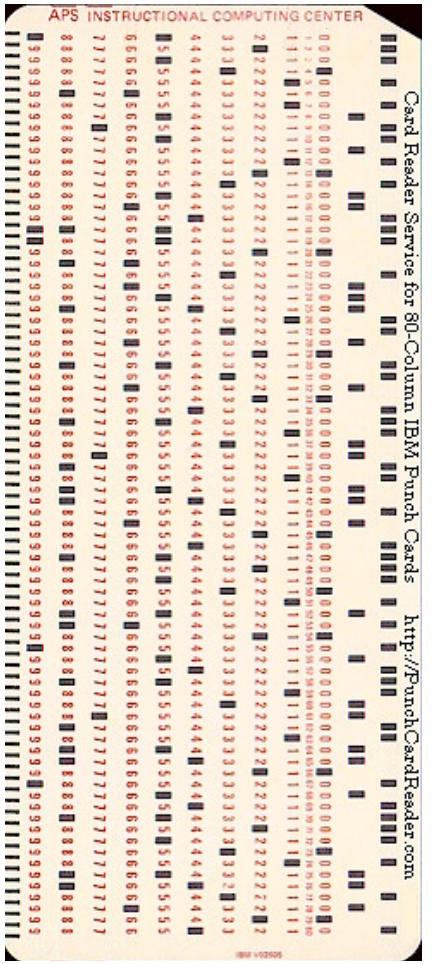
"Average distance between all inventors listed on a patent has tripled between 1975 and 2015"

Source: Matt Clancy

PURDUE UNIVERSITY

Transformations ...

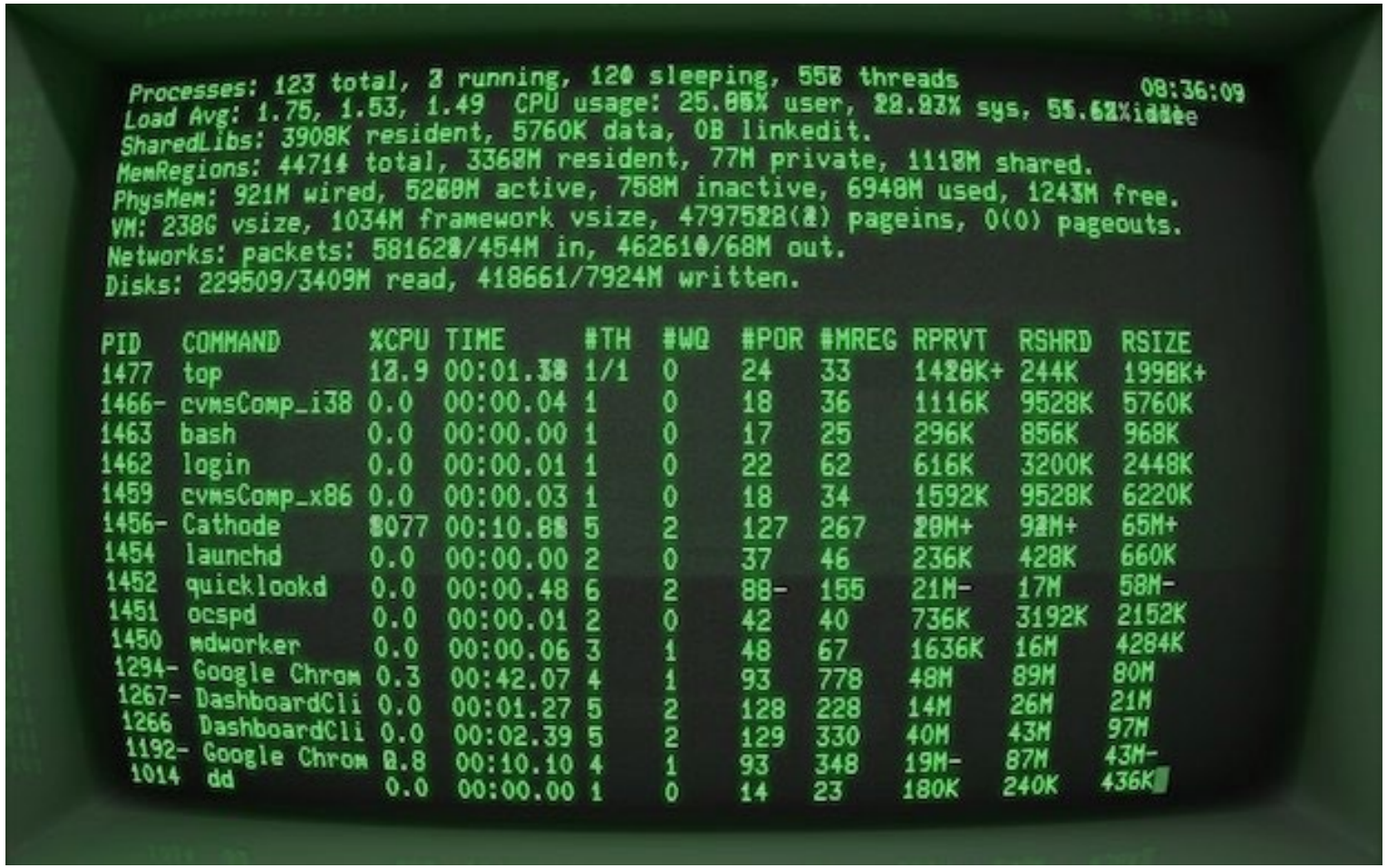




1950s

PURDUE UNIVERSITY

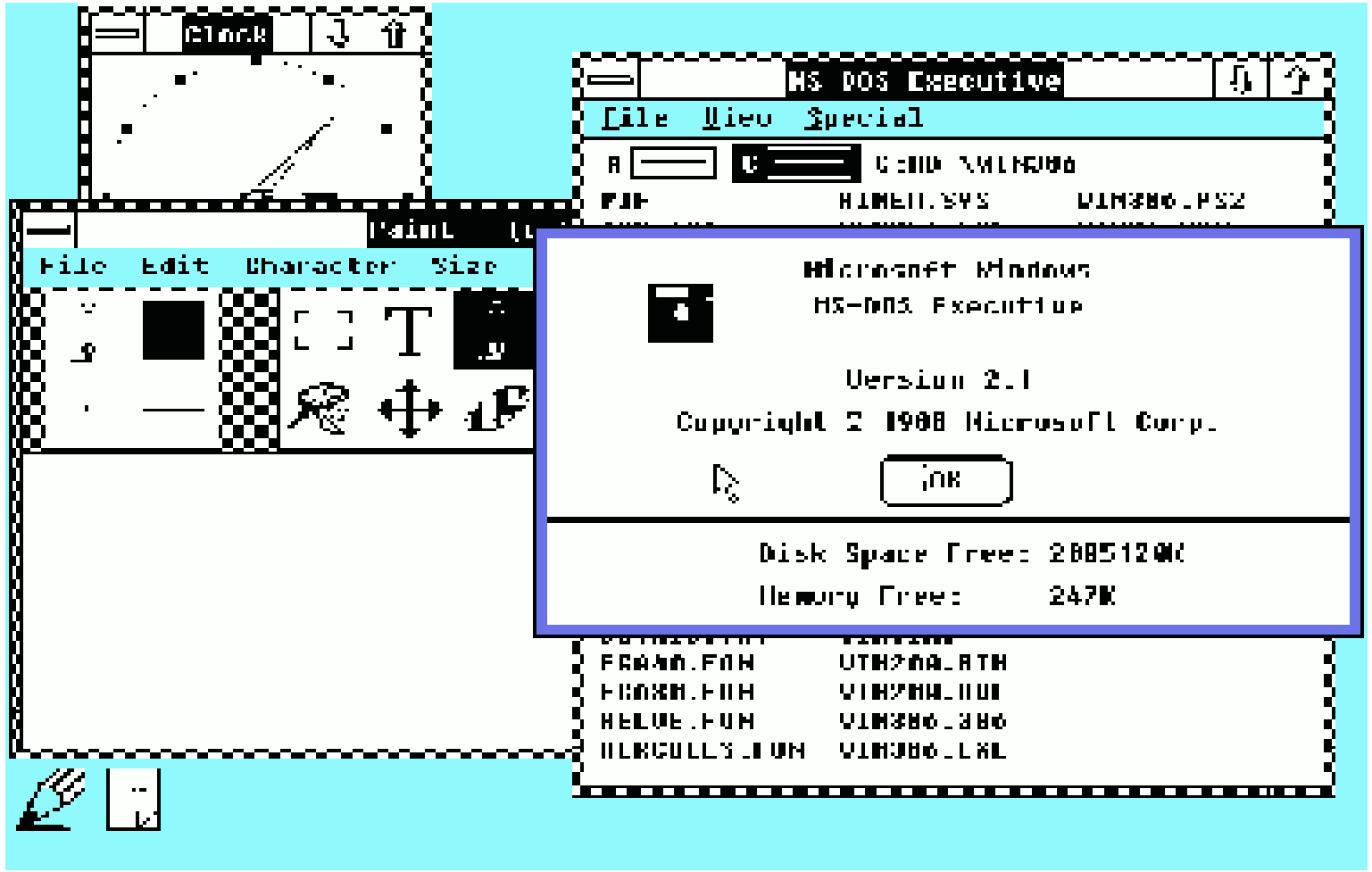
Transformations ...



