

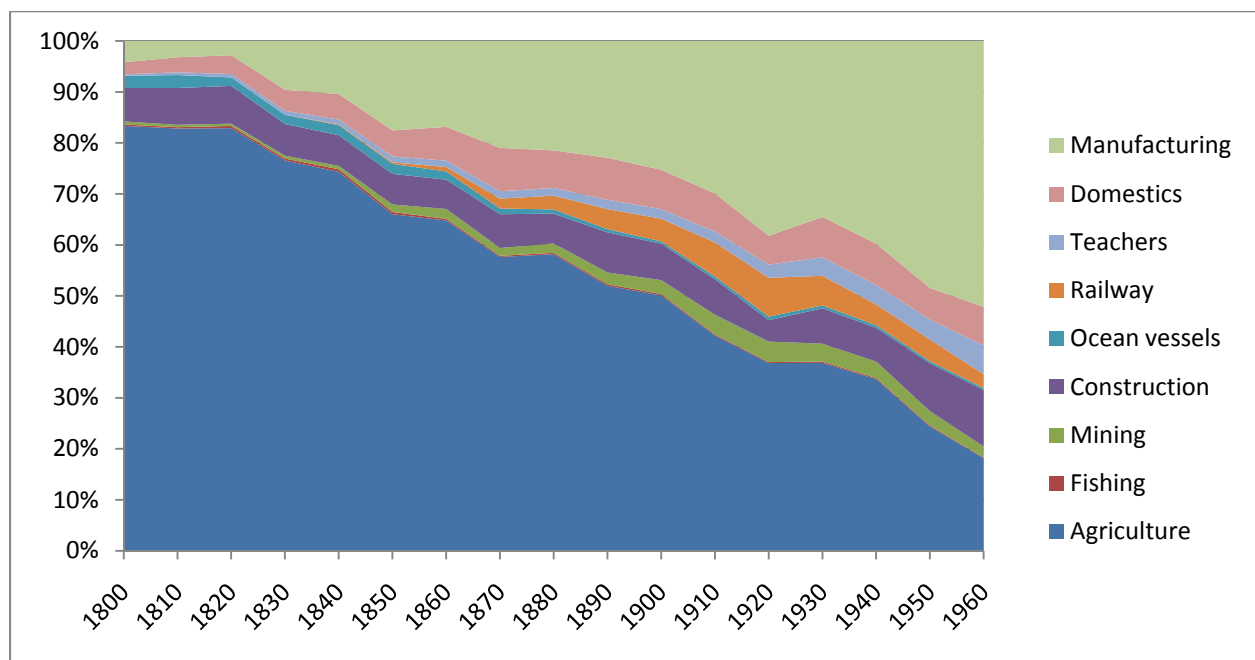
RAILROADS

TABLE 10  
SUMMARY OF RAILROAD OUTPUT, INPUT, AND PRODUCTIVITY  
(1910 = 100)

Fiscal Years	Output (1)	Persons Engaged (2)	Capital			Fuel (6)	Total Input (7)	Total Factor Productivity (8)
			Road (3)	Equip. (4)	Total (5)			
1839	.04	.3	.9	.2	.8	.07	.5	8.7
1849	.31	1.1	2.5	.7	2.2	.2	1.4	22.1
1859	1.7	5.0	11.4	3.6	10.1	1.5	6.6	26.4
1870	6.0	13.5	18.5	6.7	16.6	5.4	13.9	43.4
1880	13.8	24.5	34.2	17.3	31.5	11.7	25.9	53.2
1890	32.8	44.1	66.7	36.6	61.9	28.7	49.3	66.5
1900	54.8	59.9	77.4	45.2	72.3	45.9	63.2	86.7
1910	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

