Organizational transformation.

- Crafts production.
- The putting-out system.
- The factory system.

Jedediah Strutt’s Milford mills.
A paradox?

- The enclosure movement.
  - Move way from collective “team” working of village land.
  - Unbundling of joint-ownership rights.

- The factory system.
  - Move to collectively organized modes of production.
  - Ownership rights to capital unified in joint-stock company.
The factory system.

- What is a factory?
  - Expensive or indivisible technology.
  - The concentration of workers in a single location.
  - Close monitoring or supervision of work.
    - “Factory discipline.”
Monitoring and supervision.

- The putting-out system.
  - Contractor relationship.
  - Product monitoring.
  - Pecuniary incentives.

- The factory system.
  - Employee relationship.
  - Process monitoring.
  - “Factory discipline.”
Monitoring and supervision.

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<th>Work force concentrated</th>
<th>Work force dispersed</th>
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<td><strong>Process supervision</strong></td>
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The factory system.

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Photo of Karl Marx courtesy of the Warren J. Samuels Portrait Collection at Duke University.
Crafts production.
Crafts production.

- Artisans work at their own pace.
- Differences in absolute and comparative skill across tasks.
- Ease of “systemic” change in product.
  - Uniqueness of crafts-made goods.
- Need for “wide” human capital.
  - Skilled artisan must master many different tasks.
The division of labor.

- Improvement in “skill and dexterity.”
  - Learning by doing.
- Spread fixed set-up costs.
  - Less “sauntering” between tasks.
- Increased innovation.
  - Operative focused on and benefits from “abridging labour.”
  - Specializing in invention.
- Assign operatives according to comparative advantage.

Charles Babbage (1791-1871).

Adam Smith (1723-1790).
Factory production.
Factory production.

- Shift from parallel to series.
  - Time phasing of inputs.
  - Workers work at pace of team.
  - Workers complements not substitutes.
- Product standardized.
  - Difficulty of systemic change.
  - Ease of “autonomous” change and learning by doing.
Factory production.

- Physical capital saving.
  - Need only one set of tools.
  - Economizes on work-in-process (buffer) inventories.

- Human capital saving.
  - “Deskilling.”
  - Workers sorted by comparative advantage.
  - Human capital “deepening” instead of widening.
Factory production.

Parallel-series scale economies.

- Stage D is an “antibottleneck.”
- By replicating production lines, can double output without doubling inputs.
Exploitation.

1. Division of labor not more efficient technically than crafts production.

2. “Origin and success” of factory system lay in substitution of capitalist control for worker control.
   - Deskilling of workers.

Marglin:
Exploitation.

1. Division of labor is clearly more efficient technically than crafts production.

2. Timing: if factory production benefits capitalists, why did they wait so long?

But:
Transaction costs.

- Costs of putting-out:
  - Buffer inventories.
  - Embezzlement.

- Benefits of factory organization:
  - Closer coordination of stages.
  - Reduction in “interface leakages.”
Transaction costs.

- Costs of buffer inventories small.
- Capitalists had ways to compensate for embezzlement.
  - Factory organization for expensive materials (Spanish wool).
- Transaction costs small compared to production-cost advantages of putting out.
  - Lower labor costs.
  - Flexibility in downturns.
Technology.

“No, what made the factory successful in Britain was not the wish but the muscle: the machines and the engines. We do not have factories until these were available, because nothing less would have overcome the cost advantages of dispersed manufacture.”

The limits of the putting-out system.

- Diminishing returns on the geographic (extensive) margin.
- Attempts to increase effort (the intensive margin) run up against backward-bending effort-supply curve.
Technology and organization.

- Need for a “nonmarginal” institutional change.
  - Compare enclosure.
- Automatic machinery allows high throughput.
- But why process monitoring?
  - Constant levels of effort necessary to amortize high fixed costs.
  - Enforcing a “nonmarginal” wage-effort bargain.
  - Creating “industrial” human capital.
    - New norms of effort.

“The workers dislike discipline, but they stay in the factory because at the end of the week their wage is 60 percent greater than that they can achieve without discipline” (Clark 1994, p. 160).
The factory system in cotton.

Factory workers and handloom weavers in Britain, 1806-1862 (in thousands).

The factory system in cotton.

- Early factory workers.
  - Women and children.
    - Oldknow employs men in agriculture.
  - Poorhouses.
  - Need to build dormitories.

- By 1784, key position in spinning goes to adult males.
  - The multicellular mill.

- Recreating the cottage contracting system within factories.
  - Master spinner responsible for supervision, hiring.
  - But doesn’t own tools (machines).
  - Majority of child labor employed by masters, not capitalists.