1970s

PURDUE UNIVERSITY

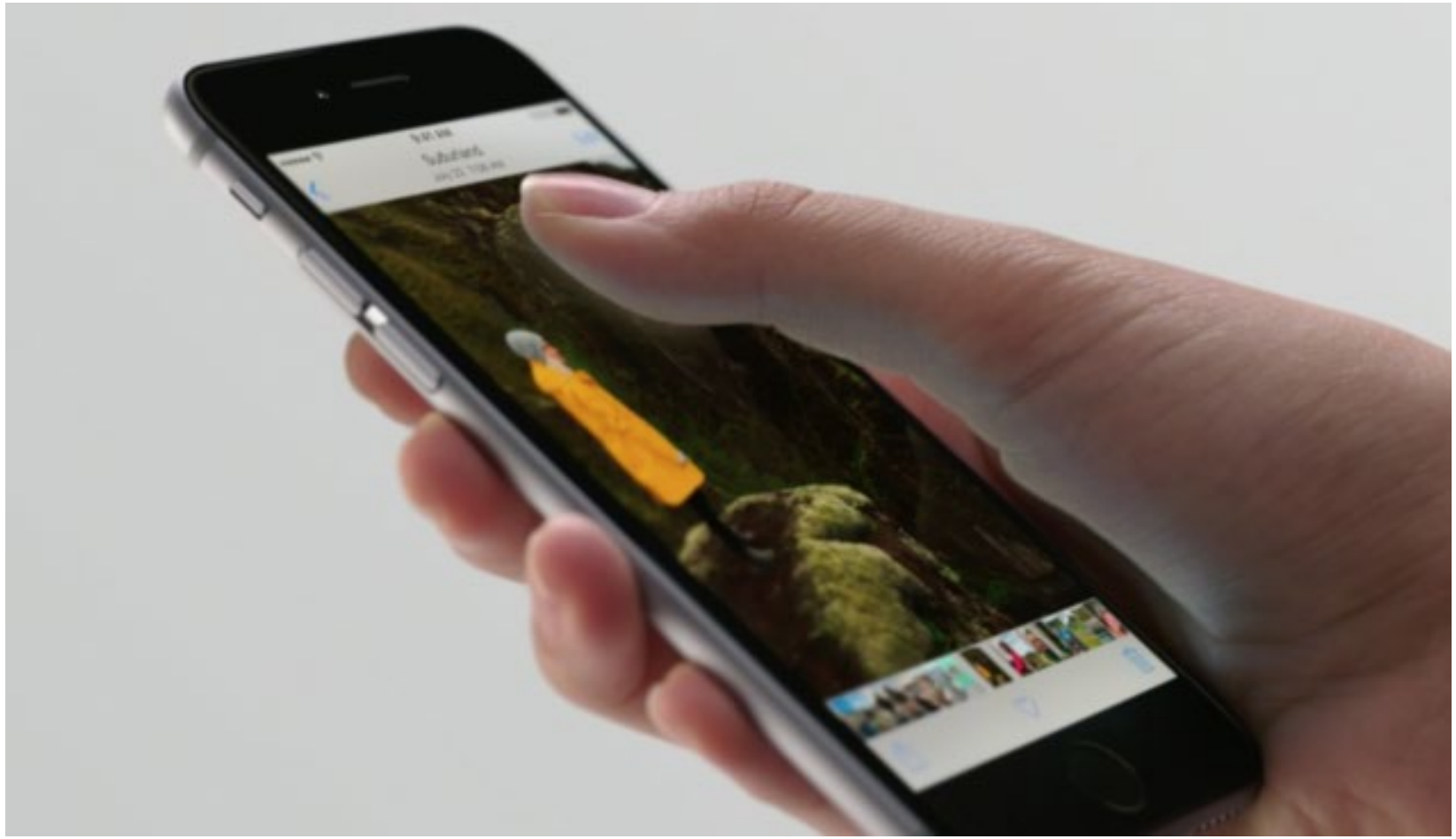
Transformations ...



1980s

PURDUE UNIVERSITY

Transformations ...



2000s

PURDUE UNIVERSITY

True remote collaboration?

Source: Spatial.is

PURDUE UNIVERSITY

Increasing digitization

Increased adoption of online tools and digital services for businesses across rural America could **create more than 360,000 jobs** in the next three years.

Increased adoption could **grow annual revenues of rural small businesses by more than 21%** over the next three years – the equivalent of $84.5 billion per year – with states in the South seeing the greatest benefit

Online tools and technology have the highest potential impact on rural small businesses with revenue under $100,000

Source: C_TEC

Source: Bureau of Economic Analysis

How Big Is the Digital Economy?

9.0% of U.S. GDP
or **$1.8 trillion** in 2018

What's included?

Goods and services that are primarily digital, plus e-commerce margins

6.8% average annual **growth**
from 2006 to 2018

Outpaced overall U.S. economic growth of 1.7%

8.8 million jobs in 2018

5.7% of total U.S. **employment**

$105,473
Average annual compensation per worker

bea
Bureau of Economic Analysis
U.S. DEPARTMENT OF COMMERCE

bea.gov/data/special-topics/digital-economy

PURDUE UNIVERSITY

Increasing benefits

- Broadband DOES matter for a whole host of social & economic outcomes!
  - Household income
  - Employment levels
  - Firm attraction
  - Farm profits
  - Civic engagement
  - Increased housing values

- <u>Adoption</u> is (arguably) more important than simple <u>availability</u>

- 100 Type 2 Diabetes patients recruited in Georgia
- A1c levels down 2.5% after 6 months
- $3,855 per patient per year in savings
- Increased quality of life among participants

Source: CoBank; FCC

PURDUE UNIVERSITY

Homework gap impacts ...

- 1 in 4 teens have limited broadband access
- 81% need fast internet for homework yet 43% struggle to complete homework
- 86% teens found jobs online
- 66% vs. 79% of teens without/with broadband → more income than parents

Source: 4-H; Microsoft

"Students with no access at home or dependent on cell phones alone performed lower on digital skills, homework completion, and grade point average."

Source: Michigan State University Quello Center

PURDUE UNIVERSITY

Houston, we have a problem ...

"Farms that contribute $80 billion to the U.S. GDP run on limited internet connections."

Source: United Soybean Board

PURDUE UNIVERSITY

Mobile only is not the solution ...

On average, U.S. households used **344 GB per month** during 2019

For a rural user on a fixed LTE service at the highest data tier this would cost **$3,190/month due to overages**

And users with an **unlimited plan** would be throttled to **0.6 Mbps for 95% of the month**

Source: OpenVault; Twitter user Ben Fineman (bfineman)

PURDUE UNIVERSITY

Community Development Key Concepts

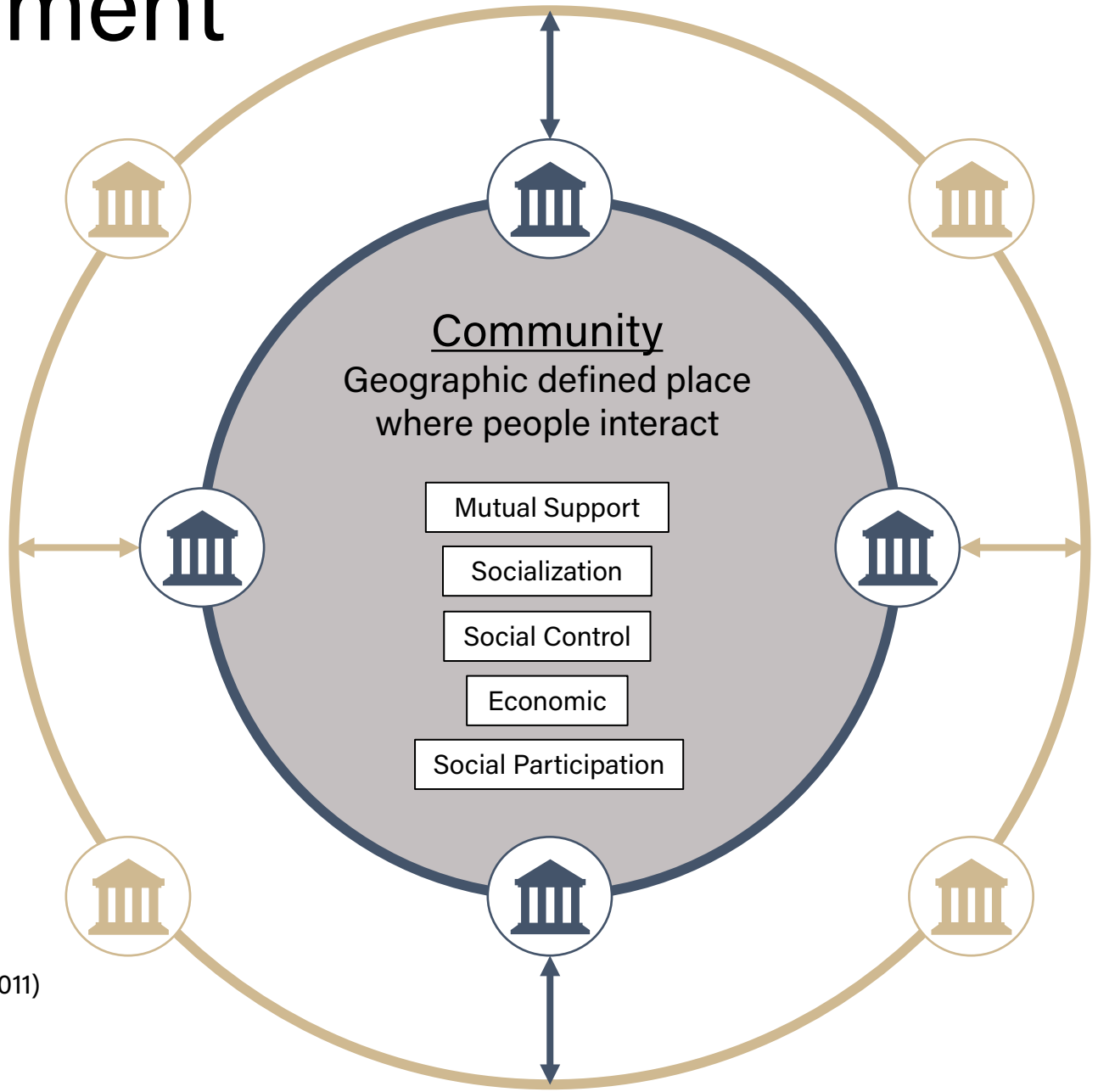
Communities carry out important activities and functions to serve its residents.

