

Econ 113: February 19, 2015

- Increasing Productivity, North and South
 - Biological Innovation in Cotton Seed
- Slavery
 - Comparison with Logan Family Sharecroppers
- Regional Conflict and War
- Postbellum Southern Development
- Postbellum Agricultural Mechanization
 - Effect on Farmers' Terms of Trade

Efficiency

- Stereotype
 - slaves lazy
- Fogel & Engerman:

Table 7. Efficiency on Southern Farms
(Free Southern farms = 100)

| # of slaves | output per unit of total input |
|-------------|--------------------------------|
| 0 | 100 |
| 1-15 | 101 |
| 16-50 | 133 |
| 51 + | 148 |

- slave labor more efficient than free (white) labor
 - But not on small farms (1-15 slaves)

Source: Walton & Rockoff, Table 13-4.

But why was efficiency higher?



- Gang system?
 - No evidence to support
 - Daily picking rates not higher with more pickers
- Economies of scale?
 - Management system
 - Again, no evidence
- The lash?
 - Slaveowners' records note slaves would be whipped for insufficient picking
 - Public whippings have external effects

Westward Movement & Cotton Seed

- Olmstead & Rhode
 - Development & spread of higher productivity cotton seed
 - Records from 142 plantations ([records](#))
- Sea Island Cotton
 - Long seed, grows along coasts of GA, SC, FL but wouldn't grow inland
- Upland cotton varieties (also called "Mexican cotton")
 - Short seed, grown inland
 - Farmers bred seeds, creating hybrids ([ad](#))
 - Developed seeds that were easy to pick, had long & strong fibers, were resistant to bugs, and had high ratio of cotton lint (fibers) to seeds
- [Next](#)

Recordkeeping on Cotton Plantations

DAILY RECORD OF COTTON PICKED on 59
during the week commencing on the 22 day of Feb 1862
Oversee.

| NAME | No. | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Week's Picking |
|------------|-----|--------|---------|-----------|----------|--------|----------|----------------|
| | 1 | 22 | 23 | 24 | 25 | 26 | 27 | |
| Joe Curtis | 2 | 350 | 255 | 255 | 310 | 250 | 275 | 1665 |
| John | 3 | 255 | 260 | 250 | 230 | 285 | 230 | 1680 |
| John Smith | 4 | 300 | 250 | 250 | 250 | 250 | 250 | 2000 |
| John | 5 | 150 | 160 | 140 | 150 | 140 | 140 | 960 |
| John | 6 | 140 | 155 | 170 | 160 | 150 | 140 | 1015 |
| John | 7 | 130 | 155 | 150 | 170 | 140 | 140 | 975 |
| John | 8 | 230 | 175 | 150 | 230 | 140 | 140 | 1065 |
| John | 9 | 155 | 165 | 150 | 160 | 155 | 155 | 995 |
| John | 10 | 155 | 160 | 150 | 150 | 150 | 150 | 965 |
| John | 11 | 155 | 150 | 150 | 150 | 150 | 150 | 905 |
| John | 12 | 155 | 150 | 150 | 150 | 150 | 150 | 905 |
| John | 13 | 155 | 150 | 150 | 150 | 150 | 150 | 905 |
| John | 14 | 155 | 150 | 150 | 150 | 150 | 150 | 905 |
| John | 15 | 155 | 150 | 150 | 150 | 150 | 150 | 905 |
| John | 16 | 155 | 150 | 150 | 150 | 150 | 150 | 905 |
| John | 17 | 155 | 150 | 150 | 150 | 150 | 150 | 905 |
| John | 18 | 155 | 150 | 150 | 150 | 150 | 150 | 905 |
| John | 19 | 155 | 150 | 150 | 150 | 150 | 150 | 905 |

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HIGHLY IMPROVED COTTON! Boyd's Extra Prolific!

CERTIFICATES!

D. DICKSON.

MEMPHIS, TENN., U.S.A.

