

# EC2212 Industrial Growth and Competition

- The role of technology in industries, and the role of both in regional/national growth
- Take course notes & seminar form from the front
- Lectures start at 3:05pm
- Study course notes before seminar
- Study other readings by exam term
- Five assignments lead to project
- Choose project topic in next week's seminar

# Weeks of the Course

1. Technology and growth.

Sources of successful technology:

2. Small firms (and regions).

3. Large firms.

Industry competition & technology:

4. Overview.

5. Market leadership change.

6. Shakeouts.

7. Sources of firm advantage.

8. Product differentiation.

9. Firm growth & technology.

10. Firm and national success.

# EC2212 Industrial Growth and Competition

## Lecture 1

Technology Is the Primary  
Source of Economic Growth

# The Manufacture of Pins

- Adam Smith, *The Wealth of Nations* — example of division of labor
- Yet technology, not division of labor nor scale, has driven cost of pins
- 1770s: average worker 4,800 pins per day
- 1970s: average worker 800,000 pins per day
- 2.6% annual productivity growth

# Technology and Growth

- Robert Solow won Nobel Prize largely for showing the importance of technology in economic growth
- Previous economists: capital, division, ...
- Solow: 12.5% of growth in output per hour, non-farm 1909-49, from capital equipment
- Remaining 87.5% attributed to improved production and skills

# Growth is More than Figures Say

- New products not in “basket” of goods to measure consumer price index
  - Yet they have the most rapid price declines
  - Overestimates inflation, underestimates growth
- Quality improvements not reflected in economic growth figures

...Because of New Technology

# Worldwide Economic Growth

- Gross world product (GWP):
  - Measured in constant 1995 US dollars
  - \$4.9 trillion in 1950
  - \$26.9 trillion in 1995
  - 1.6% average annual growth
  - 0.9% average per person
- Output per worker hour has risen 0.9%+ annually

# National Growth & Technology

- Compare growth in output per worker hour among leading industrial nations
  - Differences between countries
  - Differences between time periods
  - Convergence among leading industrial nations
- Less-industrialized countries
  - Often different patterns (institutional problems)
  - Not always convergence



## Growth Rates (% per year) of GDP per Worker Hour in Sixteen Industrial Countries, 1870-1979

	1870-80	1880-90	1890-00	1900-13	1913-29	1929-38	1938-50	1950-60	1960-70	1970-79
Australia	1.82	0.37	-0.80	1.01	1.49	0.88	2.20	2.76	2.22	2.83
Austria	1.50	1.98	1.93	1.50	0.72	0.21	1.61	5.69	5.90	4.32
Belgium	1.84	1.36	0.93	0.90	1.79	1.01	1.14	3.14	4.88	4.88
Canada	2.19	1.23	1.70	2.70	1.21	0.00	5.36	3.09	2.72	1.83
Denmark	1.47	1.95	1.90	2.21	2.57	0.43	1.23	2.97	4.90	3.06
Finland	1.29	1.14	3.36	2.42	1.95	1.89	2.10	3.96	6.37	2.60
France	2.32	0.90	2.02	1.82	2.34	2.83	0.75	4.39	5.38	4.09
Germany	1.50	2.15	2.42	1.41	1.40	2.34	-0.40	6.64	5.29	4.50
Italy	0.22	0.43	1.20	2.35	1.92	2.96	0.56	4.27	6.69	3.91
Japan	1.87	1.72	2.11	1.88	3.42	3.41	-3.20	5.57	9.96	5.03
Netherl.	1.44	1.26	0.98	1.07	2.44	-0.10	1.93	3.33	4.93	4.06
Norway	1.39	1.96	1.17	2.02	2.78	2.61	1.88	4.03	4.52	3.66
Sweden	1.76	1.95	2.70	2.62	2.40	2.66	3.43	3.43	4.79	2.55
Switzerl.	1.59	1.37	1.47	1.26	3.18	1.01	1.52	2.98	3.69	1.91
U.K.	1.63	1.20	1.24	0.90	1.44	0.87	2.21	2.19	3.56	2.77
U.S.	2.28	1.86	1.96	1.98	2.39	0.74	4.03	2.41	2.51	1.92

Source: Williamson (1991)