Institutions are rules and organizations, including informal norms, that coordinate human behavior and affect linkages.

Linkages are the capacity of communities to carry out major functions and these depend on the nature and strength of local institutions

Horizontal linkages happen between institutions (and people) at the local level achieved through partnerships and collaborations that help bring down silos

Vertical linkages happen between local institutions and external higher level (state, regional, national)



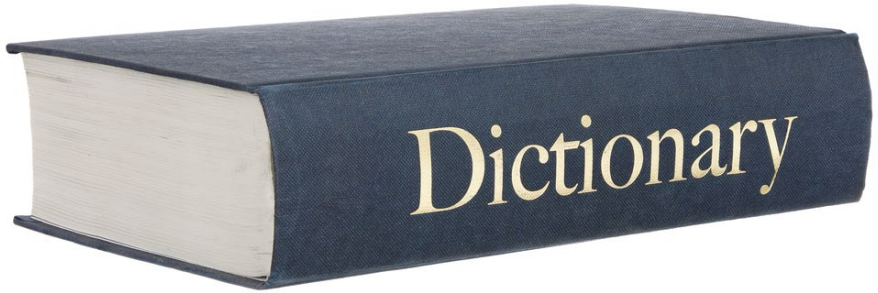
Source: Christenson & Robinson (1989); Robinson & Green (2010); Anglin (2011)

PURDUE UNIVERSITY

Community Development Definition

"Group of **people** in a **locality** initiating a social action process – i.e. **planned** intervention – to **change** their economic, social, cultural, and/or environmental **situation**."

Christenson & Robinson (1989)



PURDUE UNIVERSITY

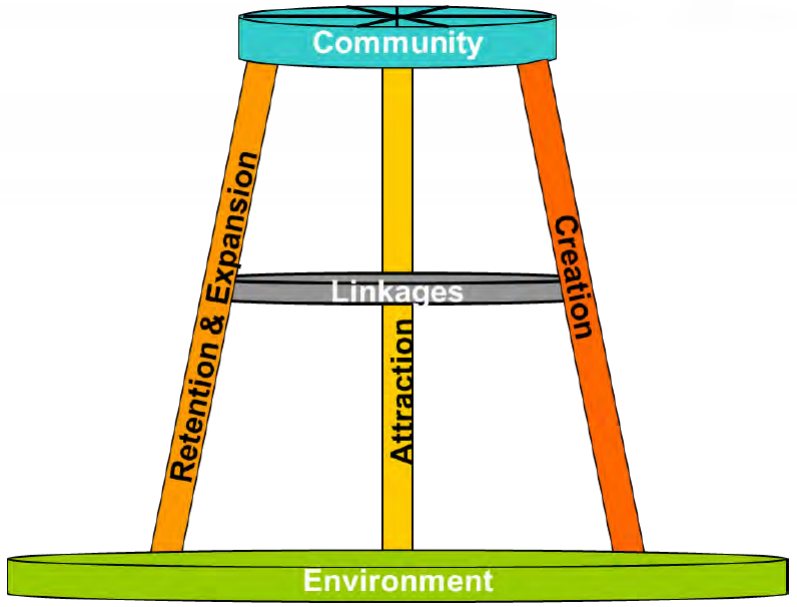
CARE Model

Create: entrepreneurship primarily

Attract: recruit external businesses

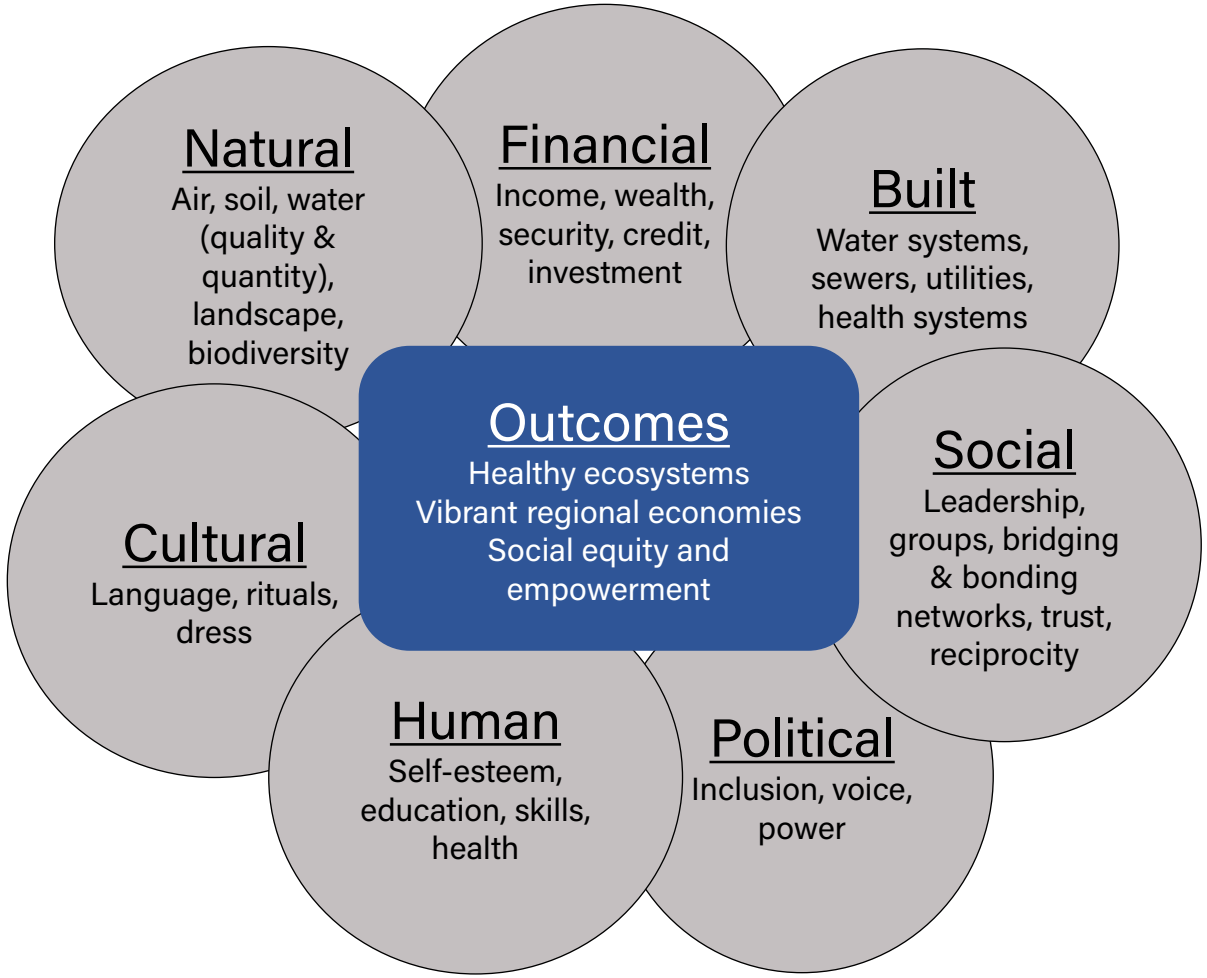
Retain: keep existing businesses

Epand: help existing businesses grow



PURDUE UNIVERSITY

Community Capitals



Source: Olson (2006)
cited in Jacobs (2007)

Jane Q. wants a walking trail in her community ...

