



The Power of Technological Innovation in Rural America

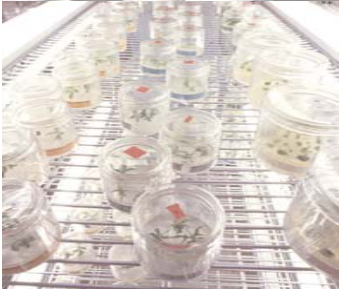
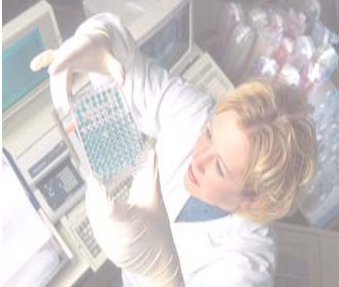
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Ag and Natural Resources Conference
IBC Education Foundation
April 17, 2008

The views expressed are those of the author and do not necessarily reflect the opinions of the Federal Reserve Bank of Kansas City or the Federal Reserve System.

Today's Outline

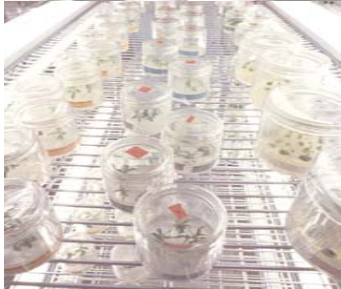
- Innovation:
 - What is it?
 - Why is it important?
- Rural Innovative
 - Half-truths and misunderstandings
 - A new perspective
- Foundations for Future Innovation





What is Innovation?

- Innovation is **NOT** an invention.
- Innovations are **commercialized** inventions that generate **new economic value** in the marketplace.



Three Impacts of Innovation

- Innovations ...
 - Create New Products



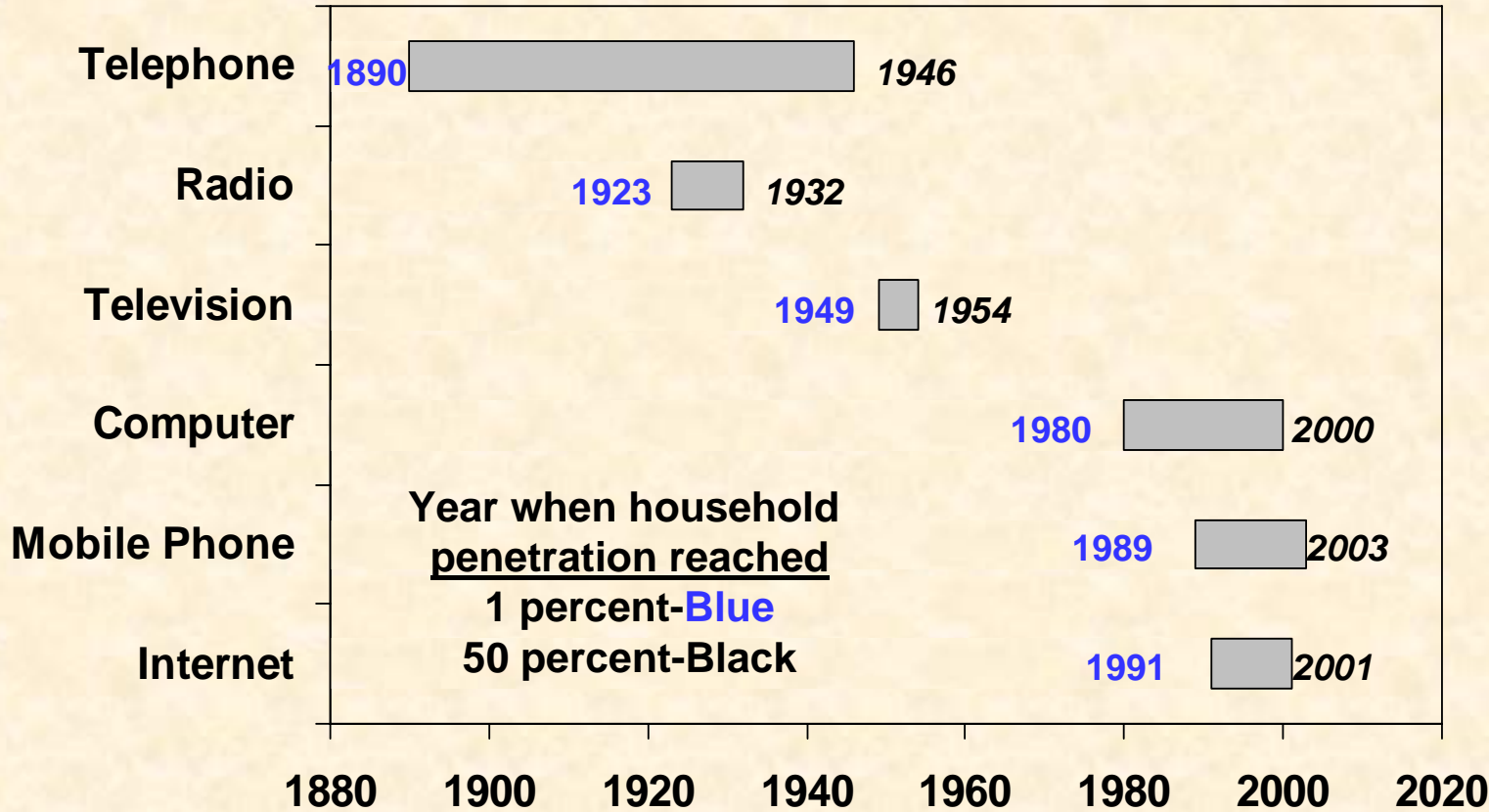
Major Innovations by Small U.S. Firms

- | | |
|--------------------------------|-------------------------------|
| Acoustical suspension speakers | Heart valve |
| Aerosol can | Heat sensor |
| Air conditioning | Helicopter |
| Airplane | High capacity computer |
| Artificial skin | Hydraulic brake |
| Automatic fabric cutting | Piezo electrical devices |
| Biosynthetic insulin | Pressure sensitive cellophane |
| Continuous casting | Rotary oil drilling bit |
| Cotton picker | Safety razor |
| Fluid flow meter | Soft contact lens |
| Geodesic dome | Six-axis robot arm |
| Gyrocompas | Spectrographic grid |

Source: NCOE, *Embracing Innovation: Entrepreneurship and American Economic Growth*



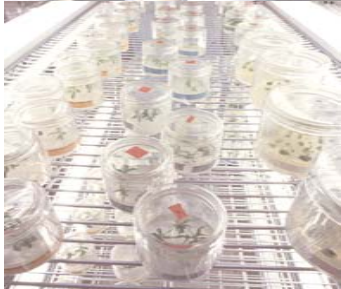
People Adopt Technology Quickly



Source: Goldman Sachs Economic Research calculations based on Dept of Commerce data.
US Economics Analyst, Iss. 05/06 Feb. 11, 2005