Annual Growth Rate (%) 1950-1979

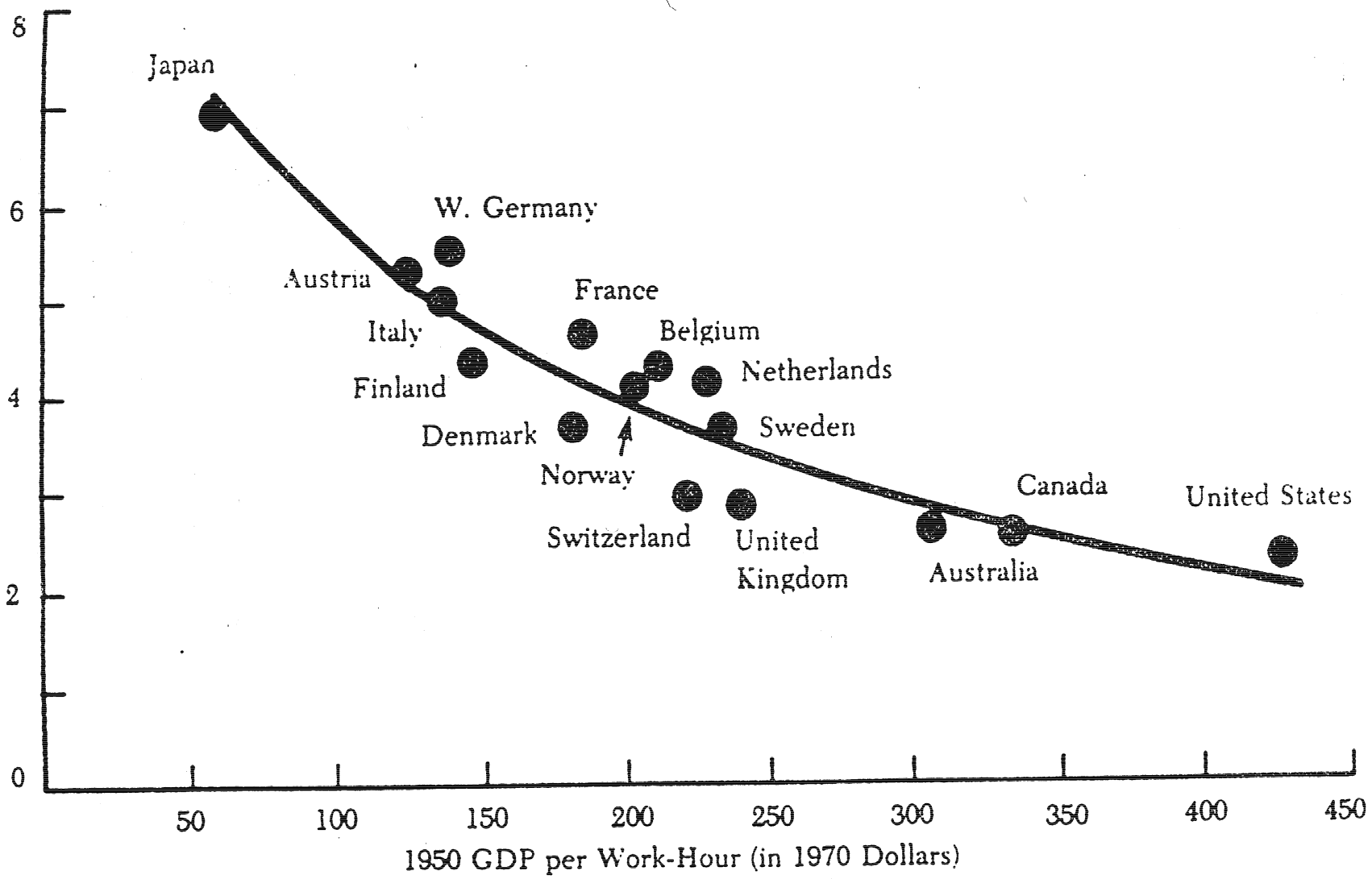


Figure 4. Postwar Productivity (GDP per work hour) Growth Rate, 16 Industrialized Countries

● Country Growth Rate      — Regression line

Source: BBW. Fig. 5.6. p. 103.