Description	Capitals Involved
Takes leadership development class, learns new skills →	Human
Partners with local hospital that wants to implement wellness campaign →	Social
Works with local parks & recreation to identify land →	Natural
State senator informs of grant that can be used →	Political & Financial
Local tourism board likes the idea and provides additional funding →	Financial
City and county build trail infrastructure →	Built
Local historical society adds historic markers →	Cultural

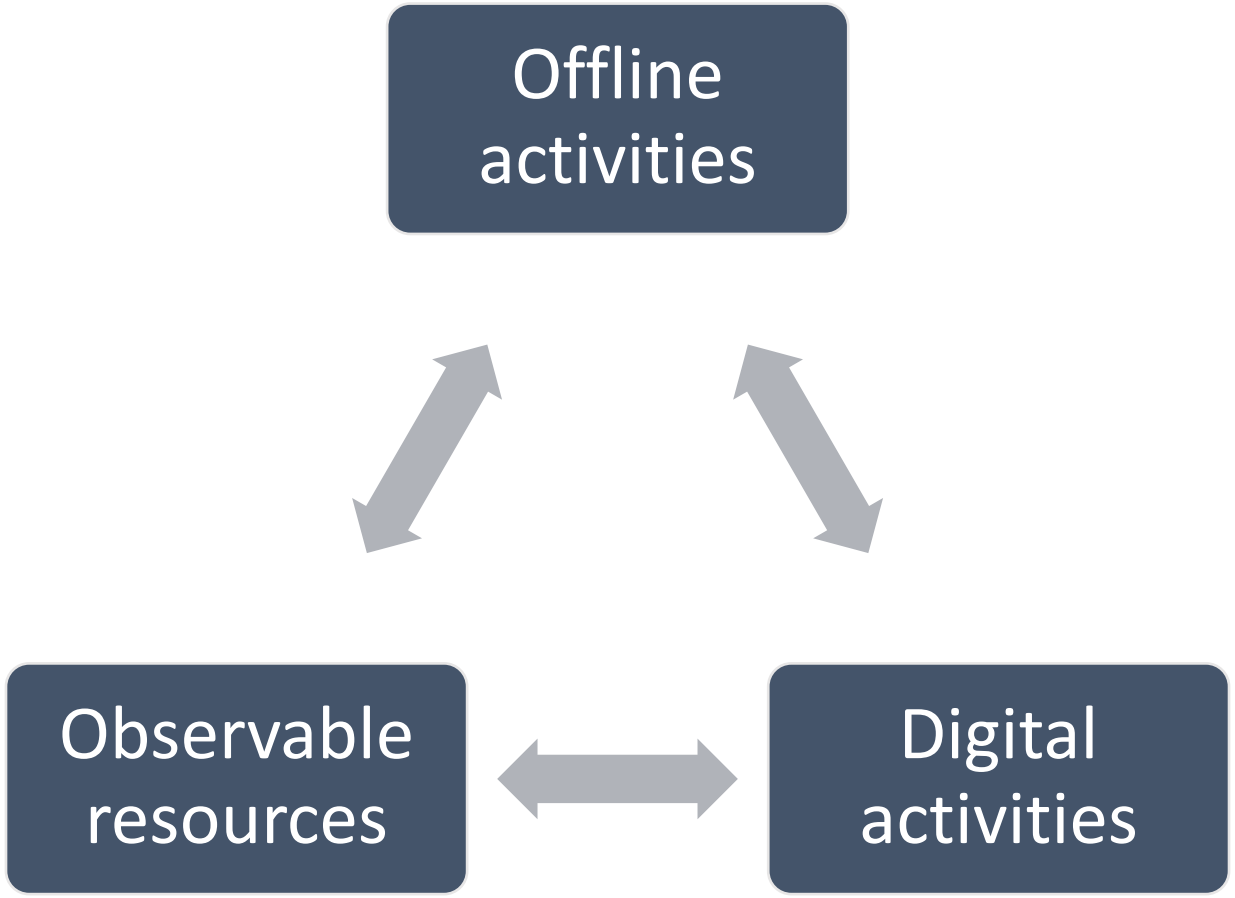
Source: Jacobs (2007)

PURDUE UNIVERSITY

Digital Capital

The accumulation of **digital competencies** (information, communication, safety, problem-solving) and **digital technology** (devices, connectivity, support, etc.)

Different levels influence quality of digital experience which in turn affect other capitals (economic, social, etc.)



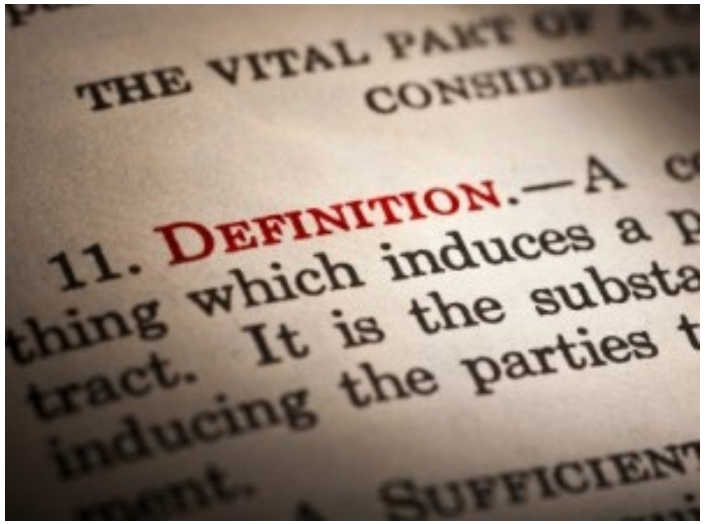
Source: Ragnedda (2018)

PURDUE UNIVERSITY

What is Digital Inclusion?

Refers to the adoption of broadband technologies and its meaningful use for social and economic benefits.

Source: Community Developments Investments Magazine, November 2018



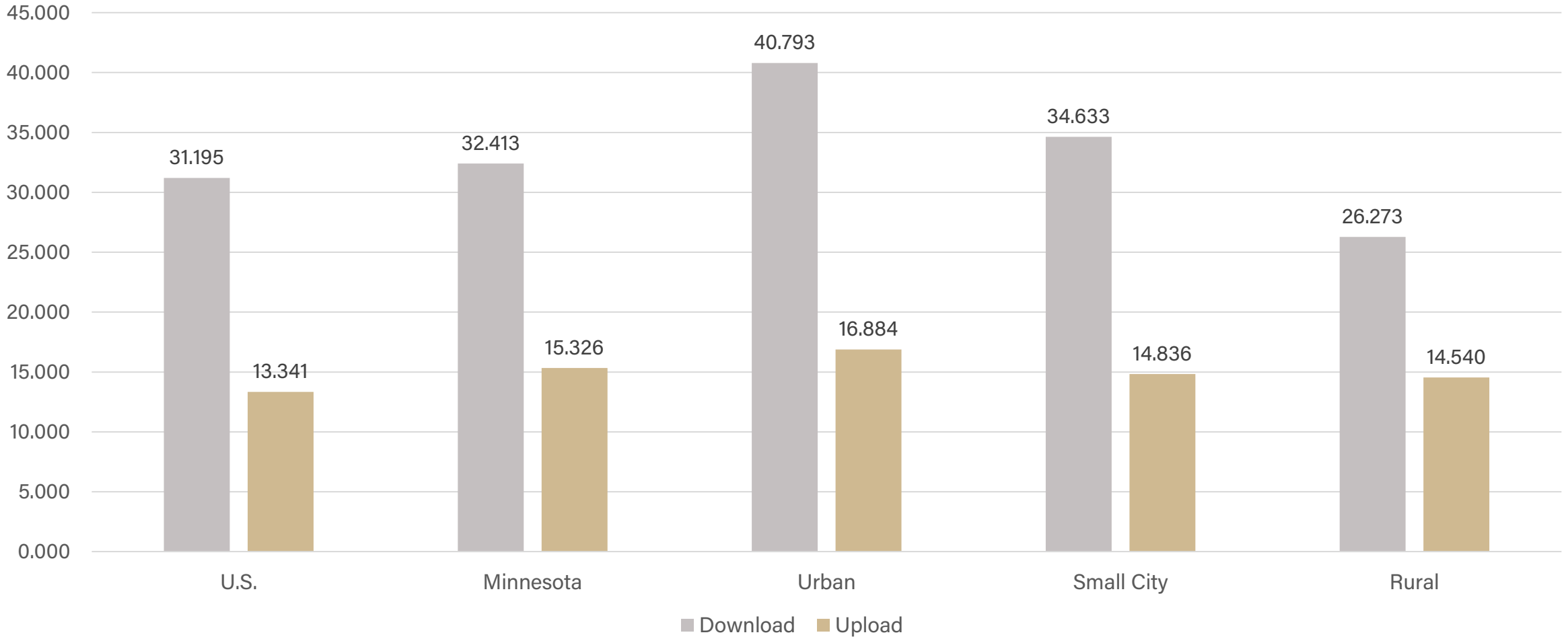
First-level divide: access yes/no

Second-level divide: differences in internet use

Third-level divide: economic, cultural, social, & personal outcomes

PURDUE UNIVERSITY

2019 M-Lab Speed Test Results by County Type (Mbps)



Source: M-Lab

PURDUE UNIVERSITY

2018 DIGITAL DIVIDE PROFILE

22.23
Digital Divide Index Score

Minnesota

The digital divide index score (DDI) ranges between 0 and 100, where a lower score indicates a lower divide. The infrastructure adoption score and the socioeconomic (see scores and indicators below) contribute to the overall DDI.

24.34 Infrastructure/Adoption Score

If this score is much higher than the socioeconomic score, efforts should be made to upgrade the broadband infrastructure.

11.5%
of people without access to fixed broadband of at least 100 Mbps down and 20 Mbps up

13.1%
of households with no internet access (not subscribing)

9.7%
of households without a computing device

25
median maximum advertised download speed in Mbps

6
median maximum advertised upload speed in Mbps

18.65 Socioeconomic Score

If this score is much higher than the infrastructure/adoption score, efforts should be made to focus on digital literacy and exposing residents to the benefits of the technology.