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Olmstead & Rhode results

- Rapid growth in cotton picking
 - Especially in New South
 - Alabama, Arkansas, Florida, Louisiana, Mississippi, Tennessee, or Texas
 - Contrast with Sea Island cotton important (oops not in table 9)
- Westward movement & seed development account for high slave labor productivity

Table 9. Cotton Picking Rates, 1801-1862
Dependent variable: ln(mean picking)

| | Upland Cotton | Old South | New South |
|-------------------------------|------------------------|------------------------|-----------------------|
| constant | 4.387 (0.032) | 3.961 (0.061) | 4.478 (0.030) |
| Year - 1830 | 0.0245 (0.0016) | 0.0156 (0.0013) | 0.0283 (0.0026) |
| (Year-1830) ² | -0.000416 (0.00008) | -0.000025 (0.00010) | -0.00054 (0.00010) |
| Implied annual rate of growth | | | |
| 1810 | 4.1% | 1.7% | 5.0% |
| 1830 | 2.5% | 1.6% | 2.8% |
| 1850 | 0.8% | 1.5% | 0.7% |
| R ² | 0.25 | 0.37 | 0.30 |
| N | 474 | 103 | 371 |

[Efficiency](#) [Cotton Picking](#) [Regional Context](#) [Evolutionary Process](#) [Biological Mechanisms](#) [Economic Implications](#)

Controlling for plantation

- Fixed effects by plantation captures differences in climate, soil quality, management practices

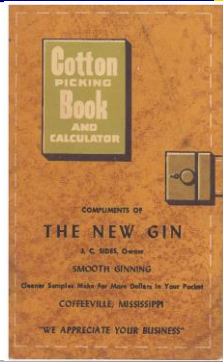
Table 22. Cotton Picking Rates, 1801-1862
with fixed effects by plantation
Dependent variable: ln(mean picking)

| | Upland Cotton | Old South | New South |
|-------------------------------|------------------------|-----------------------|------------------------|
| constant | 4.359 (0.047) | 3.879 (0.098) | 4.478 (0.636) |
| Year - 1830 | 0.0174 (0.0038) | 0.0197 (0.0044) | 0.0167 (0.0075) |
| (Year-1830) ² | -0.000074 (0.00010) | 0.000005 (0.00012) | -0.000083 (0.00020) |
| Fixed Effects by Plantation? | Yes | Yes | Yes |
| Implied annual rate of growth | | | |
| 1810 | 2.0% | 1.9% | 2.0% |
| 1830 | 1.7% | 2.0% | 1.7% |
| 1850 | 1.4% | 2.0% | 1.3% |
| R ² | 0.85 | 0.79 | 0.82 |
| N | 428 | 88 | 340 |

[Efficiency](#) [Cotton Picking](#) [Regional Context](#) [Evolutionary Process](#) [Biological Mechanisms](#) [Economic Implications](#)

100 years later: Logan Family

- Trevon Logan's article (reader #2)
- Logan family, sharecroppers, Mississippi, 1950s & 1960s
- How do cotton picking rates compare?



Logan, Table 1

Table 1: The Productivity of Logan Children, 1952-1965, and Slave Children, 1850-1860. Measured by Pounds of Cotton Picked Per Day.

| Age | Logans | | | Slaves | | |
|-----|--------|---------|--------|--------|---------|--------|
| | All | Females | Males | All | Females | Males |
| 5 | 16.98 | 14.78 | 19.20 | 18.74 | 17.15 | 20.42 |
| 6 | 21.02 | 18.23 | 24.86 | 23.93 | 22.08 | 25.97 |
| 7 | 27.75 | 26.04 | 30.19 | 29.98 | 27.87 | 32.45 |
| 8 | 35.85 | 33.75 | 36.82 | 36.90 | 34.51 | 39.83 |
| 9 | 43.46 | 42.16 | 45.25 | 44.64 | 41.95 | 48.09 |
| 10 | 51.88 | 50.16 | 52.86 | 53.13 | 50.11 | 57.12 |
| 11 | 60.46 | 59.94 | 60.95 | 62.24 | 58.86 | 66.80 |
| 12 | 68.16 | 67.86 | 69.25 | 71.81 | 68.04 | 76.97 |
| 13 | 80.54 | 79.21 | 82.47 | 81.66 | 77.46 | 87.42 |
| 14 | 89.78 | 88.35 | 92.15 | 91.60 | 86.93 | 97.95 |
| 15 | 99.48 | 98.15 | 101.49 | 101.41 | 96.23 | 108.32 |
| 16 | 108.86 | 107.45 | 108.27 | 110.87 | 105.16 | 118.32 |
| 17 | 118.82 | 118.12 | 119.16 | 119.81 | 113.53 | 127.73 |
| 18 | 124.62 | 122.49 | 125.95 | 128.04 | 121.19 | 136.36 |