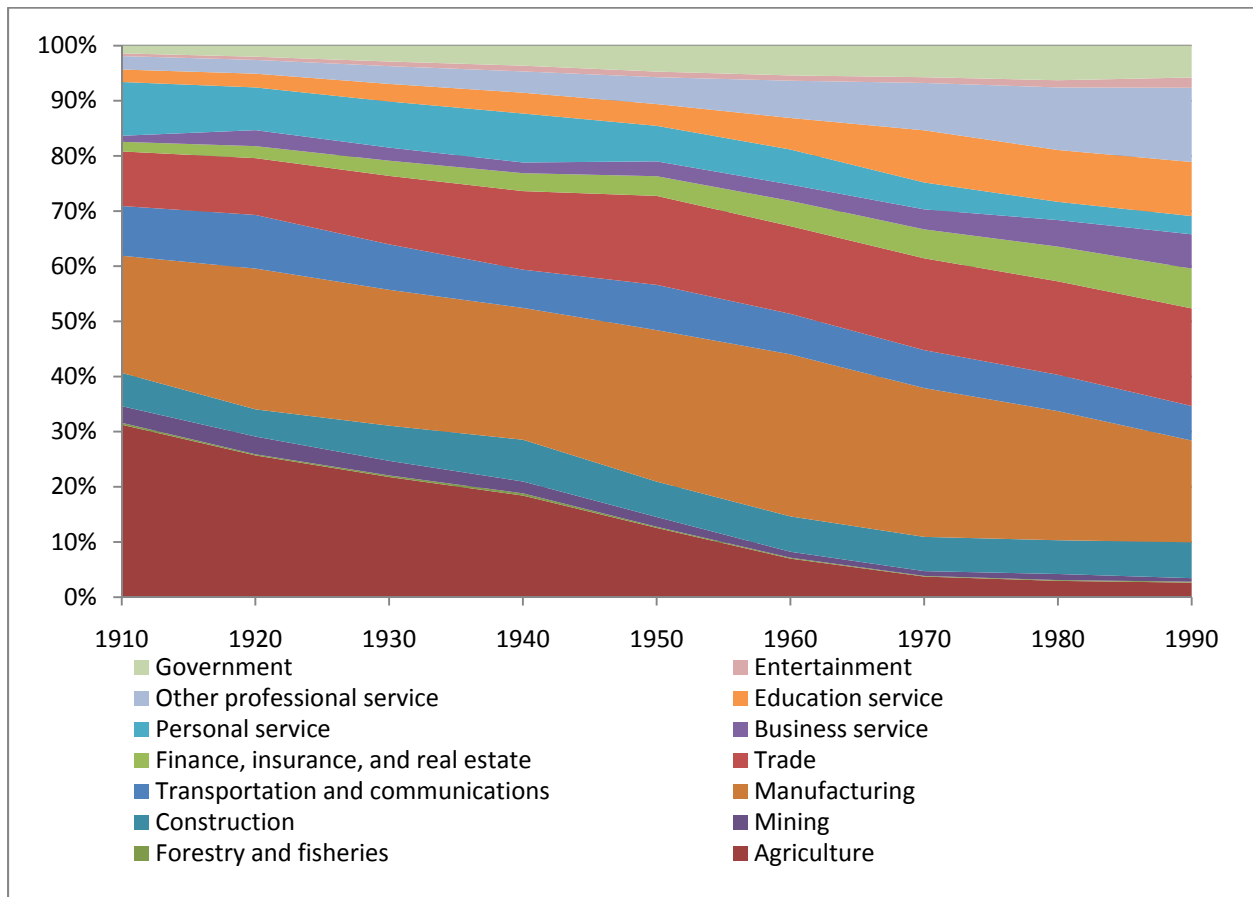