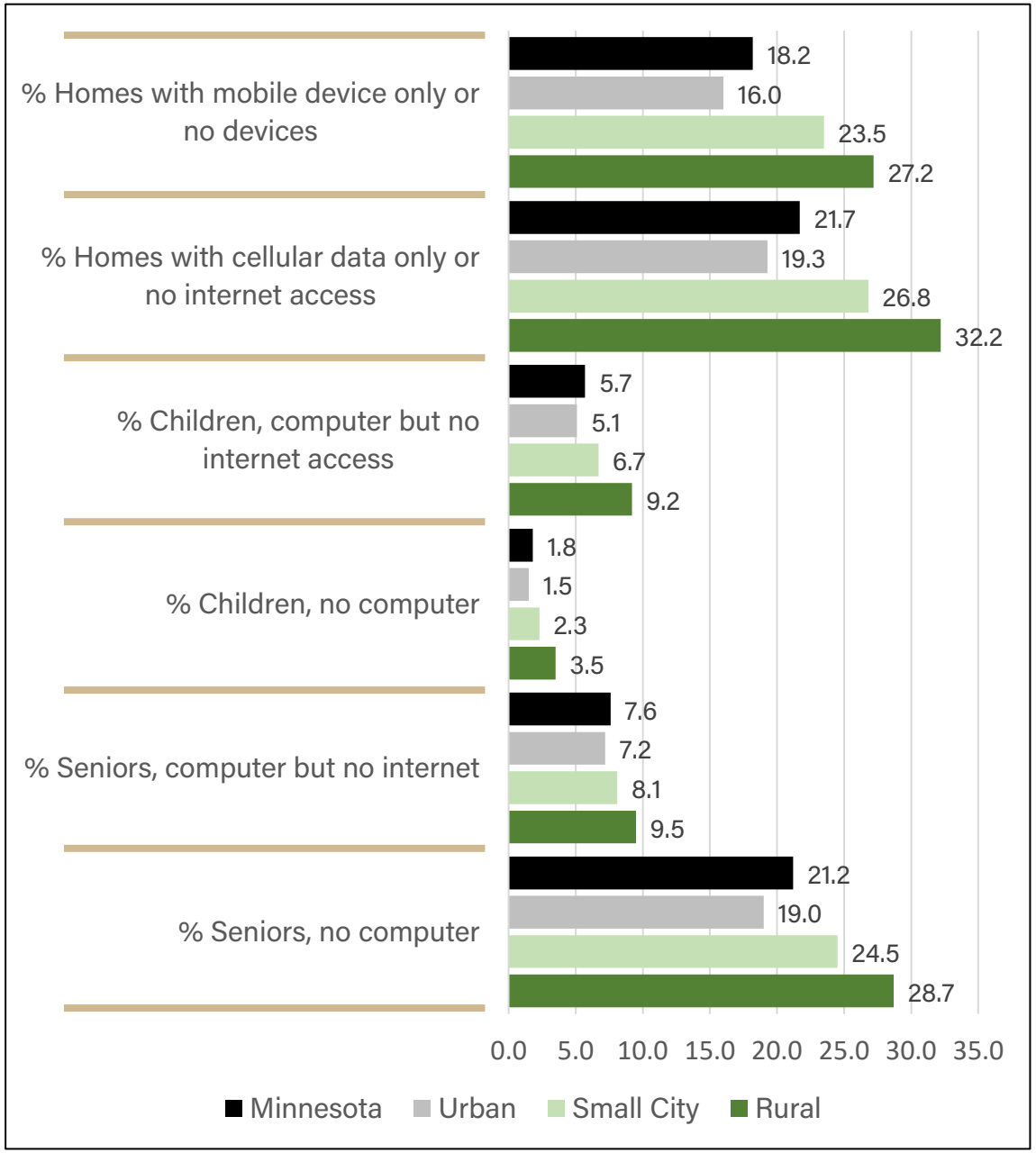
15.0%
population ages 65 and older

7.0%
ages 25 and older with less than a high school degree

10.1%
of individuals in poverty

10.8%
noninstitutionalized civilian population with a disability

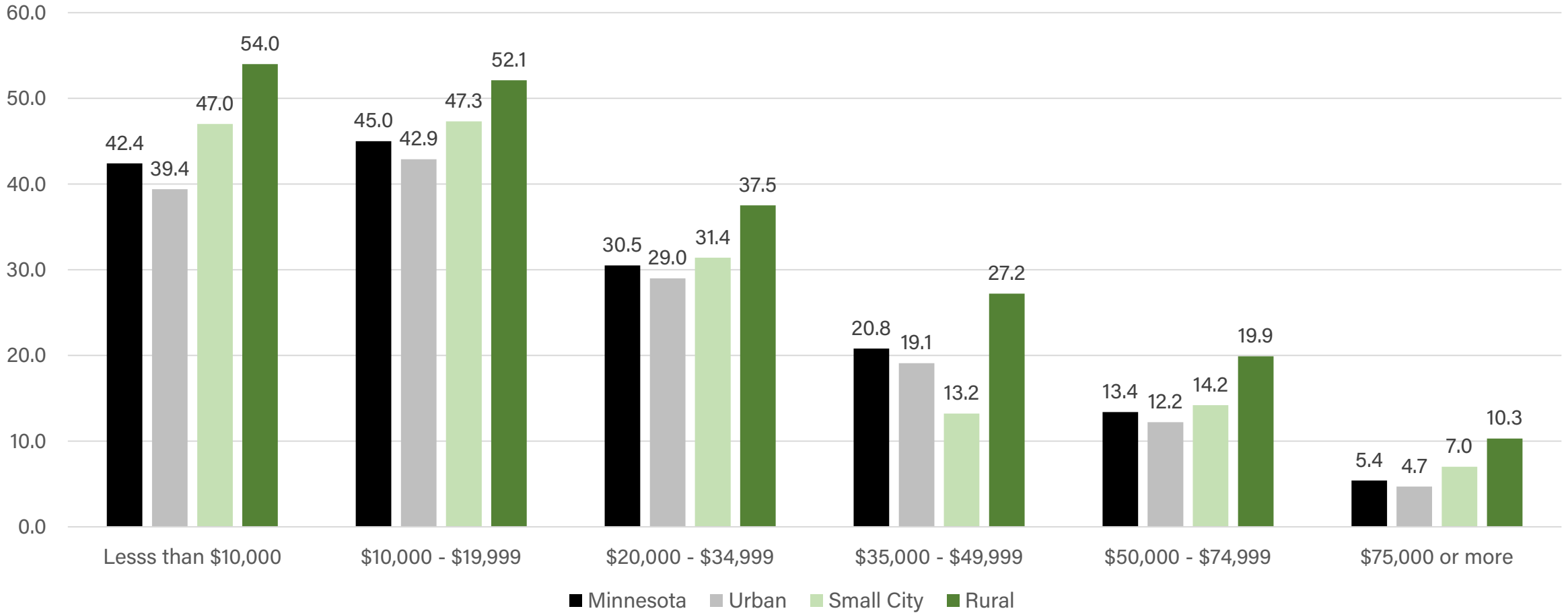
pcrd.purdue.edu/ddi



Source: ACS 2014-2018

PURDUE UNIVERSITY