Logan Teen Girls Picked More Than Slaves

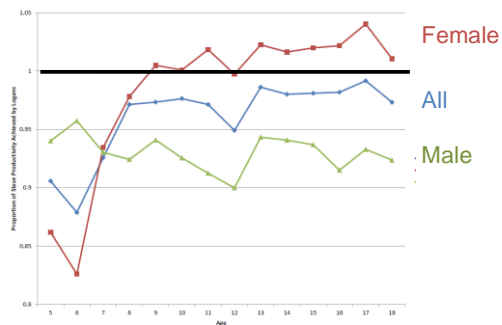


Figure 4: Proportion of Slave Productivity Achieved by Logan Family by Age.

Studying Slavery: The Important Lesson

*Profit-maximization
and ethical behavior
are not necessarily consistent!*

Regional Conflict

- North East (industrial)
 - past & future growth based on high $\frac{K}{L}$
- West ("North Central" – midwest agriculture)
 - past & future growth based on high $\frac{T}{L}$
- South (slave states)
 - past growth based on high $\frac{L}{P}$
 - future growth based on expanding slavery

Settlement of new areas is key

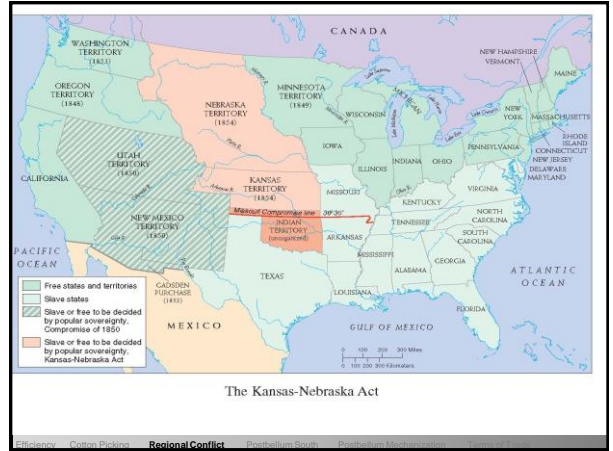
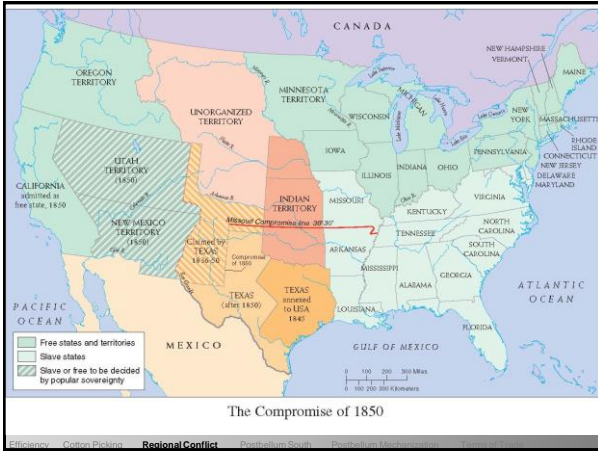
Table 11. Differences in Regional Growth

| | Real income per capita (1860 \$, total population) | | |
|--------------|---|------------|------------|
| | 1840 | 1860 | % Δ |
| NORTH | 109 | 141 | 1.3 |
| North East | 129 | 181 | 1.7 |
| No Central | 65 | 89 | 1.6 |
| SOUTH | 74 | 103 | 1.7 |
| So Atlantic | 66 | 84 | 1.2 |
| E. So. Ctrl | 69 | 89 | 1.3 |
| W. So. Ctrl | 151 | 184 | 1.0 |
| WEST | 65 | 89 | 1.6 |