Glad Corn, Mountain Lake, Minnesota





Three Impacts of Innovation

- Innovations ...
 - Create New Products
 - Improve Production Processes

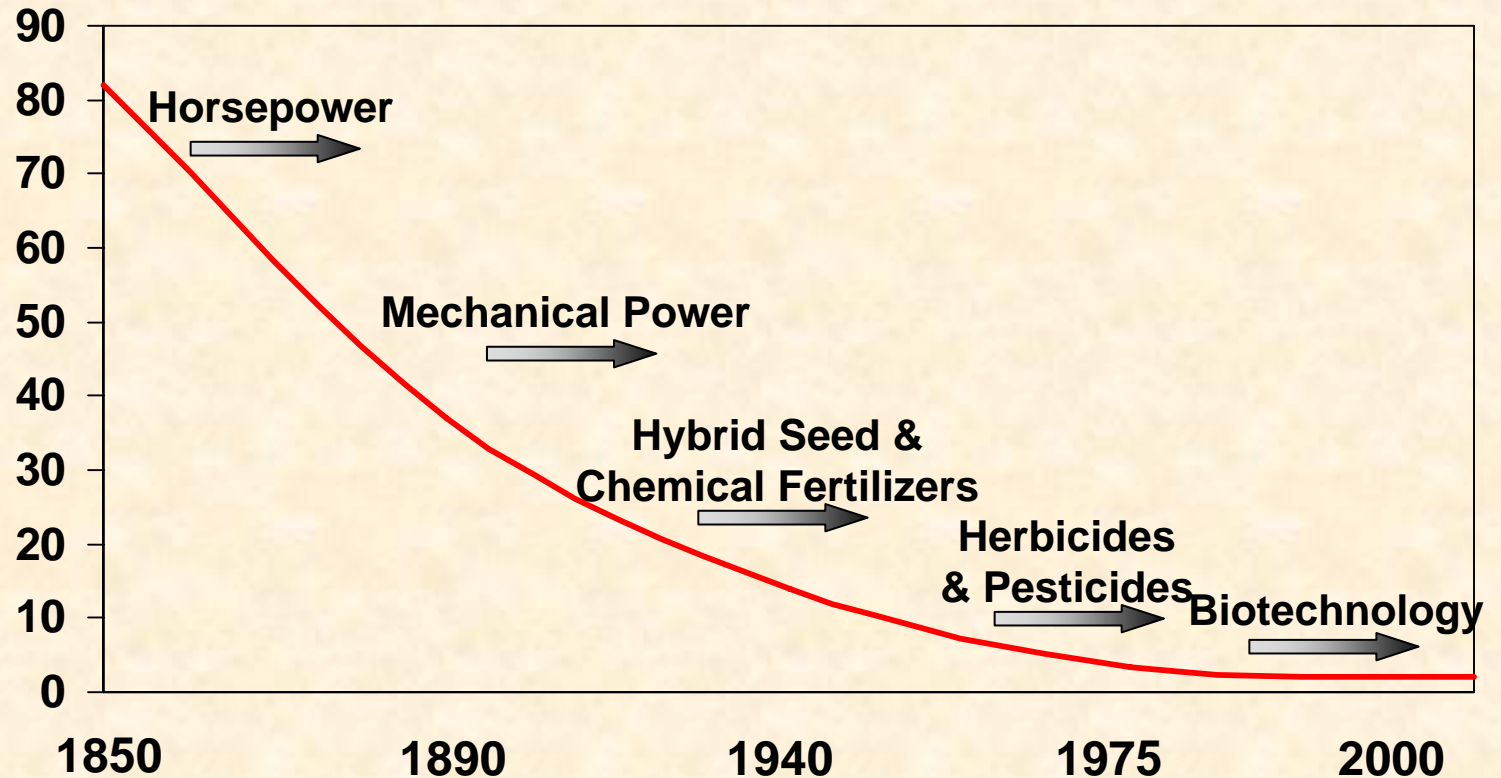
This is Not 21st Century Agriculture



Technological Innovations Boost Efficiency

Labor Needed for U.S. Corn Production

Hours to produce 100 bushels of corn

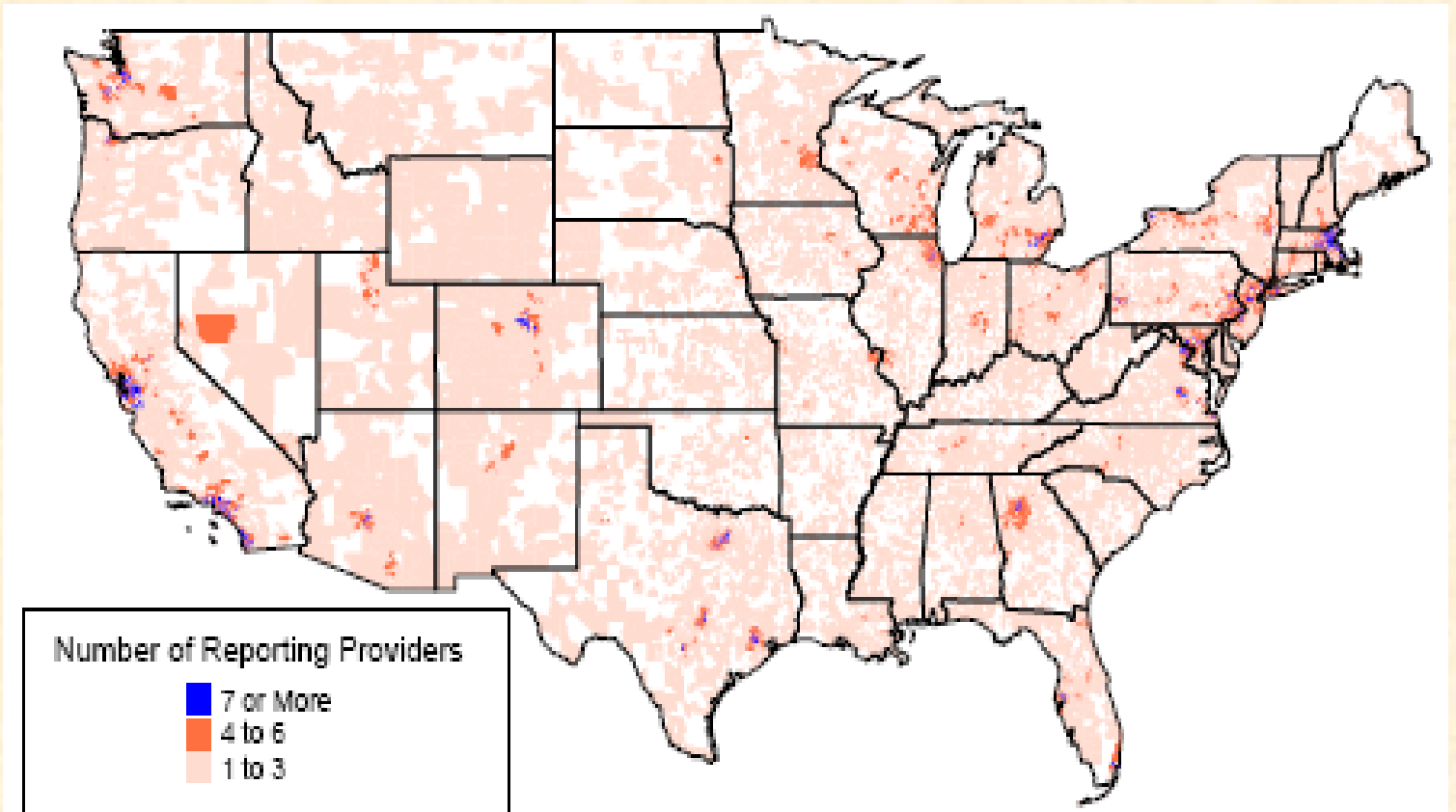


Source: USDA





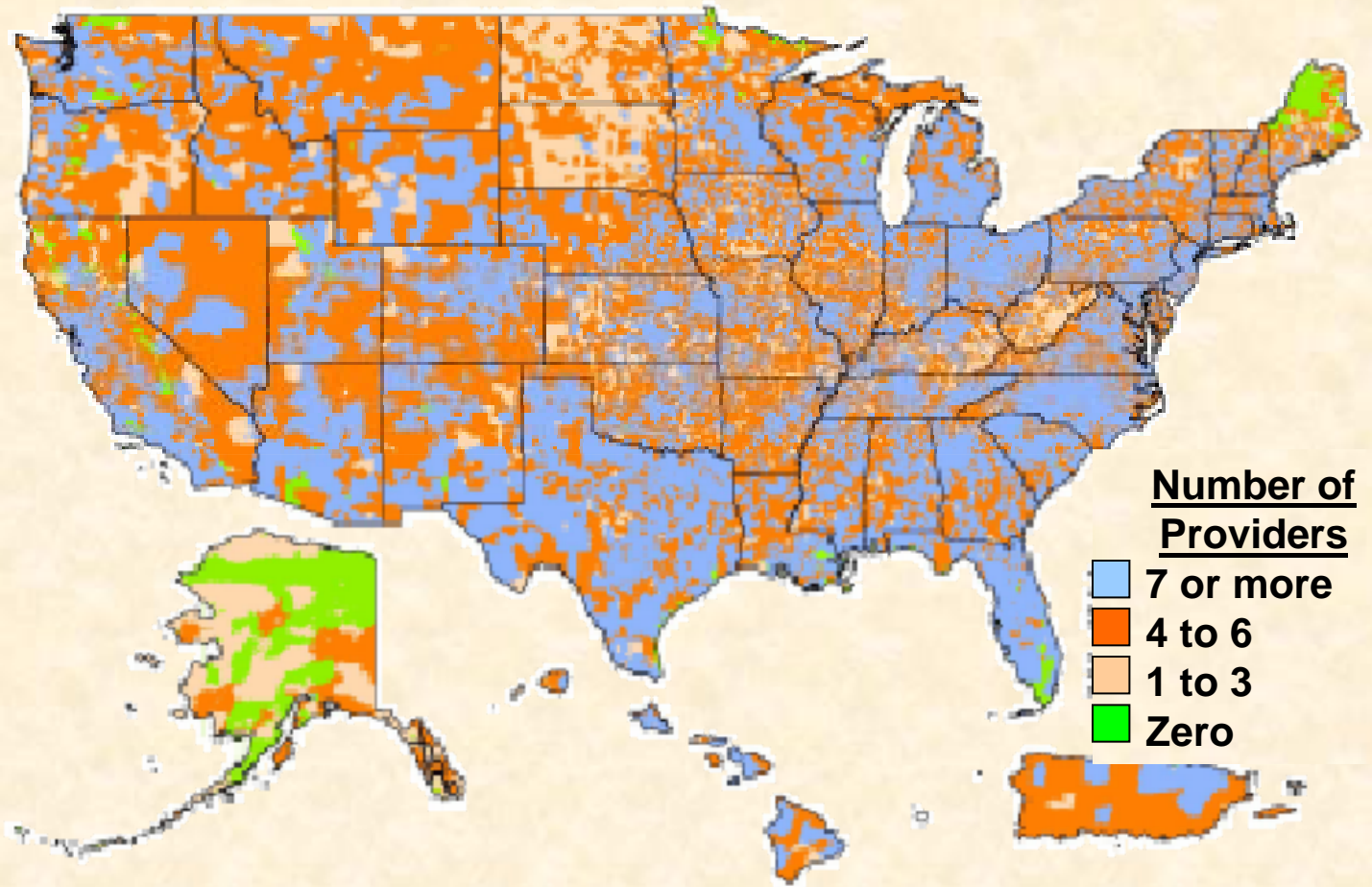
High Speed Internet Coverage June 2000



Source: FCC



High Speed Internet Coverage June 2007



Prepared by Federal Communications Commission
 Division of Competition, Bureau of Industry and Technology Analysis