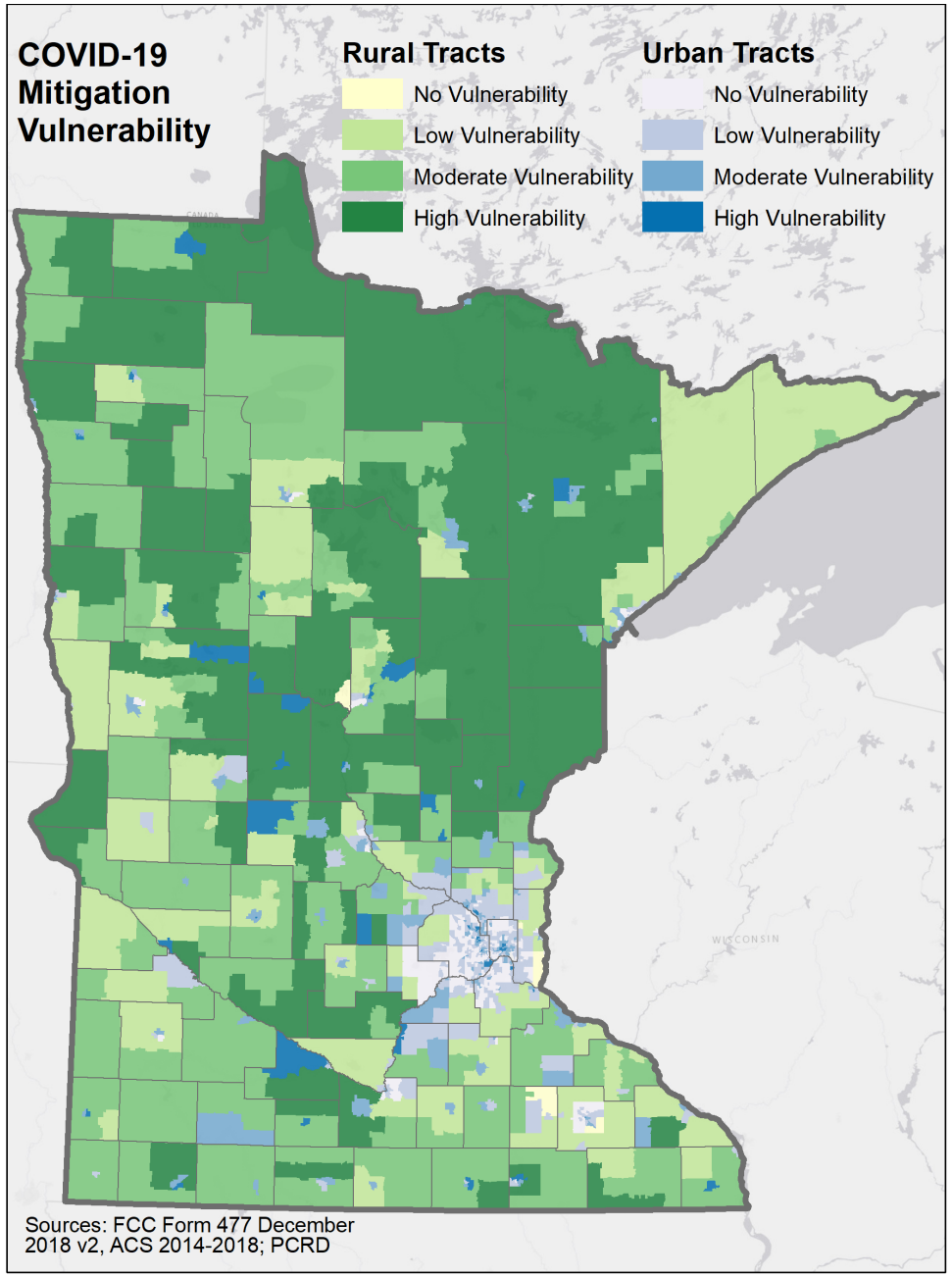
Digital Equity: % Homes with no Internet Access by Income and County Type



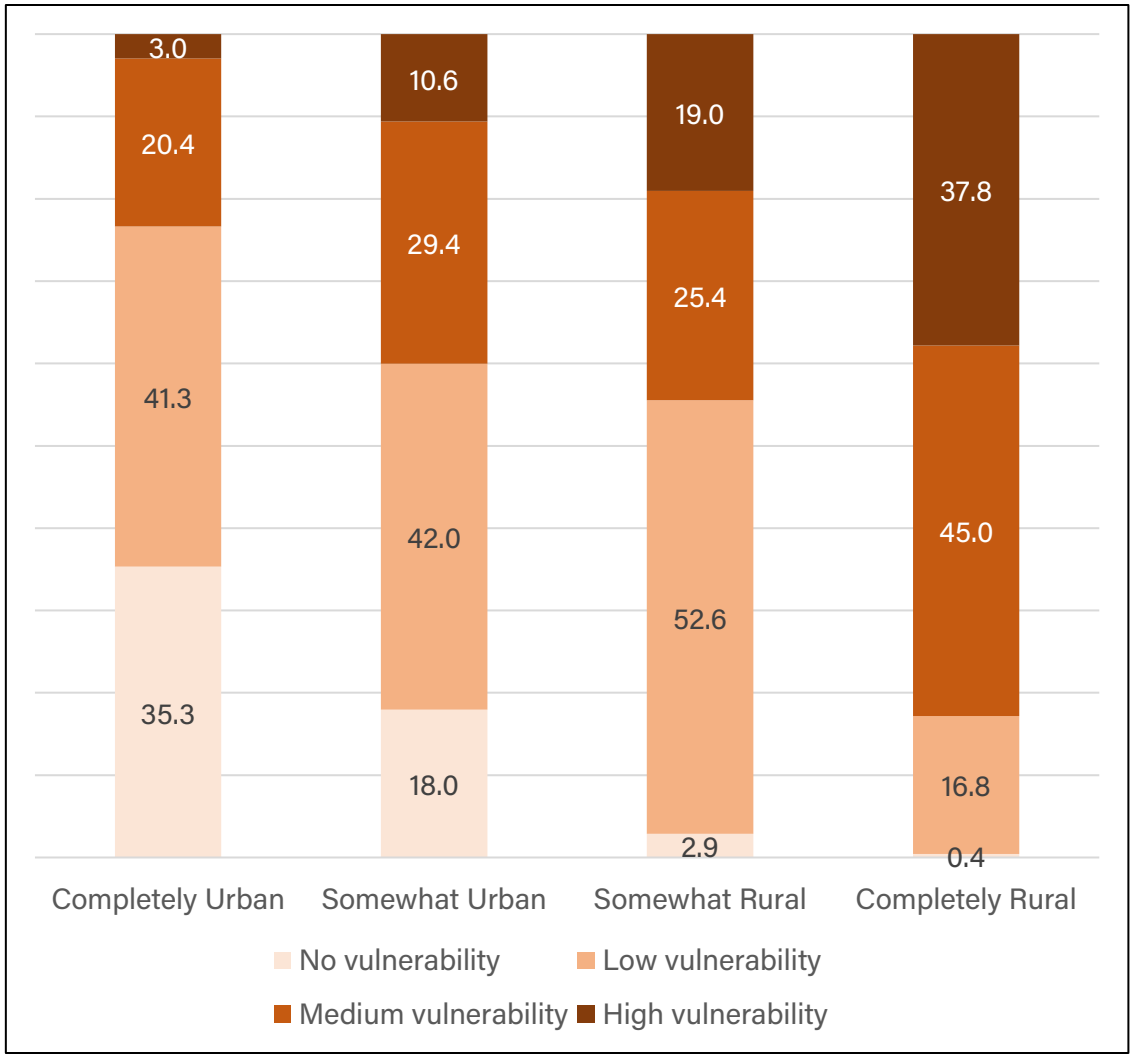
Source: ACS 2014-2018

PURDUE UNIVERSITY

COVID-19 Mitigation Vulnerability

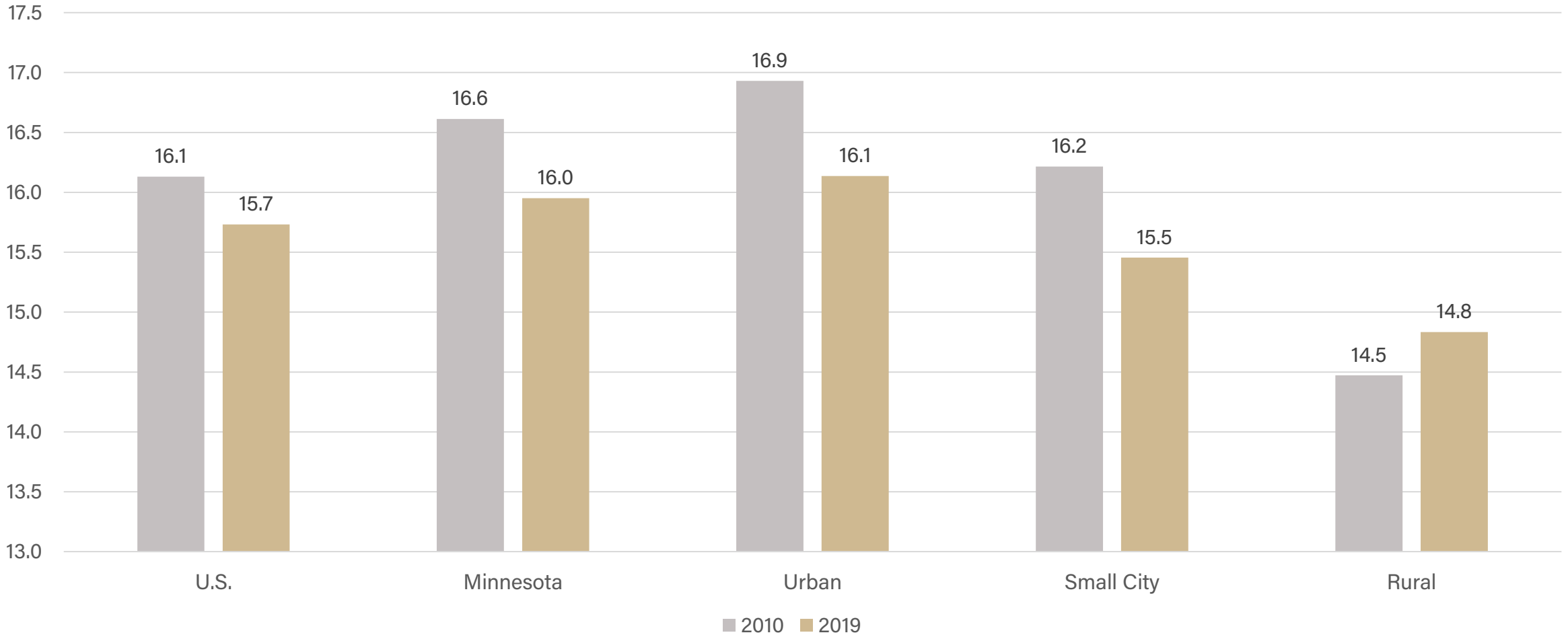


Share of Minnesota households by neighborhood type and COVID-19 vulnerability level