Regional Alliances

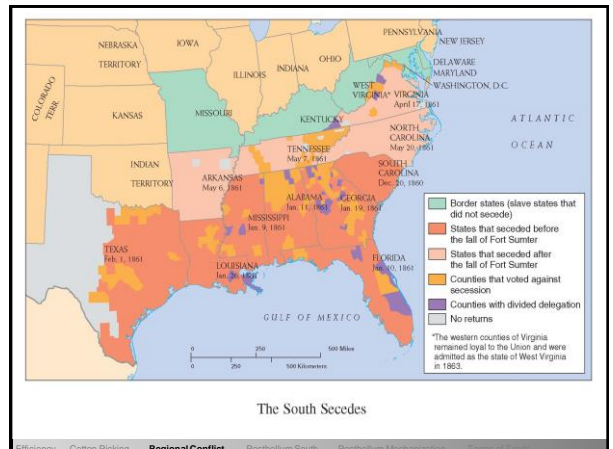
- Fragile political-economic balance between the South, West and NorthEast fell apart over issue of slavery
 - Compromise of 1850 and Kansas-Nebraska Act (1854) potentially expanded slavery above 36° 30' parallel





Regional Alliances

- Fragile political-economic balance between the South, West and NorthEast fell apart over issue of slavery
 - Compromise of 1850 and Kansas-Nebraska Act (1854) potentially expanded slavery above 36° 30' parallel
 - U.S. Supreme Court's Dred Scott decision, 1857, effectively legalized slavery throughout U.S.

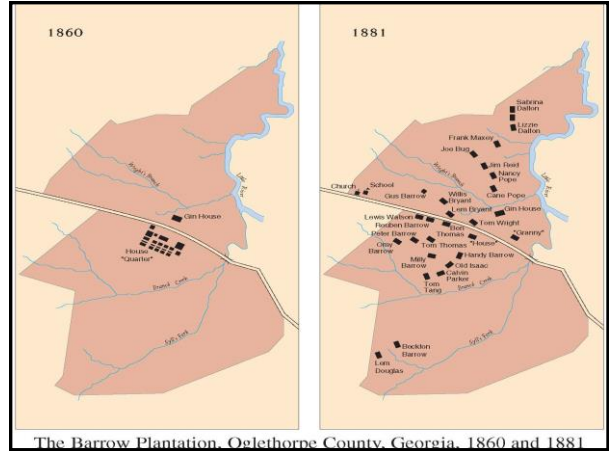


Southern Postbellum Growth

- Drop in Southern income after 1860
- And slow recovery to 1860 level
- Why this pattern?

| | Southern Income per Capita as a % of U.S. Income |
|------|--|
| 1860 | 72 |
| 1880 | 51 |
| 1900 | 51 |
| 1920 | 62 |
| 1950 | 73 |
| 1990 | 90 |
| 1995 | 92 |

Source: Ransom & Sutch, *One Kind of Freedom*. 1990s data from 1997 *Statistical Abstract*, Table 706. Regional data discontinued thereafter...



The Barrow Plantation, Oglethorpe County, Georgia, 1860 and 1881

Why did income decline?

- Voluntary decline in labor force participation

| Source | Percentage Decline in Worker-Hours per Capita | |
|--------------------|---|------|
| | low | high |
| participation rate | 17 | 24 |
| days / year | 8 | 11 |
| hours / day | 9 | 10 |
| Cumulative effect | 28 | 37 |

Source: Ransom & Sutch, *One Kind of Freedom*, Table 3.3.

Why didn't income grow?

- **Five part explanation**
- 1. The South had little industry relative to North
- South, 1880: > 75% of income from agriculture
 - U.S.: about 25% of income from agriculture
- Why? Lack of financial institutions

| | Value Added in Manufacturing, per capita | | |
|------|--|---------|------------|
| | South | Midwest | North East |
| 1850 | \$5.27 | \$12.14 | \$36.02 |
| 1860 | \$7.52 | \$15.76 | \$50.66 |

Source: Gavin Wright, *Old South, New South*, p. 21

2. South focused increasingly on cotton

- Less agricultural diversification over time

Table 15. Per Capita Corn Output and Number of Hogs, Deep South

| | Corn (bu) | Hogs (#) |
|------|-----------|----------|
| 1860 | 29 | 1.8 |
| 1880 | 17 | 1.0 |

Source: Wright, *Old South, New South*, p. 35.