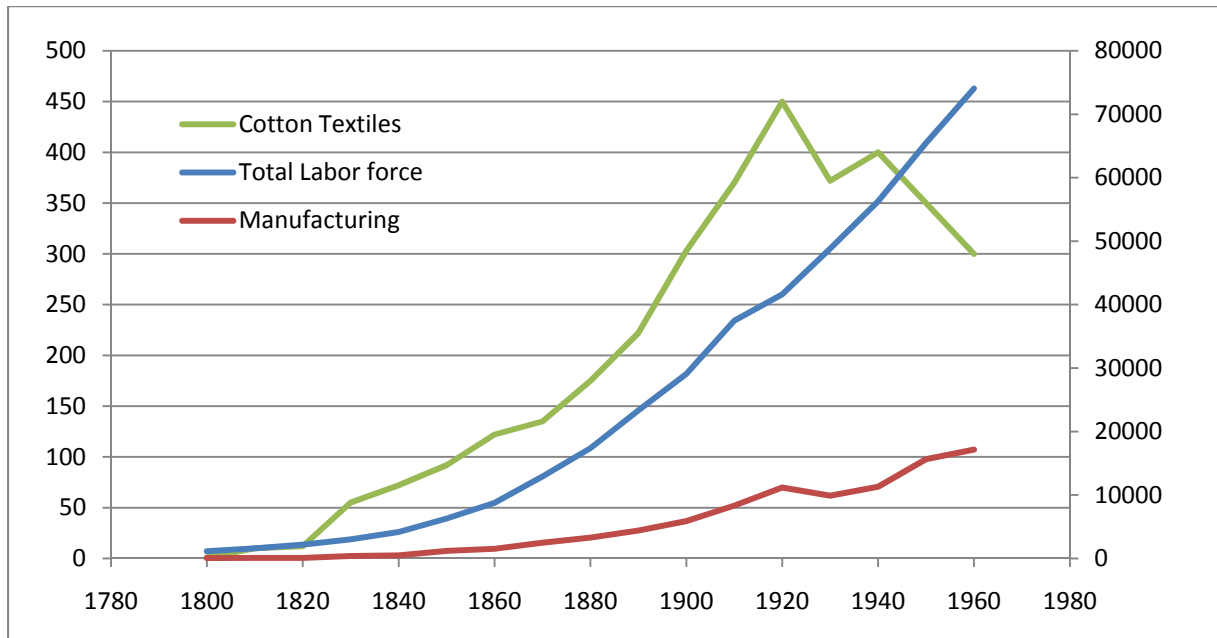
COTTON