PURDUE UNIVERSITY

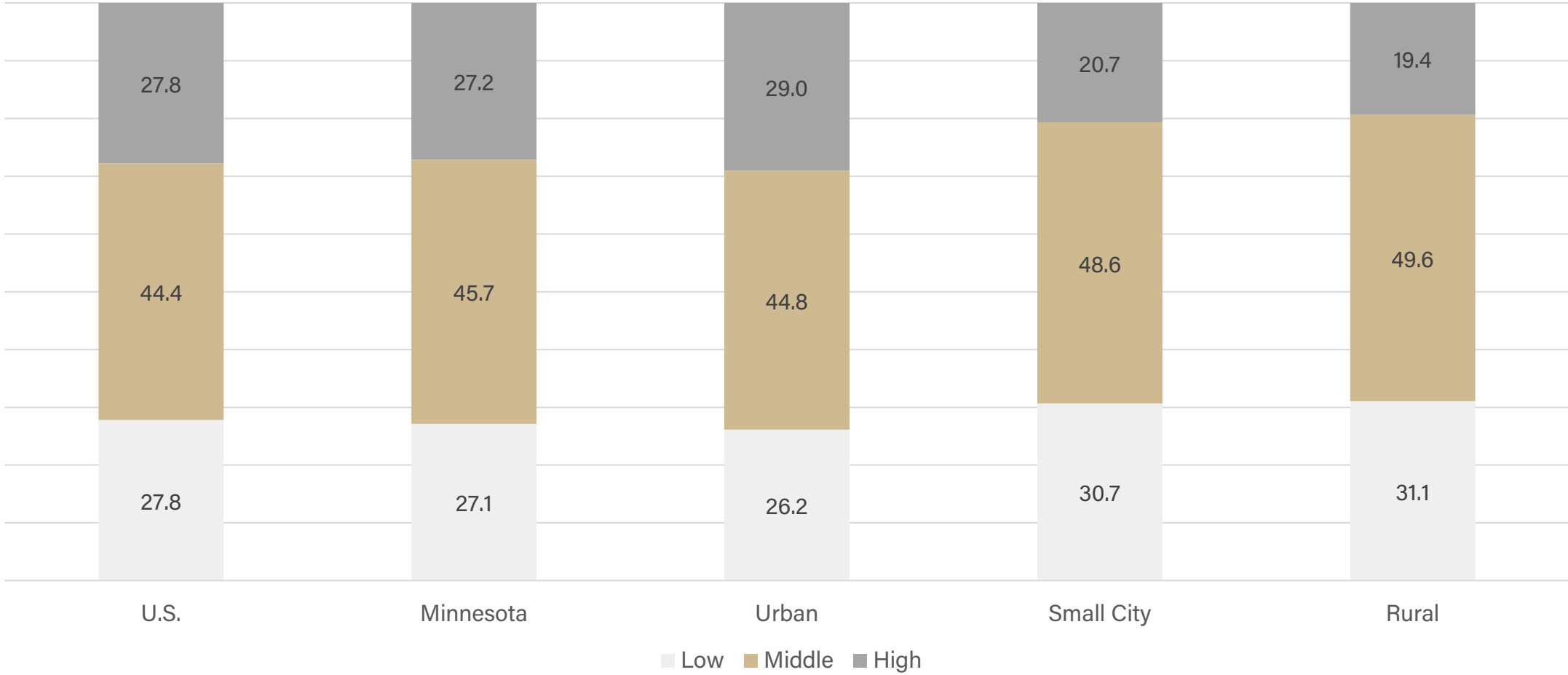
2010 & 2019 Share of Digital Economy Jobs by County Type



Source: BEA; EMSI

PURDUE UNIVERSITY

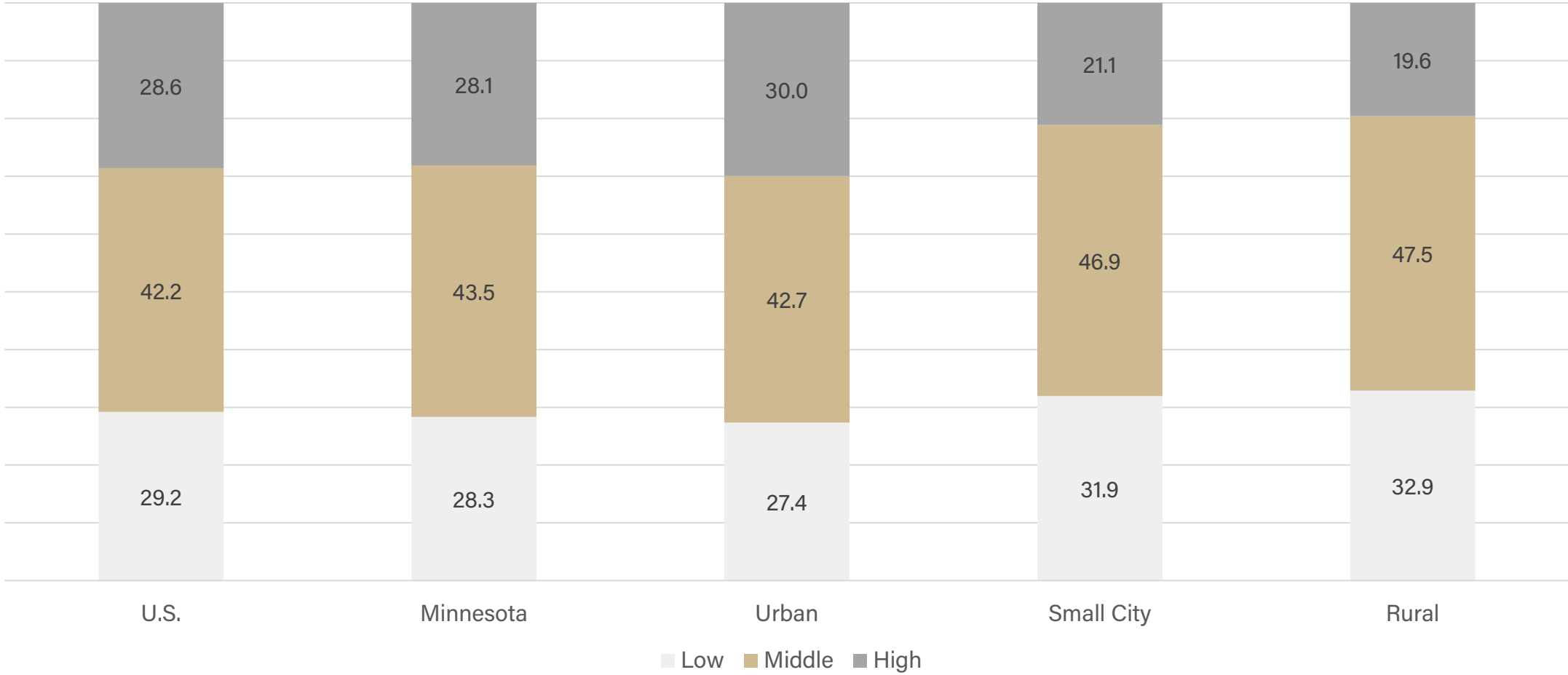
2010 Share of Low, Middle, and High Digital Skill Jobs by County Type



Source: Brookings; EMSI

PURDUE UNIVERSITY

2019 Share of Low, Middle, and High Digital Skill Jobs by County Type



Source: Brookings; EMSI

PURDUE UNIVERSITY

Community Digital Transformation Components

- Mindset
- Leadership
- Capacity building
- Empower residents
- Relevant applications
- Improve communication

Community Implications

1. Industrial age assumptions no longer hold; look inward
   - ❖Diversify priority areas (e.g. manufacturing)
   - ❖Digital Entrepreneurial Ecosystem

2. Make digital inclusion a priority
   - ❖Gather relevant data (infrastructure, skills, use)
   - ❖Ensure existing businesses can compete in digital economy
   - ❖Proactively manage community's online reputation

3. Placemaking (minimum viable millennial product or MVMP)
   - ❖Historic/cultural assets
   - ❖Walking/bike trails, libraries, coffee shops

PURDUE UNIVERSITY

Community Implications (cont'd)

4. Telework friendly policies

5. Repurpose workforce development
   - ❖Continuous learning
   - ❖Soft skills
   - ❖Remote work skills

6. Make community more responsive and engaging
   - ❖Don't make residents get in line for something that can be done online

7. Improve leadership pipeline; engage youth

PURDUE UNIVERSITY

Telework friendly community

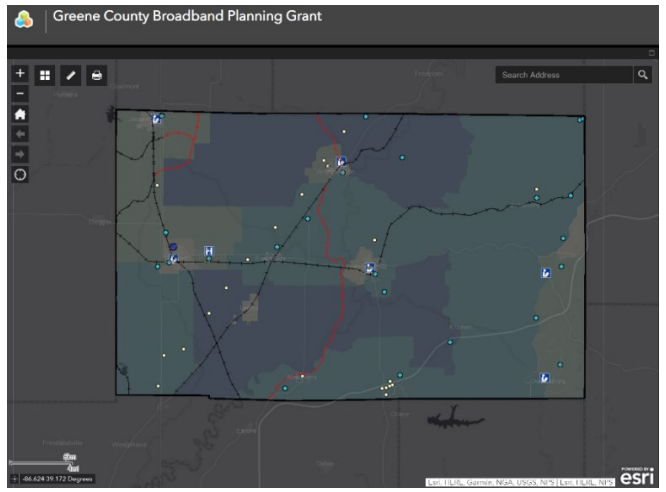
- Existing businesses: incentivize existing business to hire teleworkers
- Business attraction (not physically!): incentivize out of state businesses to hire teleworkers in your state
- Workforce development: provide remote working skills to workers
- Broadband availability and affordability: improve connectivity and offer subsidies to remote workers