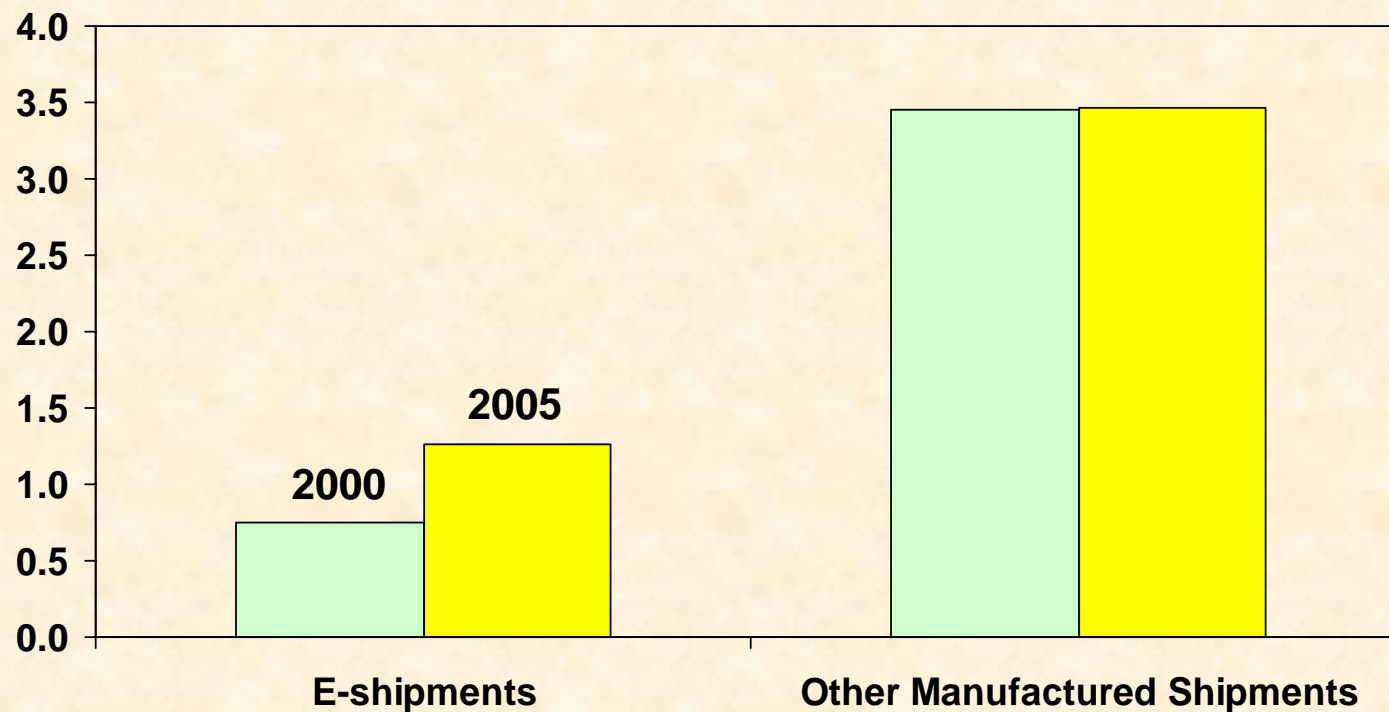
Source: FCC



The Internet is Changing How Manufacturers Sell to Other Businesses.

U.S. Manufactured Shipments

Billion dollars



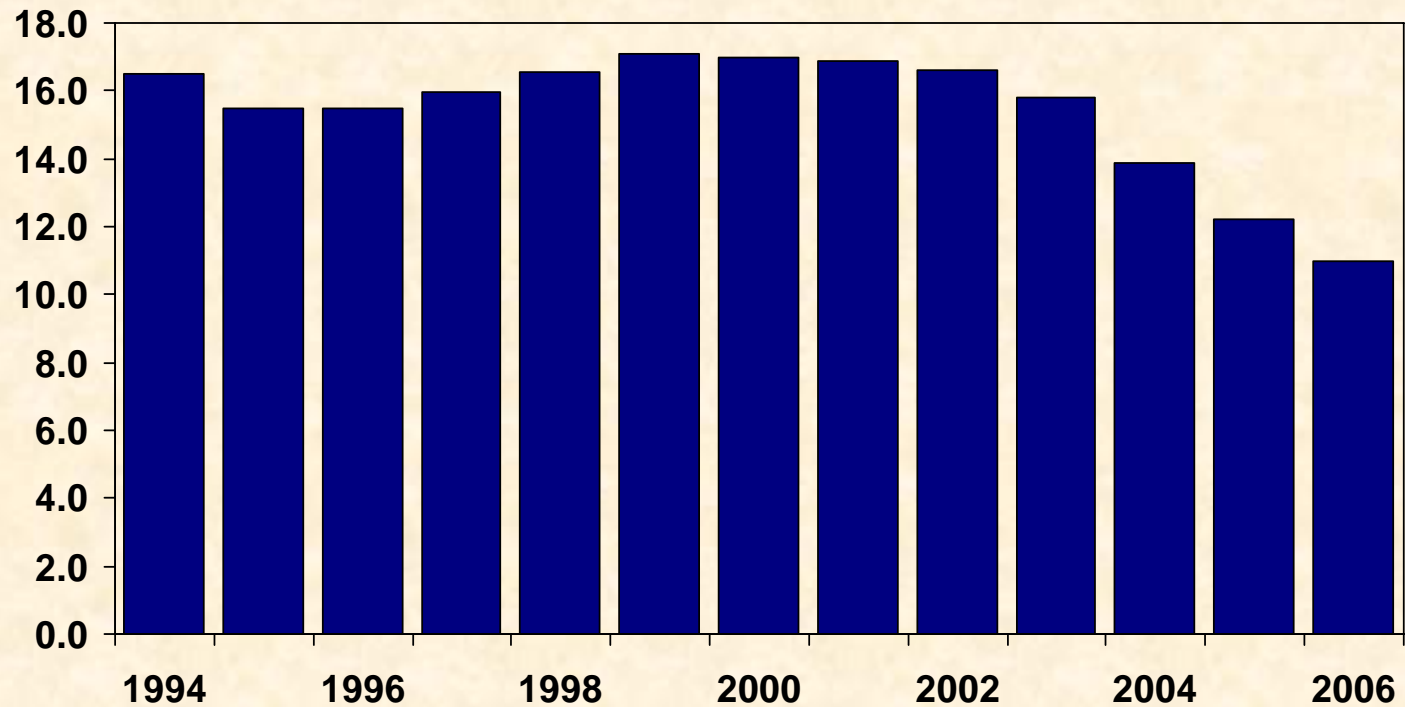
Source: Census Bureau



E-commerce is Changing the Payments Business

Checks Handled by Federal Reserve

Million pieces

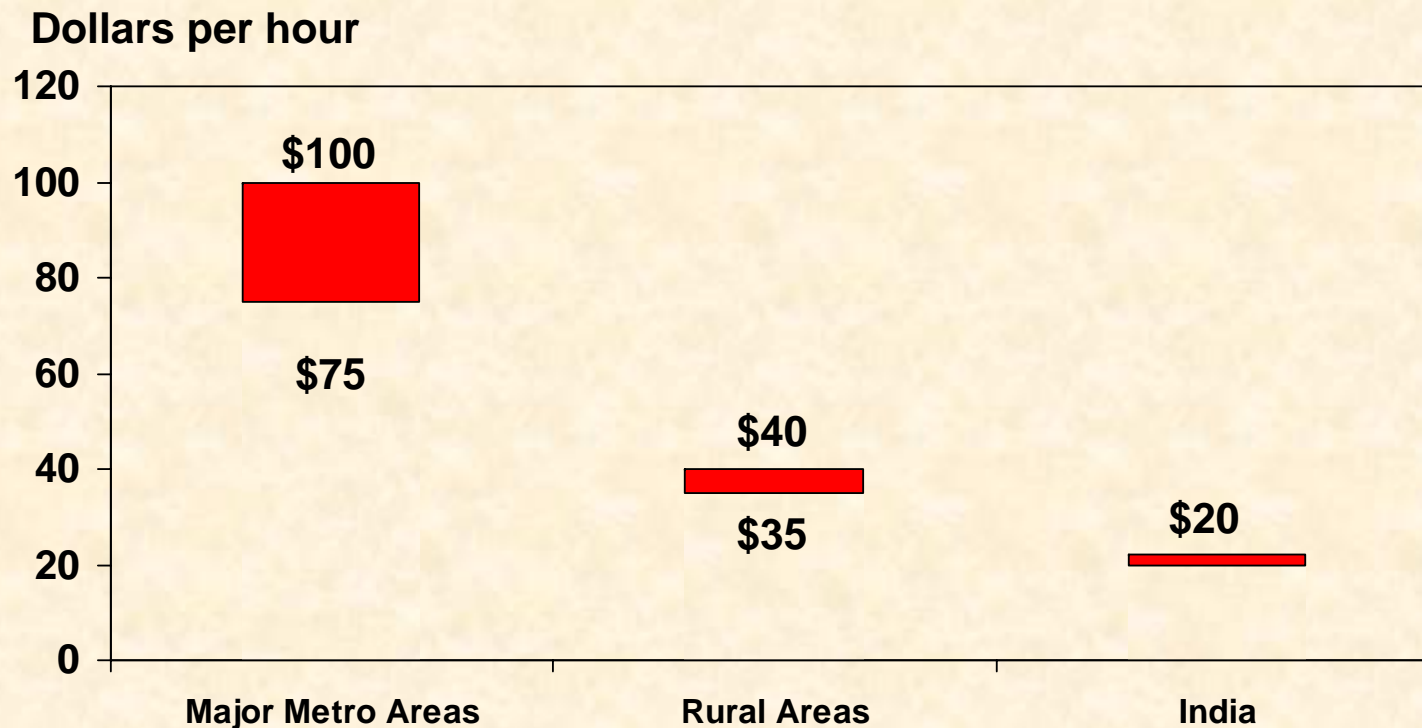


Source: Federal Reserve Board of Governors

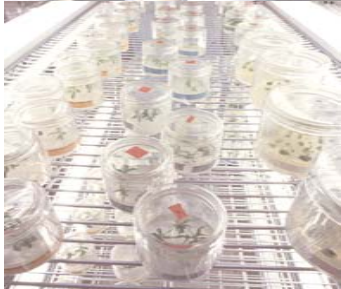


“Homeshoring” High-Skilled Service Jobs to Rural America

Wages for Software Developers



Source: Hall (2005)