3. But cotton market was saturated

- Big post-1860 increase in production of cotton in India
 - U.S. had produced 80% of world's cotton c. 1860
 - Down to 60% by 1910
 - Today, about 15%
- World cotton prices falling

Table 16. Cotton Output and Price

| | bales (millions) | ¢ per pound |
|------|------------------|-------------|
| 1859 | 5.4 | 11.5 ¢ |
| 1866 | 2.1 | |
| 1873 | 4.2 | 14.1 ¢ |
| 1880 | 6.6 | 9.8 ¢ |
| 1890 | 8.7 | 8.6 ¢ |

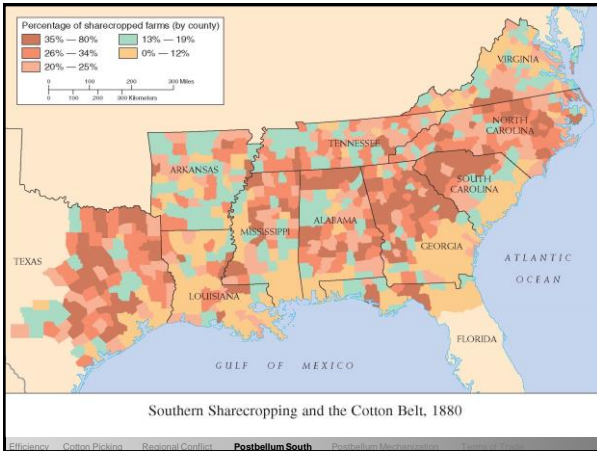
Source: *Historical Statistics*, Series K554-K555.

4. So why stick with cotton?

- Debt Peonage
 - Merchants extending credit required that farmers stick with cotton
 - Despite economic incentives to diversify crops

5. Why didn't individual Southerners invest in agriculture?

- Sharecropping system discouraged investment
 - Half of output to land-owner
 - But all expense of investment borne by cropper



Lesson: Institutions matter!

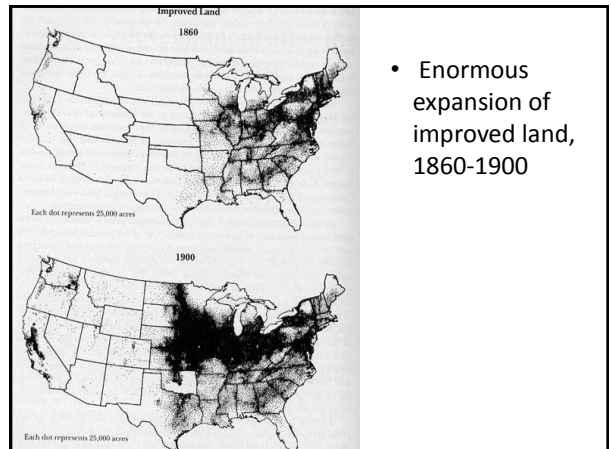
- Institutional factors slowed Southern growth
 - slavery, and its aftermath
 - financial institutions (lack thereof)
 - credit institutions (especially debt peonage)
 - land-holding & labor institutions (especially sharecropping)

Postbellum Northern Agriculture

Table 17. Farms & Farmers

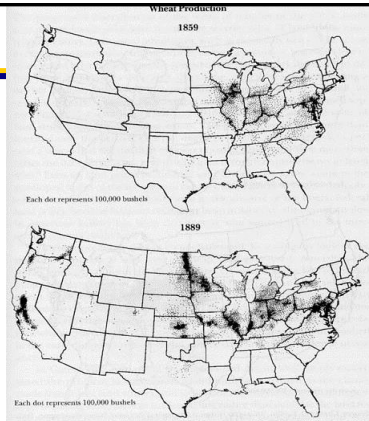
| | farms (millions) | acres (millions) | people (millions) | Gainful Employment (millions) |
|------|---------------------|---------------------|----------------------|-------------------------------------|
| 1870 | 2.7 | 408 | | 6.4 |
| 1880 | 4.0 | 536 | 22.0 | 8.6 |
| 1890 | 4.6 | 623 | 24.8 | 10.0 |
| 1900 | 5.7 | 841 | 29.9 | 10.7 |
| 1910 | 6.4 | 881 | 32.1 | 11.3 |
| 1920 | 6.5 | 887 | 32.0 | 11.1 |
| 2000 | 2.1 | 943 | | < 1 |