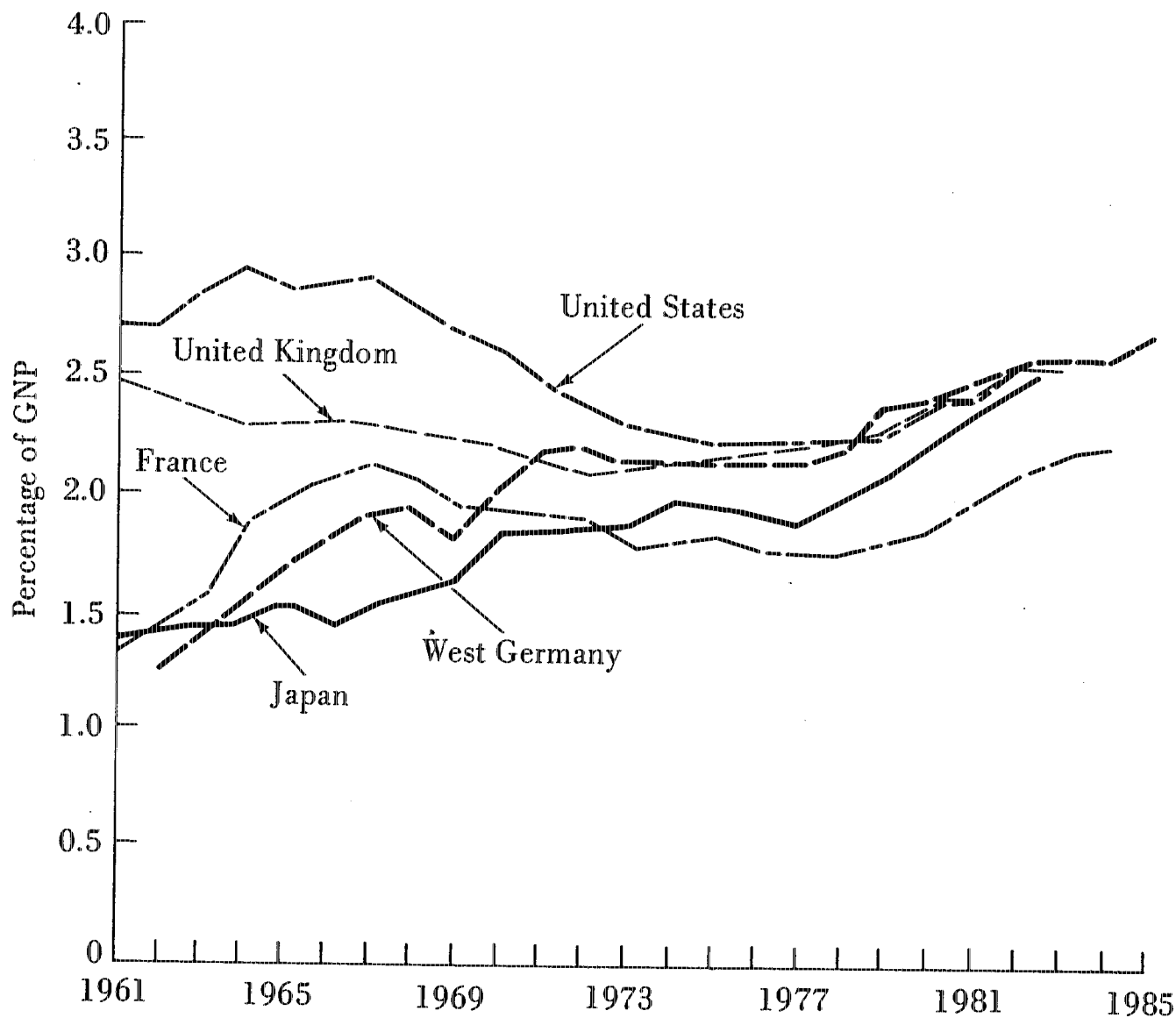


Figure 8.1. National expenditures for performance of R&D as a percentage of gross national product by country. (These are gross expenditures for performance of R&D including associated capital expenditures [except for the United States, where total capital expenditures data are not available]. Estimates for 1972–80 show that the inclusion of capital expenditures for the United States would have an impact of less than 0.1 percent per year.) *Source:* National Science Foundation (1985).