Three Impacts of Innovation

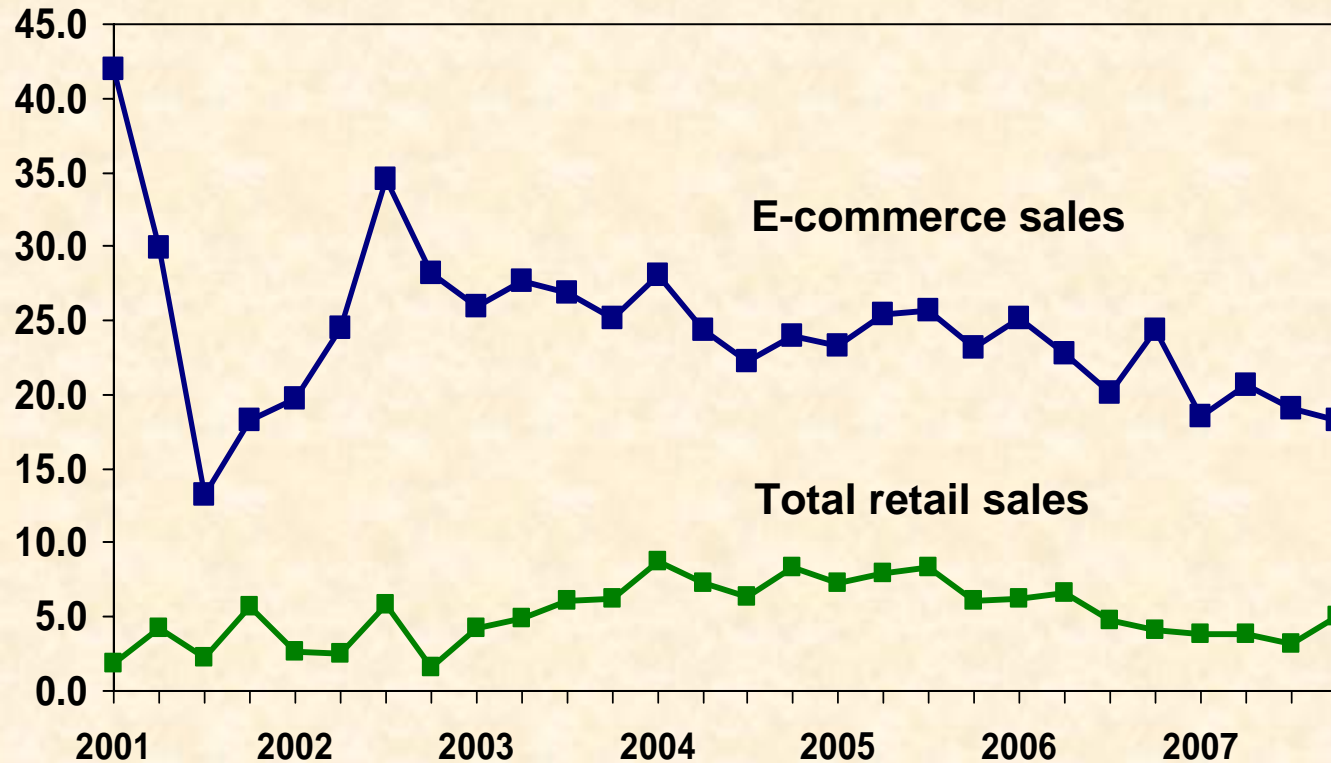
- Innovations ...
 - Create New Products
 - Improve Production Processes
 - Open New Markets.



In Retail, E-commerce Sales Growth Paces Total Retail Sales.

U.S. Retail Sales Growth

Percent change from year ago

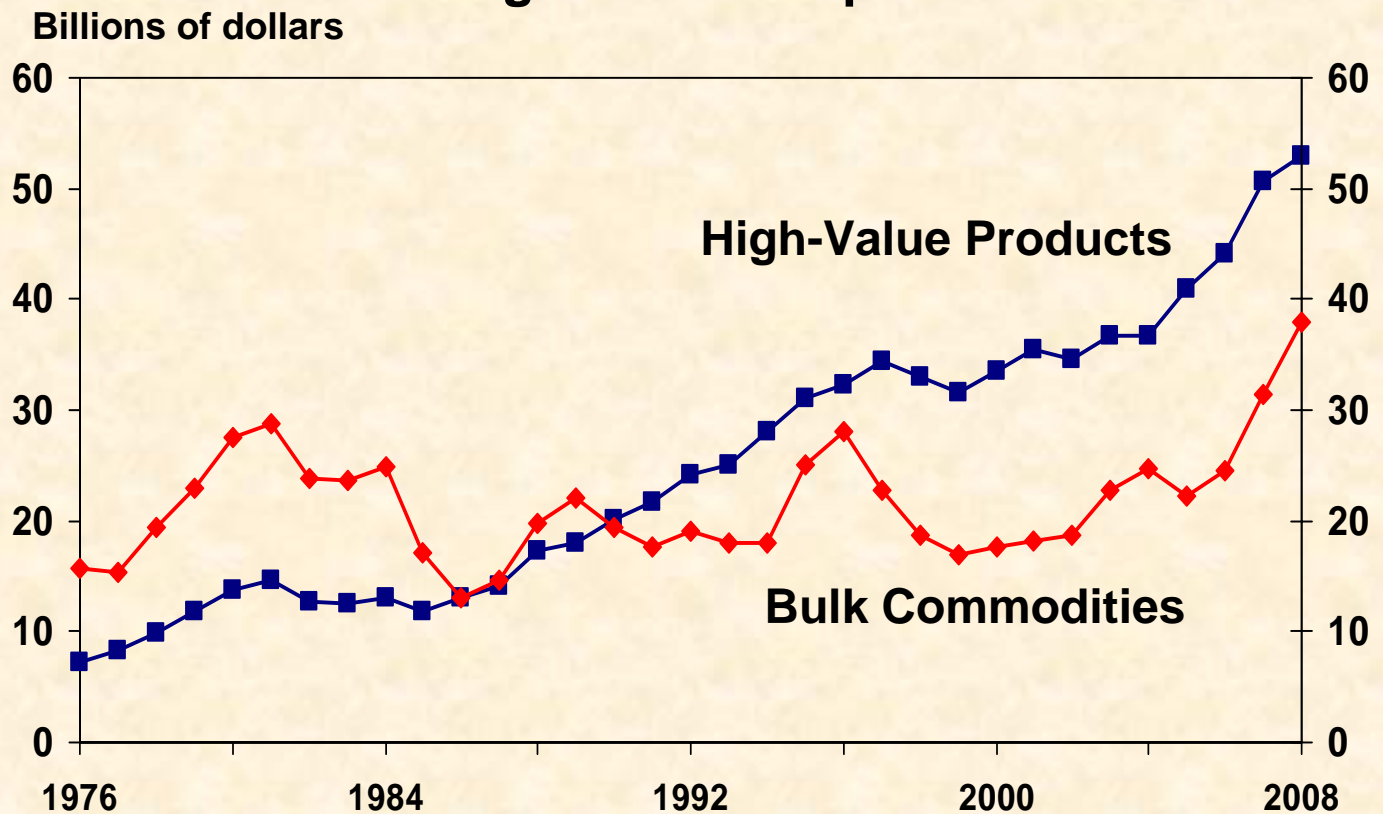


Source: Census Bureau



In Agriculture, High-Value Products are Pacing Export Growth.