Source: *Historical Statistics*, Series K1, K4, K5, D153. 2000 data from *Farms and Land in Farms*, Agricultural Statistics Board, Feb. 22, 2002



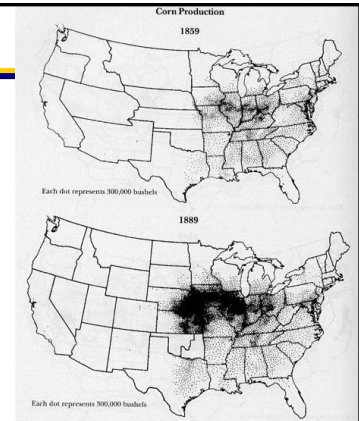
Wheat

- Wheat
 - Kansas
 - South & North Dakota & Minnesota
 - California
- About 30% of crop exported



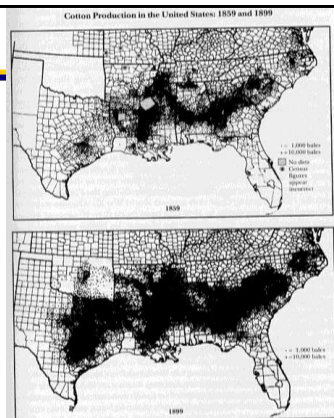
Corn

- Corn
 - Iowa, Illinois, Indiana, Kansas, Nebraska
- Feed crop as well as consumable



Cotton

- Cotton grown
 - Deep South
- 2/3 of crop exported



Land Policy

- 1862 Homestead Act (≤ 160 acres per person; ≤ 320 acres per married couple)
 - Enacted *during* Civil War
 - Had been opposed by Southern Democrats who wanted western lands for slave-based cotton plantations
- Assorted subsequent revisions
 - 1909 revision doubled acreage
- Total granted by 1934:
 - 1.6 million homesteads
 - 270,000,000 acres (420,000 sq mi): 10% of all U.S. land
- <http://www.youtube.com/watch?v=yxaJY8UZxn4>

- Scarce Labor on Northern Farms
- Leads to development of capital (agricultural implements)

Table 18. Agricultural Productivity

| | Hours per 100 bushel (or bale) | Bushels (or Bales) per acre | Hours per Acre before harvest | Hours per Acre at harvest |
|-----------|--------------------------------|-----------------------------|-------------------------------|---------------------------|
| WHEAT | | | | |
| 1800 | 373 | 15 | 16 | 40 |
| 1840 | 233 | 15 | 12 | 23 |
| 1880 | 152 | 13 | 8 | 12 |
| 1900 | 108 | 14 | | |
| 1910-1914 | 106 | 14 | | |
| 2000 | | 42 | | |
| CORN | | | | |
| 1800 | 344 | 25 | 56 | 30 |
| 1840 | 276 | 25 | 44 | 25 |
| 1880 | 180 | 26 | 28 | 18 |
| 1900 | 147 | 26 | | |
| 1910-1914 | 135 | 26 | | |
| 2000 | | 137 | | |

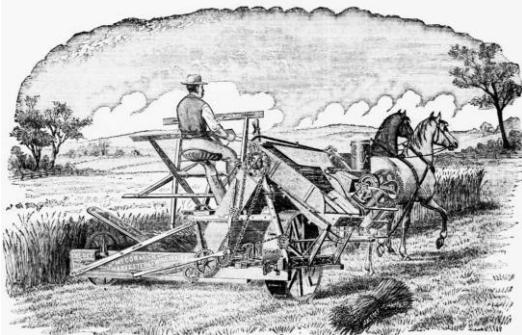
Harvester (reaps & threshes): 1858



33 Horse team wheat harvester, Walla Walla, 1902
Library of Congress, Prints & Photographs Division, LC-USZ62-71469

Efficiency Output/Paddock Regional Conflict Postbellum South Postbellum Mechanization

Binder (binds wheat): 1878



Efficiency Output/Paddock Regional Conflict Postbellum South Postbellum Mechanization

Combine, 1880s (does it all): horsepower!