One of the key industries of the industrial revolution and industrialization Further evidence of structural change



Note much of the service sector and government is missing

The share of textiles is not that large, but grows much faster than manufacturing as a whole



## Links to other areas of what we have done

- 1) Cotton itself Major export of the US (see agricultural innovation)
  - 2) Major beneficiary of transport advances (goods flows with the US) and across the Atlantic (both as a crop export and as manufactured traded commodity)
  - 3) Initially a very simple technology (can be reproduced easily) but becomes more complex overtime
  - 4) Machine producers are very concentrated (only three or four countries make machinery)
  - 5) Area of intensive use of labor and of time motion studies. Extensive division of labor both between and within firms
    - a. Because labor share is large, major issue of how to deal with labor costs
    - b. How to deal with skills
  - 6) Industry is both mobile and immobile.
    - a. Before 1700 industry is disperse and flow are from Asia to Europe
    - b. Core of the industry 1770-1920 is England (most of the world's trade cotton cloth) is produced in England,
    - c. After 1920 this industry moves ever more to developing economies.
- 3) Clark

## How to measure differences in productivity

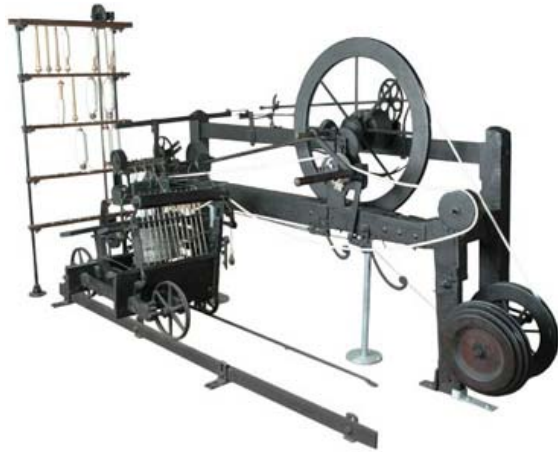
## COTTON TEXTILE COSTS AND PROFITS AS IMPLIED BY INPUT PRICES, c.1910

Country or Region	Weekly Wage Rate	Plant and Machinery (dollar/spindle)	Coal (dollar/ton)	Manufacturing Cost (England = 1.00)	Implied Profit Rate
New England	\$8.8	\$17.43	\$3.80	1.59	-8.9%
United States (South)	6.5	17.43	3.80	1.30	-0.7
England	5.0	12.72	2.50	1.00	8.0
Germany	3.8	18.48	4.88	1.00	7.9
France	3.7	16.54	4.67	0.95	9.5
Switzerland	3.7	24.80	6.62	1.15	4.7
Austro-Hungary	2.8	16.38	5.75	0.85	12.6
Spain	2.7	19.33	6.50	0.91	10.5
Mexico	2.6	19.27	10.00	0.94	9.6
Russia	2.4	20.69	7.20	0.91	10.3
Italy	2.4	16.00	7.25	0.81	13.8
Portugal	1.72	17.50	7.00	0.76	15.0
Japan	0.80	24.57	2.58	0.73	14.1
India	0.78	17.56	5.02	0.61	19.1
China	0.54	16.32	3.25	0.53	22.1
Share in costs in England	0.618	0.124	0.034		

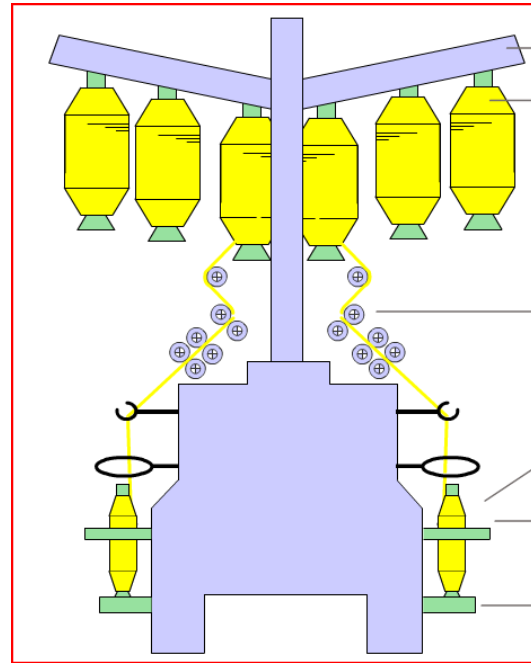
TABLE 4  
MACHINES PER OPERATIVE, c. 1910

Country or Region	Average Weekly Wage	Loom-Equivalents per Worker	Index of Machines per Worker	Ring Spindles per Worker	Plain Looms per Worker
New England	\$8.8	2.97	1.55	902	8.0
Canada	8.8	2.53	1.41	750	6.0
United States (South)	6.5	2.65	1.44	770	6.0
Britain	5.0	2.04	1.00	625	3.8
Germany	3.8	1.28	0.63	327	2.9
France	3.7	1.11	0.81	500	2.8
Switzerland	3.7	1.40	0.70	450	2.7
Austro-Hungary	2.8	1.24	0.65	403	2.8
Spain	2.7	0.91	0.73	450	2.0
Mexico	2.6	1.15	0.77	540	2.5
Russia	2.4	1.10	0.77	450	2.0
Italy	2.4	0.88	0.76	436	2.0
Portugal	1.72	0.88	0.65	384	2.0
Egypt	1.69	0.81	0.39	240	1.5
Greece	1.38	0.46			
Japan	0.80	0.53	0.52	190	1.6
India	0.78	0.50	0.33	214	1.9
China	0.54	0.48	0.34	168	1.5
Peru		1.17	0.78	391	3.5
Brazil		0.88	0.67	527	3.0