U.S. Agricultural Exports

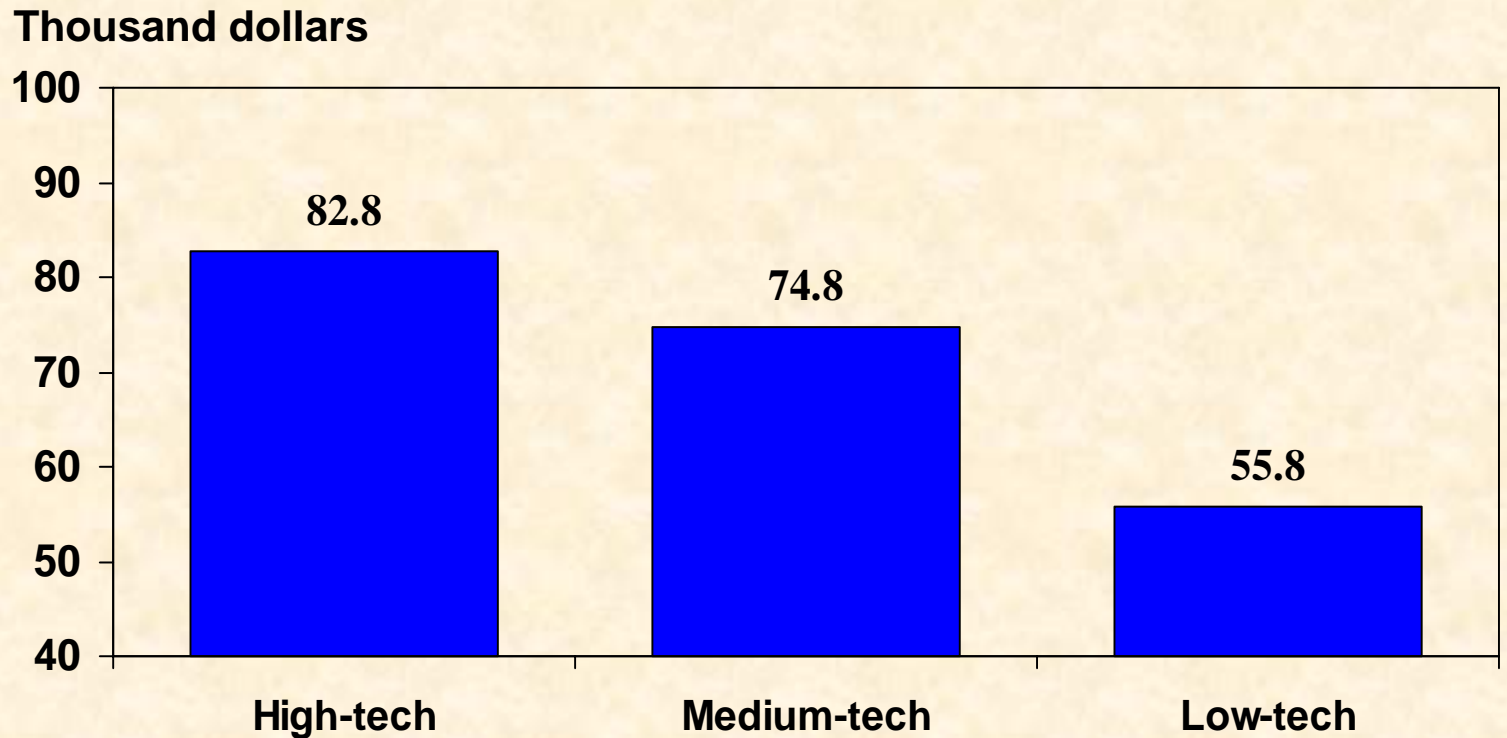


Source: USDA



High-Tech Sectors Appear to Create More High-Growth Entrepreneurs.

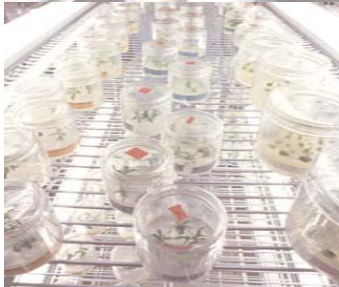
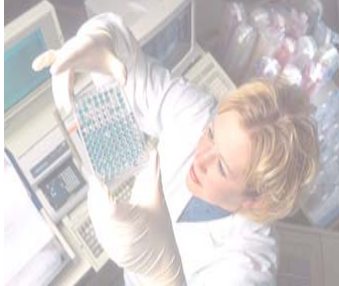
Self-employed Income by Manufacturing Industry



Calculations based on BLS, Current Population Survey data and Wojan (2005) categories

Today's Outline

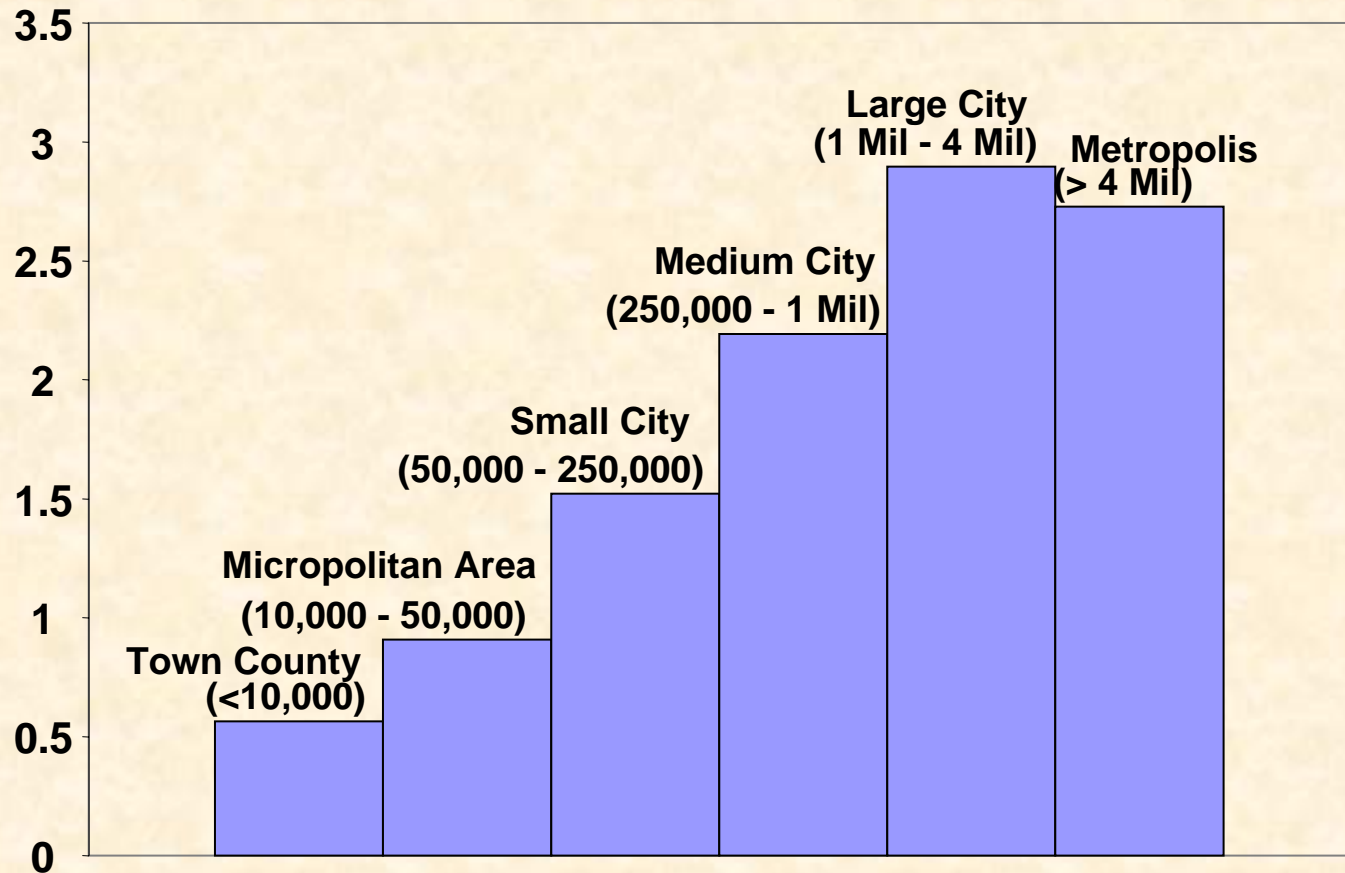
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Innovation is More Prevalent in Populous Places.