Efficiency Output/Paddock Regional Conflict Postbellum South Postbellum Mechanization

Ag Productivity

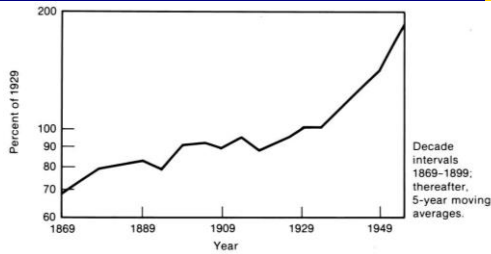


FIGURE 15.1 Total Factor Productivity in Agriculture, 1869-1955 This figure shows a ratio of agricultural output relative to a price weighted average of land, labor, and capital inputs. (Source: John W. Kendrick, *Productivity Trends in the United States* [Princeton, N.J.: Princeton University Press, 1961], pp. 362-364.)

Efficiency, Output, Productivity, Regional Growth, Postbellum South, Postbellum Mechanization

Acres per worker increased

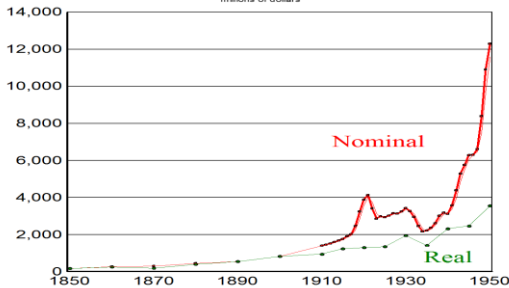
Table 19. Acreage Worked

| | acres/gainful | |
|------|---------------|------------|
| | worker | acres/farm |
| 1870 | 63.4 | 153 |
| 1880 | 62.3 | 134 |
| 1890 | 62.4 | 137 |
| 1900 | 78.5 | 147 |
| 1910 | 77.7 | 138 |
| 1920 | 86.2 | 148 |
| 2000 | | 434 |

Efficiency, Output, Productivity, Regional Growth, Postbellum South, Postbellum Mechanization

Mechanization: even more post-WWII

Value of Farm Implements, 1850-1950
in millions of dollars



Efficiency, Output, Productivity, Regional Growth, Postbellum South, Postbellum Mechanization

Impact on Farm Prices

• Terms of Trade = $\frac{\text{Price of Agricultural Goods}}{\text{Price of Non-agricultural Goods}}$

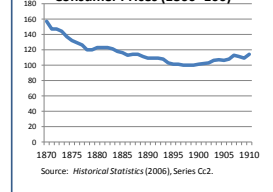
Table 20. Terms of Trade, 1870-1915
(1870 = 100)

| | Wholesale Farm Prices | Consumer Prices | Farmers' Terms of Trade |
|------|-----------------------|-----------------|-------------------------|
| 1870 | 100 | 100 | 100 |
| 1875 | 88 | 87 | 102 |
| 1880 | 71 | 76 | 94 |
| 1885 | 64 | 71 | 90 |
| 1890 | 63 | 71 | 89 |
| 1895 | 55 | 66 | 84 |
| 1900 | 64 | 66 | 97 |
| 1905 | 71 | 71 | 100 |
| 1910 | 93 | 74 | 127 |
| 1915 | 90 | 80 | 112 |

Source: Walton & Rockoff, Table 15-4

Context: general deflation, 1875-1895

Consumer Prices (1860=100)

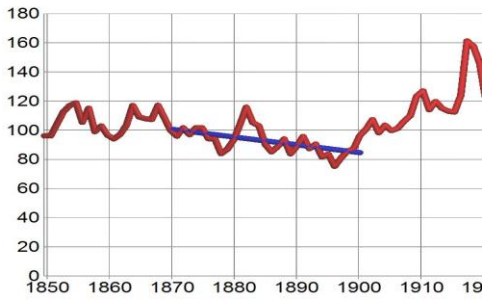


Source: Historical Statistics (2006), Series CC2.

Efficiency, Output, Productivity, Regional Growth, Postbellum South, Postbellum Mechanization, Terms of Trade

Farmers' Terms of Trade

Farmers' Terms of Trade
1870 = 100



But they didn't know what the future held. . .

Farmers' Terms of Trade
1870 = 100

- By mid-1890s, *unhappy* farmers