### 4) Saxonhouse-Wright

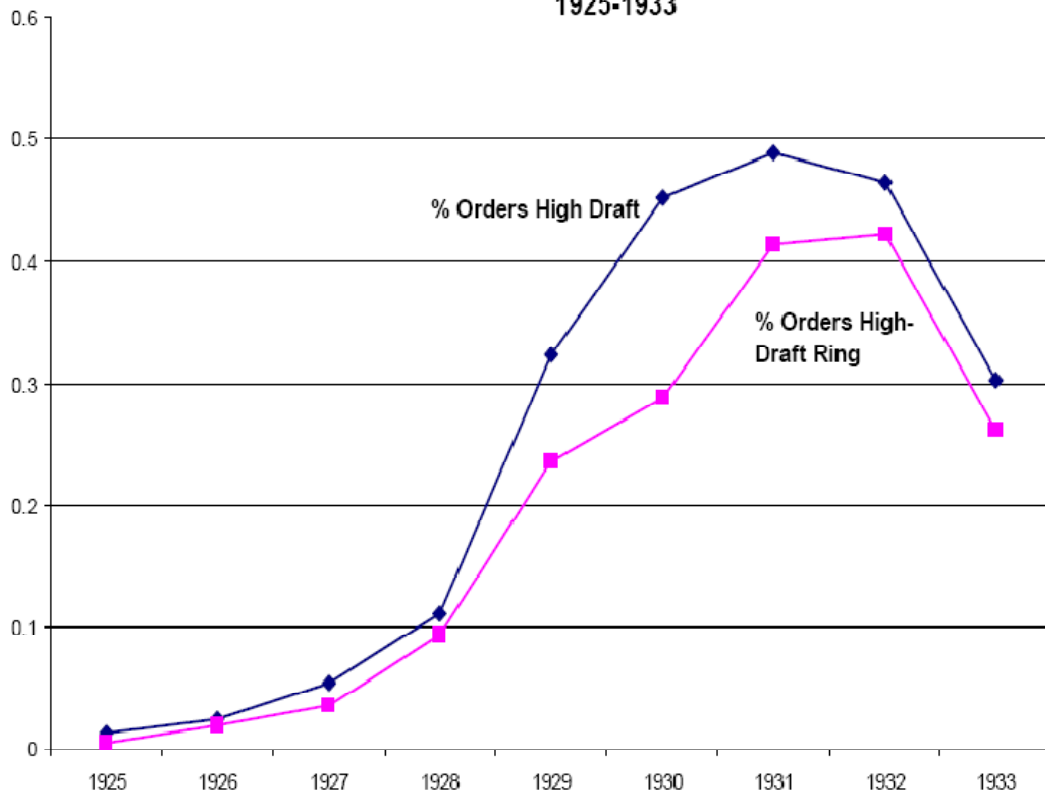


Mule Spinner

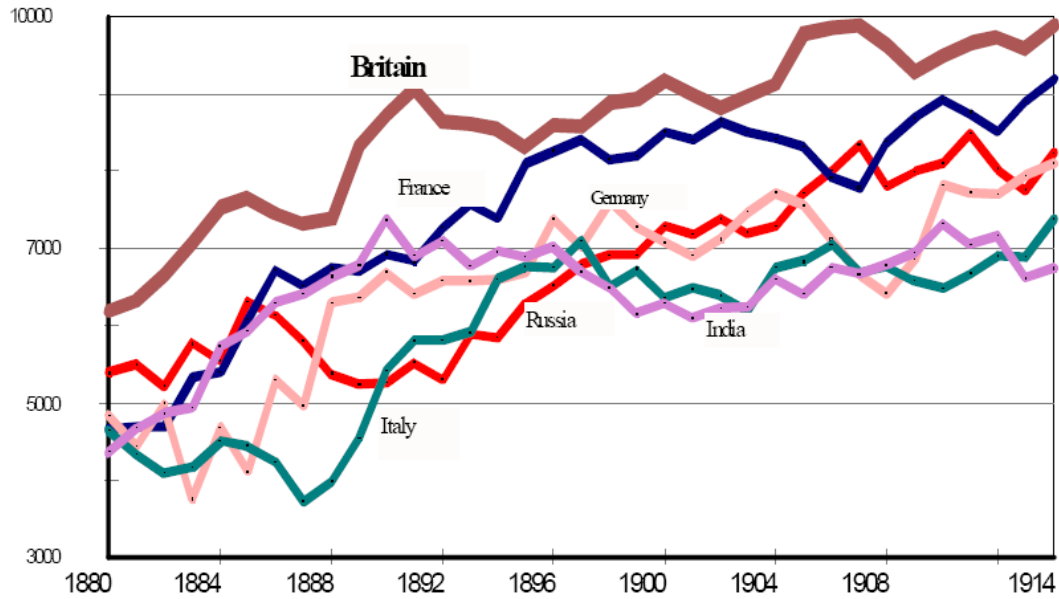


Ring Spinner

### Diffusion of High Draft Ring Spinning 1925-1933



## RPM per Mule Frame 1880-1914



## RPM per Ring Frame 1888-1914