Patents per 10,000 population

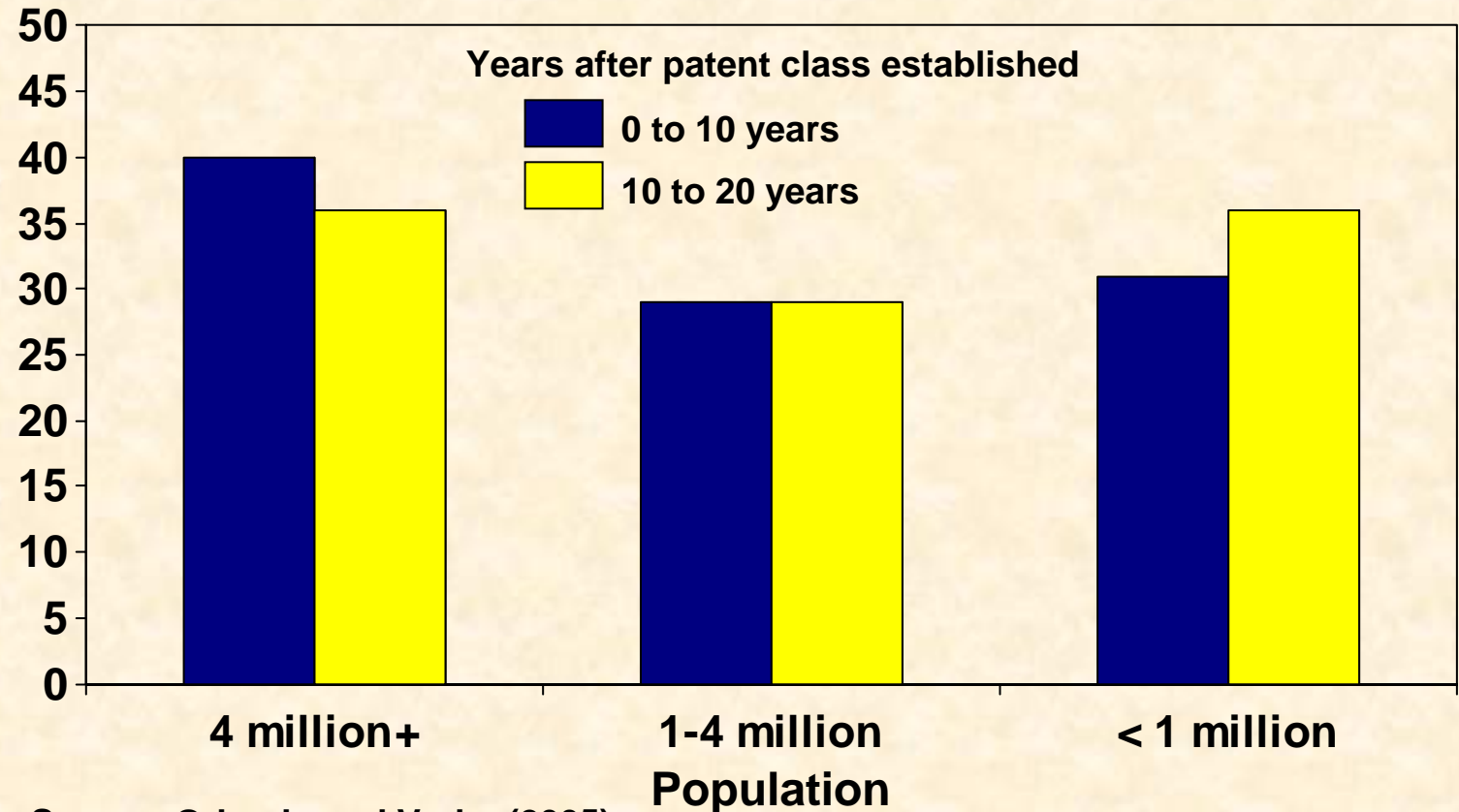


Source: Orlando and Verba (2005)

Smaller Communities Have Higher Patent Activity as Technologies Mature.

Patent Activity Over Time

Share of Patents



Source: Orlando and Verba (2005)





A New Economy is Built on Productivity.

Productivity

$$\begin{array}{r} \text{Value} \\ \text{per} \\ \text{Input} \end{array} = \begin{array}{r} \text{Value} \\ \text{per} \\ \text{Output} \end{array} \times \begin{array}{r} \text{Output} \\ \text{Per} \\ \text{Input} \end{array}$$

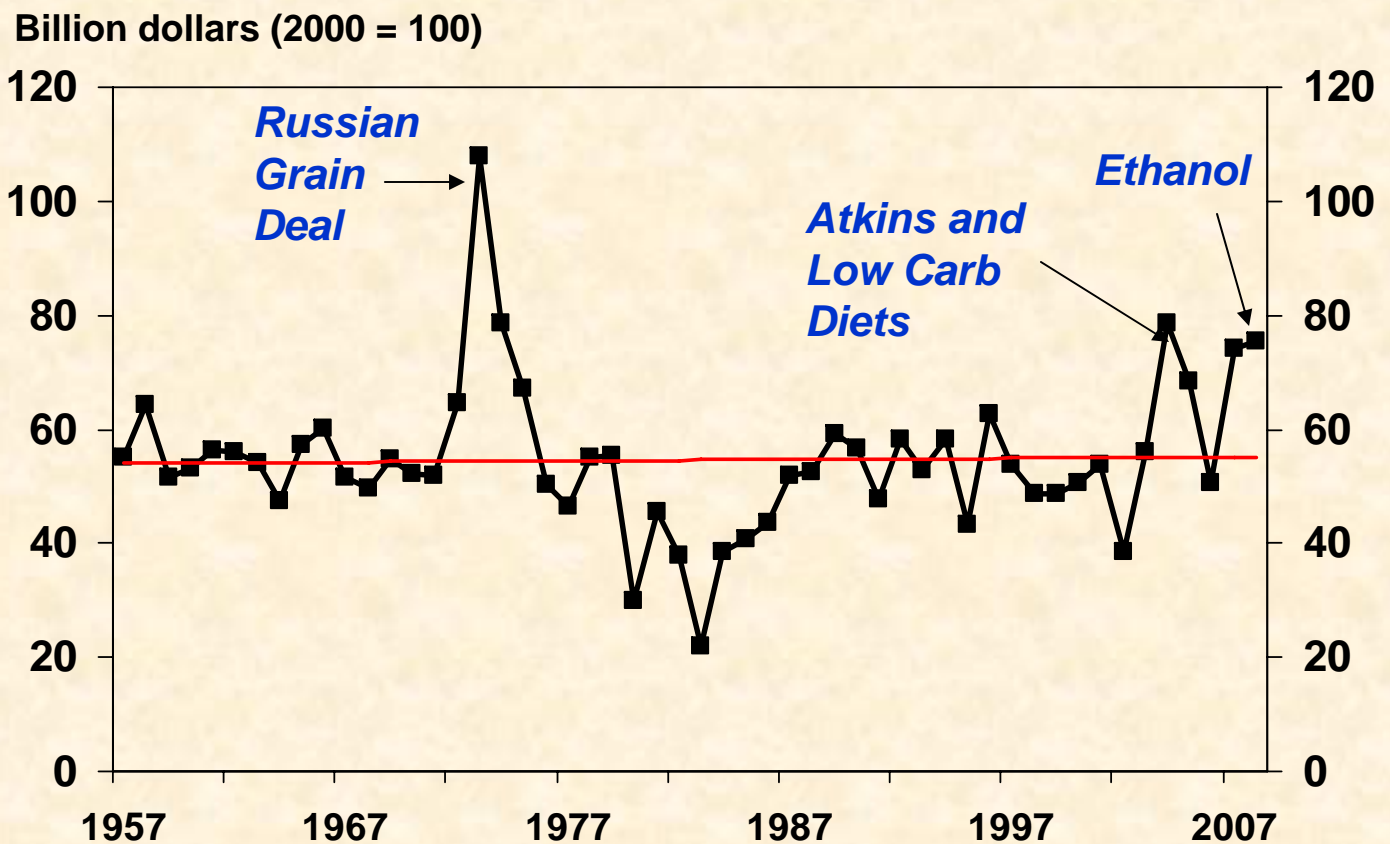
- **Efficiency: Output per Input**
The ability to create more things with fewer inputs.
- **Value: Value per Output**
The ability to create things of higher value.

Which part of productivity does Rural America struggle with?



Lessons From The Past: What Boosts Real Farm Incomes?