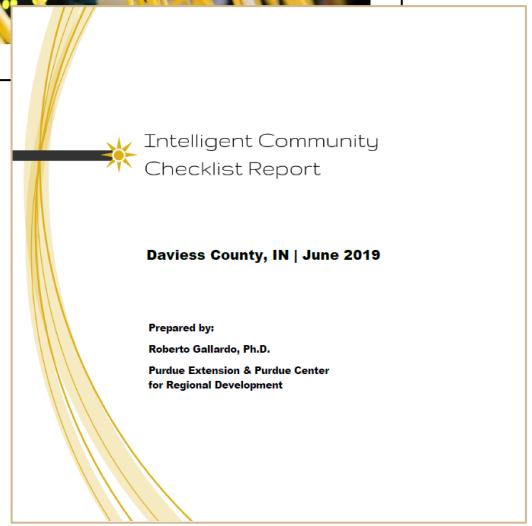
Source: Gallardo & Whitacre (2018)

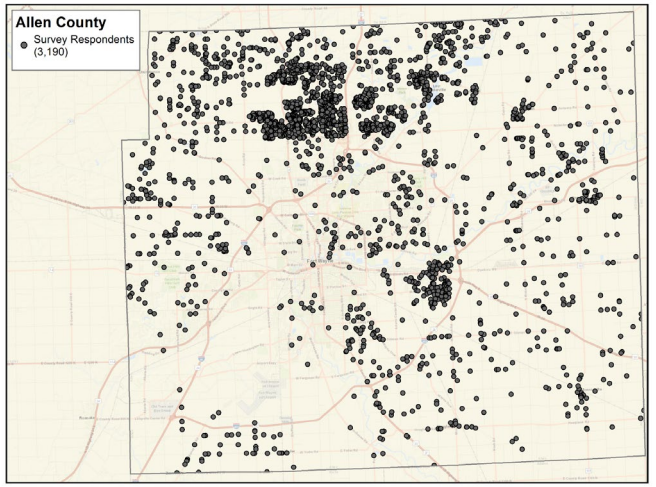
PURDUE UNIVERSITY

What is PCRD/Extension doing? Community Engagement

- Comprehensive Digital Inclusion Plan
- Digital Divide Index
- COVID Mitigation Vulnerability
- 4 Intelligent Community checklists completed
- 2,500+ household data validation survey completed
- 5 interactive maps
- 4 state of broadband reports completed







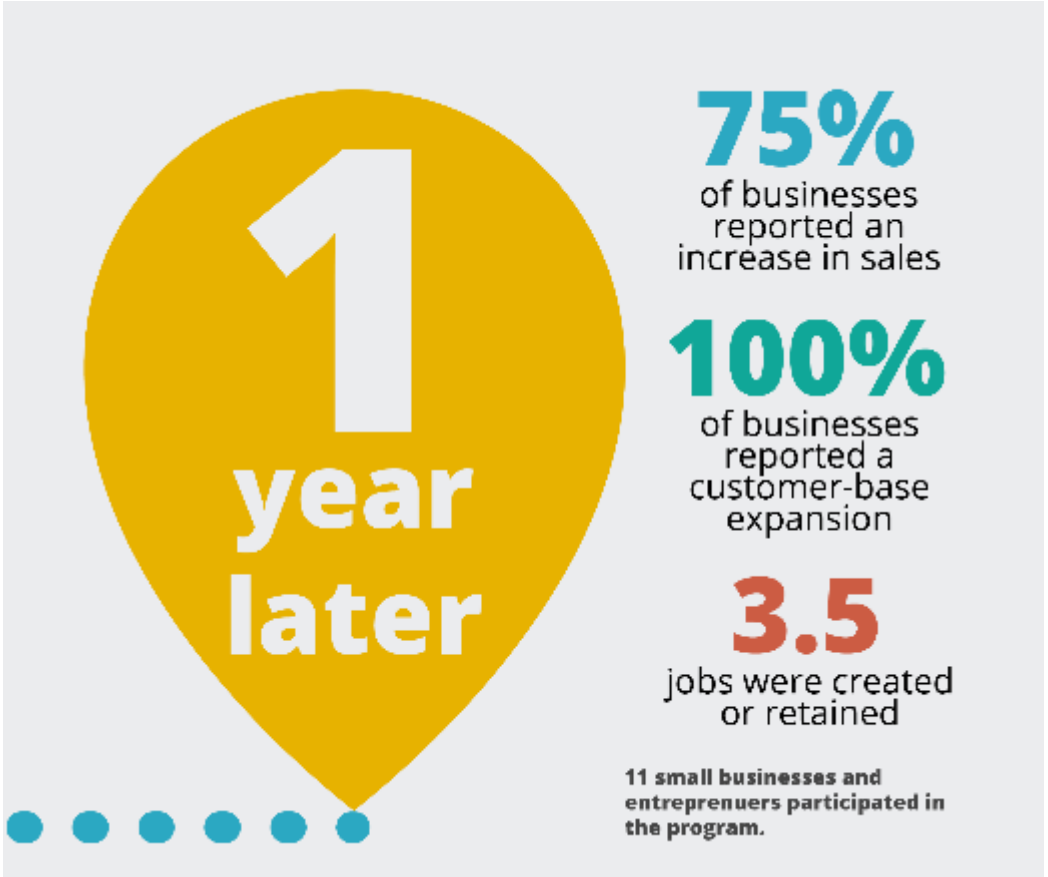
PURDUE UNIVERSITY

What is PCRD/Extension doing? Digital Ready Businesses

PURDUE EXTENSION | COMMUNITY DEVELOPMENT
DIGITAL READY
Expanding Your Community's Online Presence

- From April 2018 through September 2019
- 22 extension educators trained; 16 counties; 89 workshops; 100+ businesses
- Online version & certification
- Android/iOS app study guides

https://cdext.purdue.edu/dr



PURDUE UNIVERSITY

What is PCRD/Extension doing?
Remote Work Certification

- Four-week online course
- Provides skills to remote work
  - W-2
  - Freelancer
  - Self-employed
- Workflow
- Productivity & time management
- Teams
- Critical thinking

What is PCRD/Extension doing? Digital Ready Community

- Objective: improve civic engagement and responsiveness
- Improve or expand community's online presence
- Identify and create a digital asset group (DAG)
- Design & implement a digital engagement plan

PURDUE UNIVERSITY

Essential Digital Employability Skills (EDES)

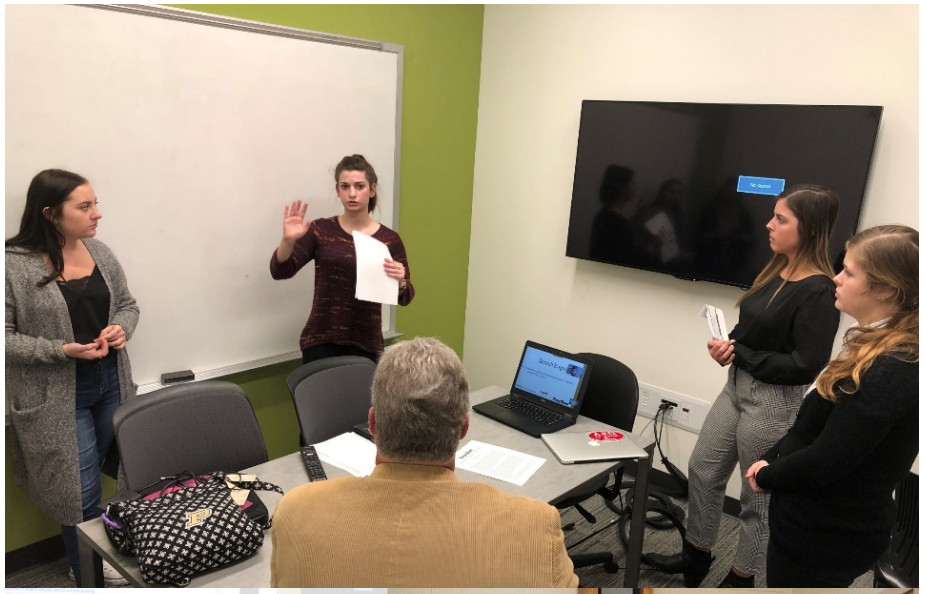
Provide employability digital skills through online modules

- Connect and collaborate effectively
- Communicate effectively
- Project management
- Purdue-backed badge/certificate

PURDUE UNIVERSITY

iFrontDoor

- What is your community's online reputation?
- Partnership with Lamb School of Communication & Agricultural Communication
- Conduct online audit/assessment
- Develop/implement plan



https://pcrd.purdue.edu/ifrontdoor

PURDUE UNIVERSITY

Is your community digital inclusive?

PURDUE UNIVERSITY

How can we help?

Purdue Center for Regional Development

Phone: 765-494-7273
Web: pcrd.purdue.edu
Twitter: @PCRD
Facebook: /purdueCRD