U.S. Real Net Farm Income

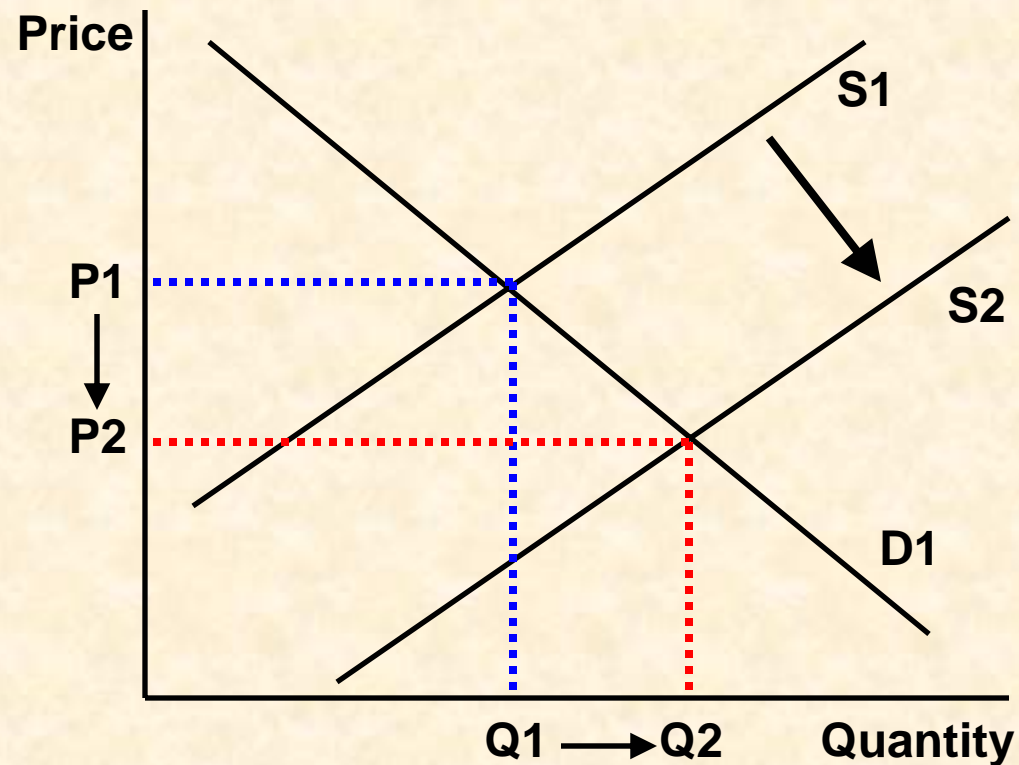


Source: USDA



Technologies of the Past

Focused on reducing cost: shifting supply

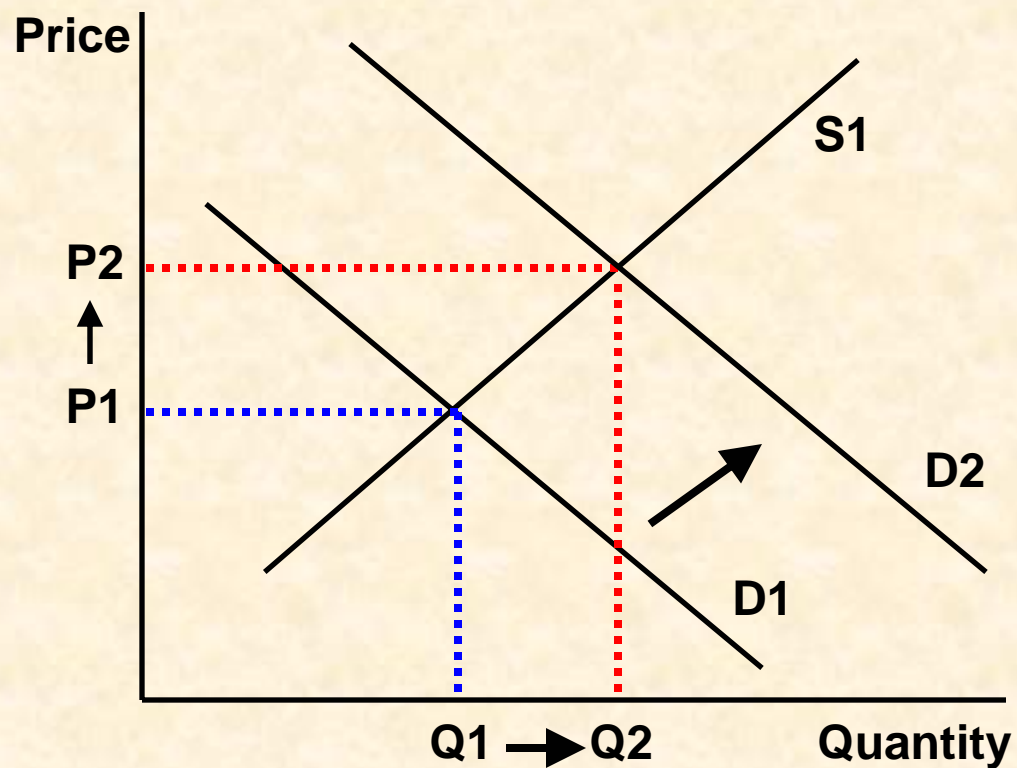


Does total revenue grow by shifting supply?



Technologies of the Future

Focused on Boosting Demand



Total revenue always grows



New Opportunities For the Rural Economy

- Value-added Agriculture



Japanese Watermelon

Cost:

**Square Watermelon:
\$82**

**Regular Watermelon
\$15 to \$25**

Source: BBC



New Opportunities For the Rural Economy

- **Market ready food products**
Premium foods (Angus Beef)
Convenience foods – snackable, microwaveable foods
- **Regional foods**
Local farmer food cooperatives or networks
Direct sales to grocery stores and restaurants,
- **Organic foods**
Despite higher production, price premiums are holding.



New Opportunities For the Rural Economy

- Value-added Agriculture
- Product Agriculture
 - Transforming agricultural products into non-food products
 - Energy
 - Bio-lubricants
 - Pharmaceuticals

Cargill Dow LLC (Blair, NE) converting corn to polymers.



New Opportunities For the Rural Economy

- Value-added Agriculture
- Product Agriculture
- Recreation and Natural Amenities

Ski Nebraska





The Opportunity Of Natural Resources Recreation And Tourism

- In 2006, 87 million people in the U.S. engaged in wildlife recreation.
(fishing, hunting, and wildlife watching)
- They spent \$120.1 billion.

U.S. Gross Crop Receipts: \$120.0 billion

U.S. Gross Livestock Receipts: \$119.3 billion



New Opportunities For the Rural Economy

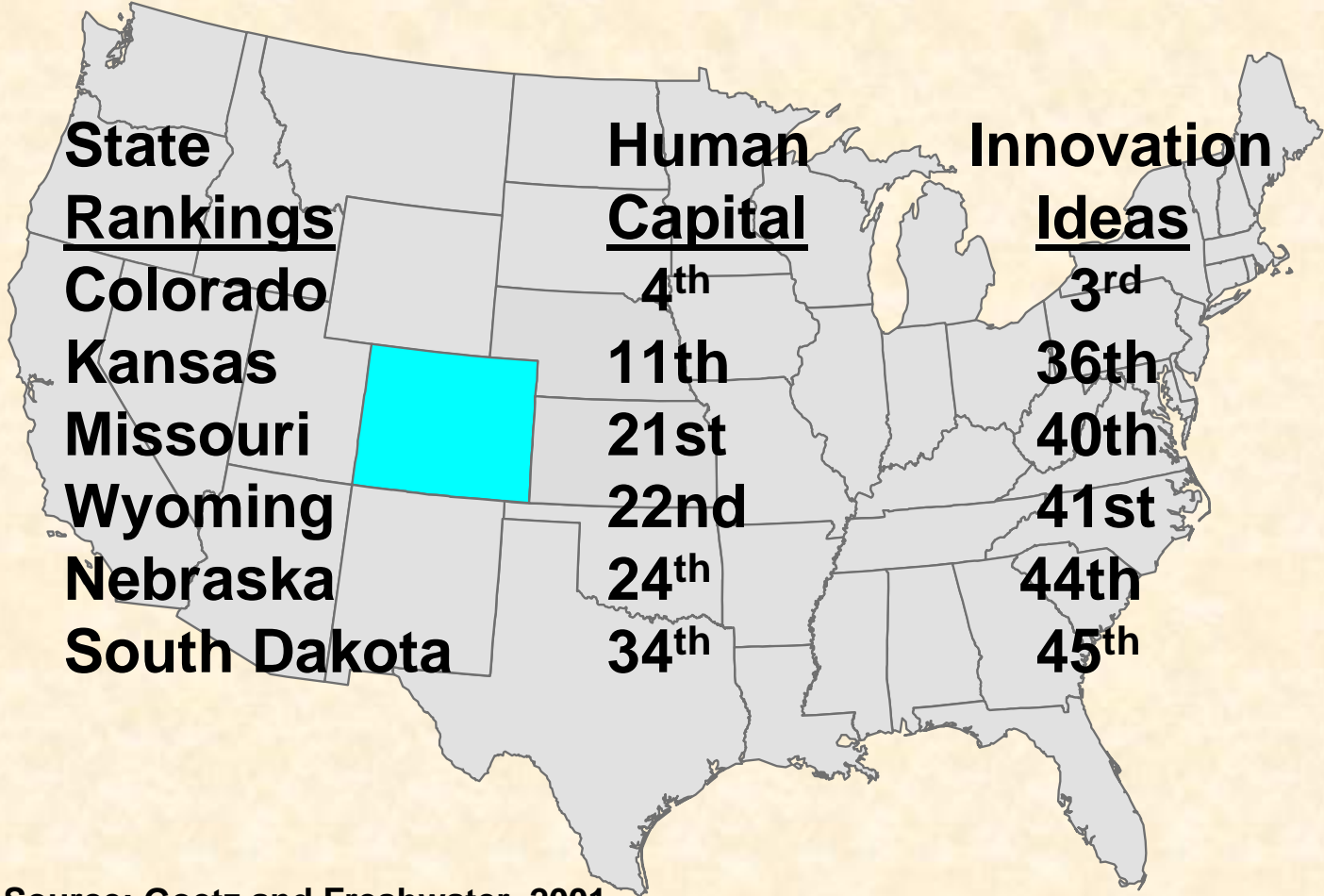
- Value-added Agriculture
- Product Agriculture
- Recreation and Natural Amenities
- Advanced Manufacturing
 - Lean manufacturing
 - High-tech industries
 - High-end products or hand-crafted
- High Skilled Services

Today's Outline

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 - A new perspective
- Foundations for Future Innovation
 - Entrepreneurs
 - People



Human Capital and Innovation in Nebraska



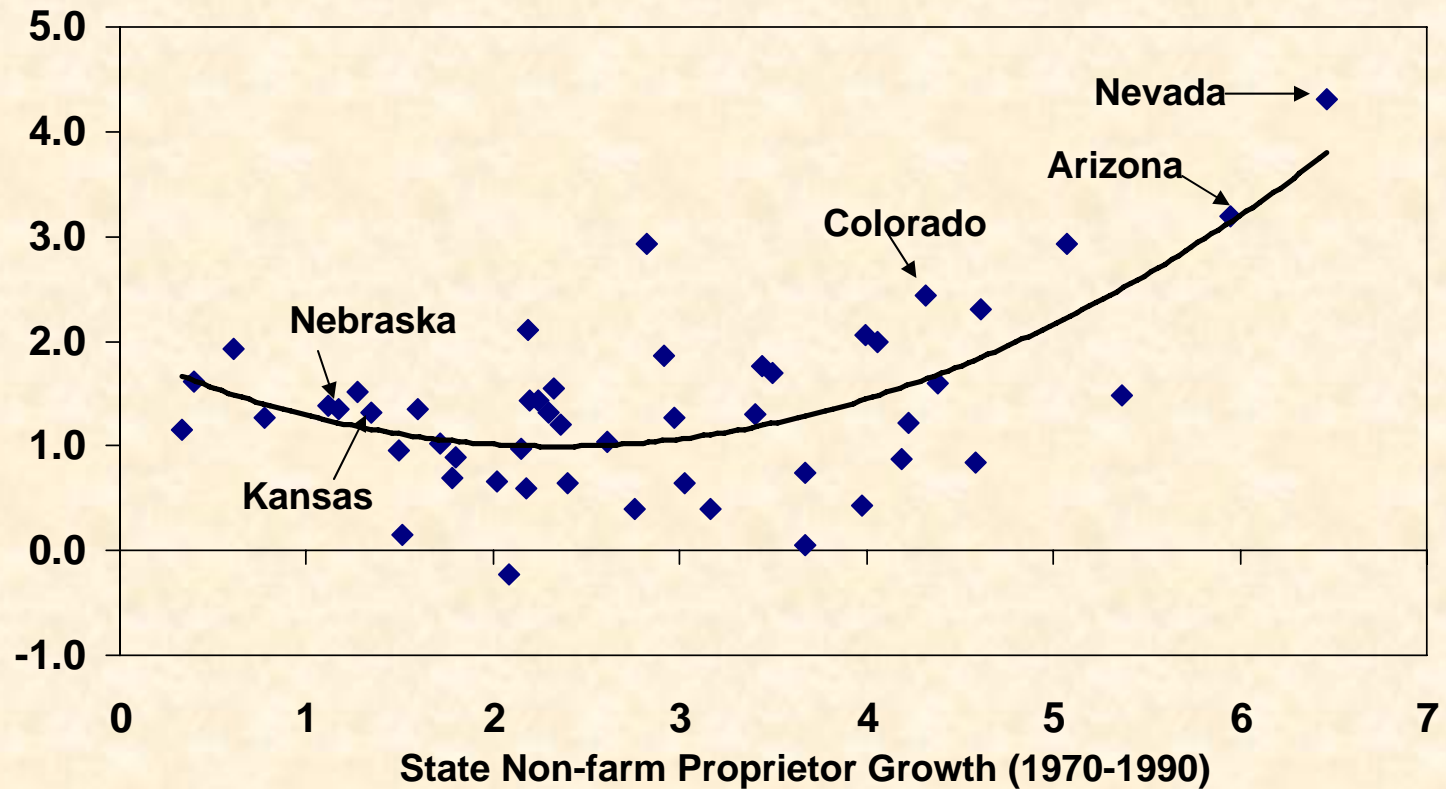
Source: Goetz and Freshwater, 2001



States That Grow More Entrepreneurs Have Stronger Economic Growth.

Employment and Entrepreneur Growth

Employment Growth (Wage and Salary: 1990-2004)



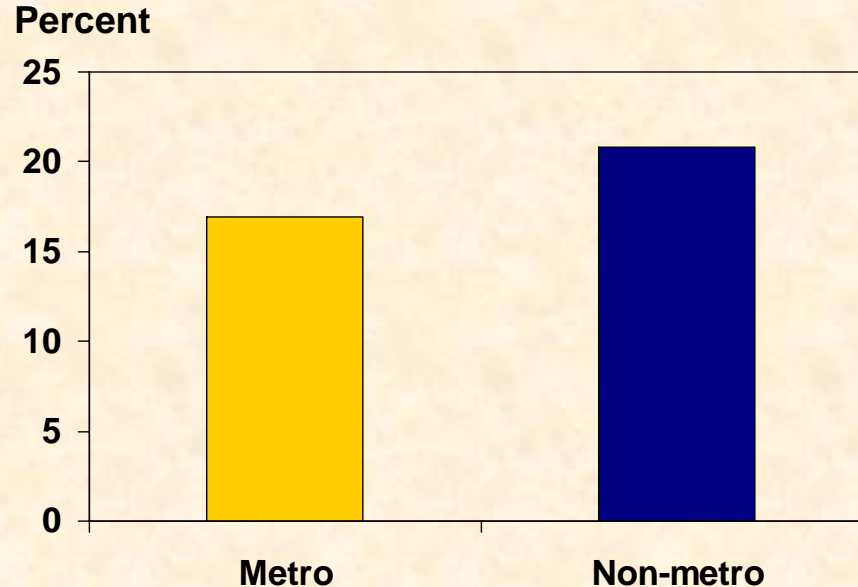
Calculations based on BEA, Regional Economic Information System data



What Do We Know About Metro and Non-Metro Entrepreneurs?

- Non-metro areas have more entrepreneurs on a per capita basis.

Proprietors Share of Employment, 2004



Calculations based on BEA data

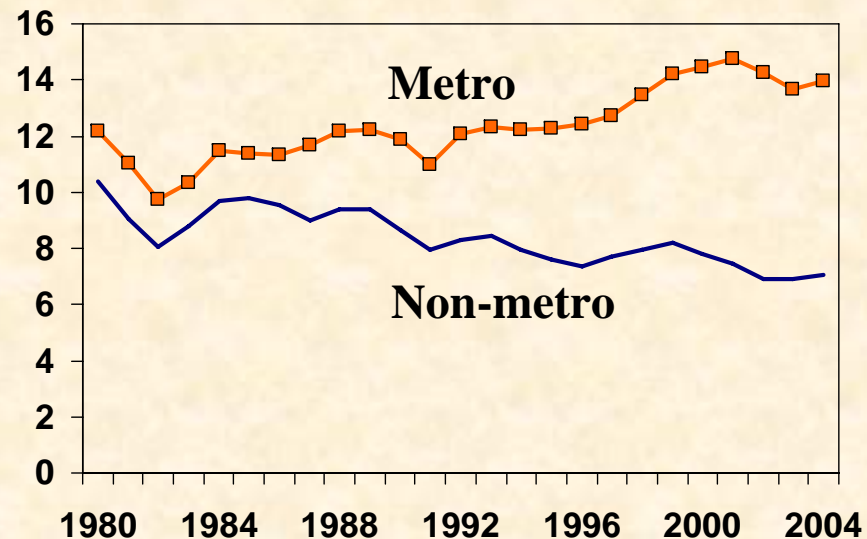


What Do We Know About Metro and Non-Metro Entrepreneurs?

- Non-metro areas have more difficulty producing high-growth businesses.

Real Non-farm Proprietor Income

Thousand dollars, per proprietor



Calculations based on BEA data

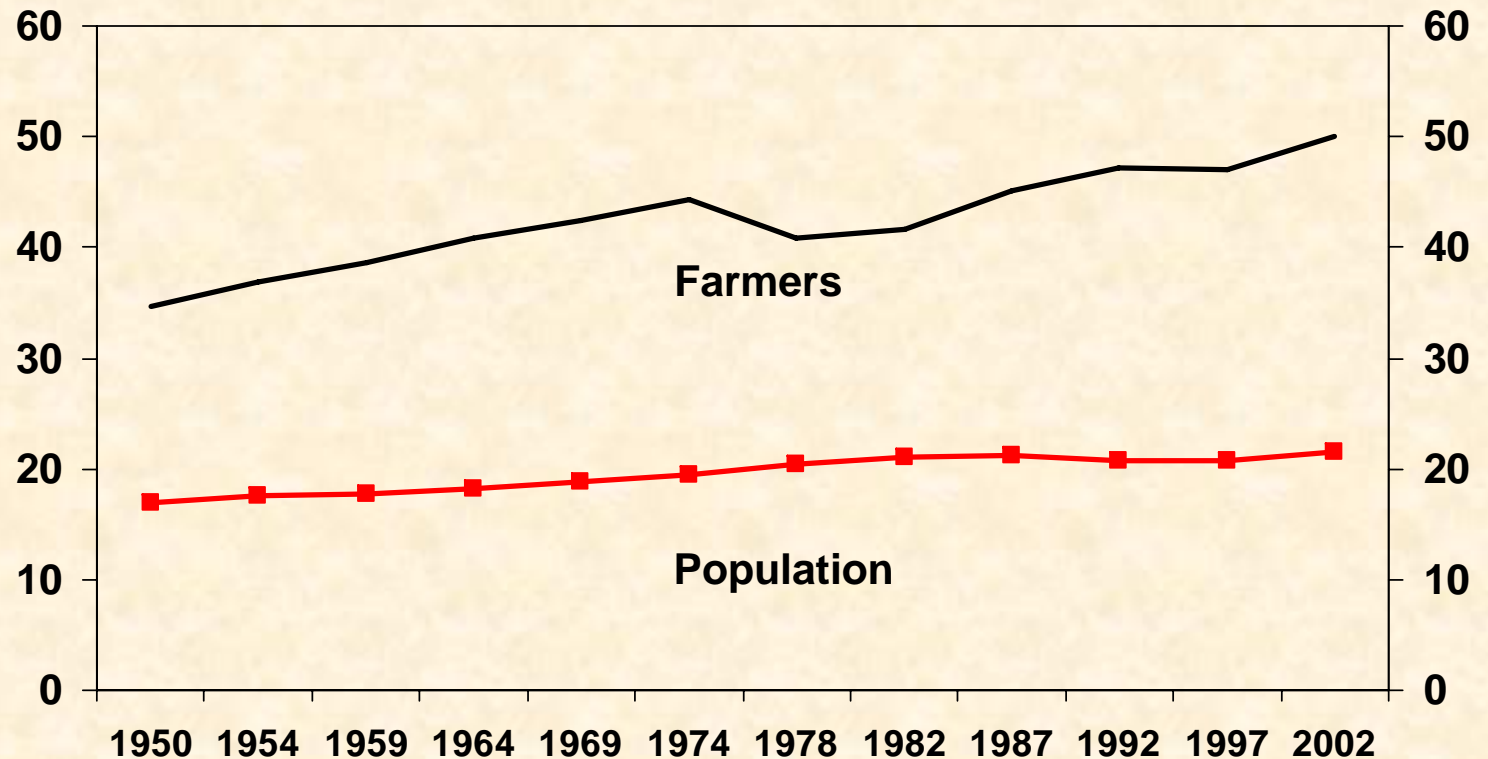


Where Will Agriculture's Next Generation of Leaders Emerge?

U.S. Age Demographics

Percent 55 or older

Percent 55 or older



Source: USDA, ERS

In Closing ...

- Rural America is searching for new economic engines.
- New engines of growth often emerge from technological innovations that
 - ... create new products
 - ... improve production practices
 - ... or open new markets
- A new generation of entrepreneurs is needed.

How can we change rural perceptions?