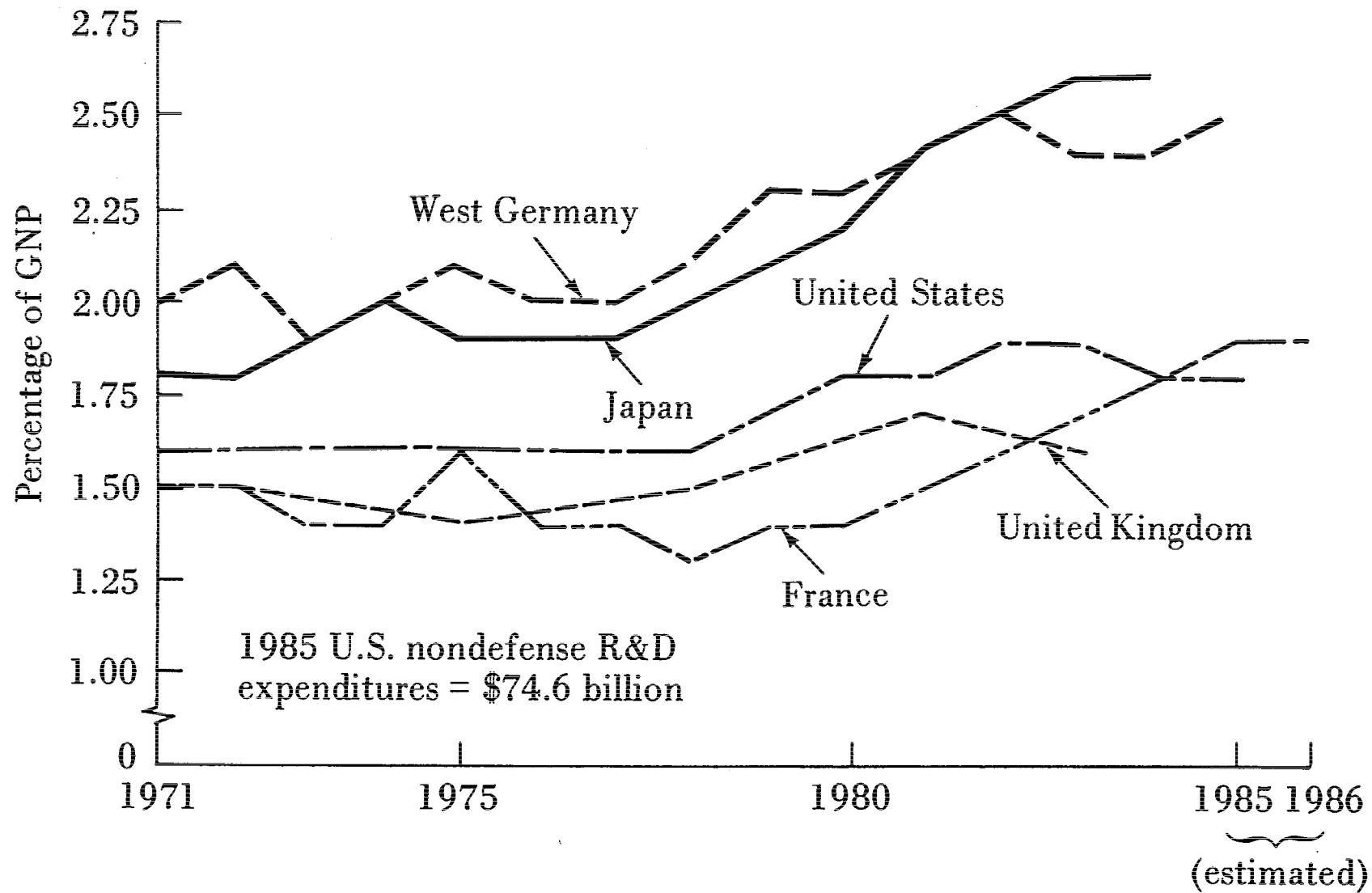


Figure 8.2. Nondefense R&D expenditures as a percentage of gross national product by country. *Source:* National Science Foundation (1987).

# UK Technological Progress

- Leadership to 1800 lost by 1900s
- Strong in services not manufacturing
- Strong in pharmaceuticals, military aerospace
- Large government budget to military
  - Benefits those industries
  - But secrecy, use of good personnel
- Little education in eng., app. science
- Culture looks down on engineers
- Oxbridge old-boy network reinforces
- Modest government R&D funding, especially non-military

Walker (1993)

# Technology vs. Competitiveness

- Economists care about ensuring competition
- But technological change more important in medium & long term
- Suppose 10% price decrease from better competition
- Same 10% decrease in 20 years by 0.5% more productivity growth (10.6 years by 1% more), & the change keeps working

# Joseph Schumpeter

- Pointed to productivity growth, new products, causing growth
- Large firms & monopolies as primary source of rapid growth
- Stopping anti-competitive practices thus may irreparably damage the economy!
- We will discuss more during the course

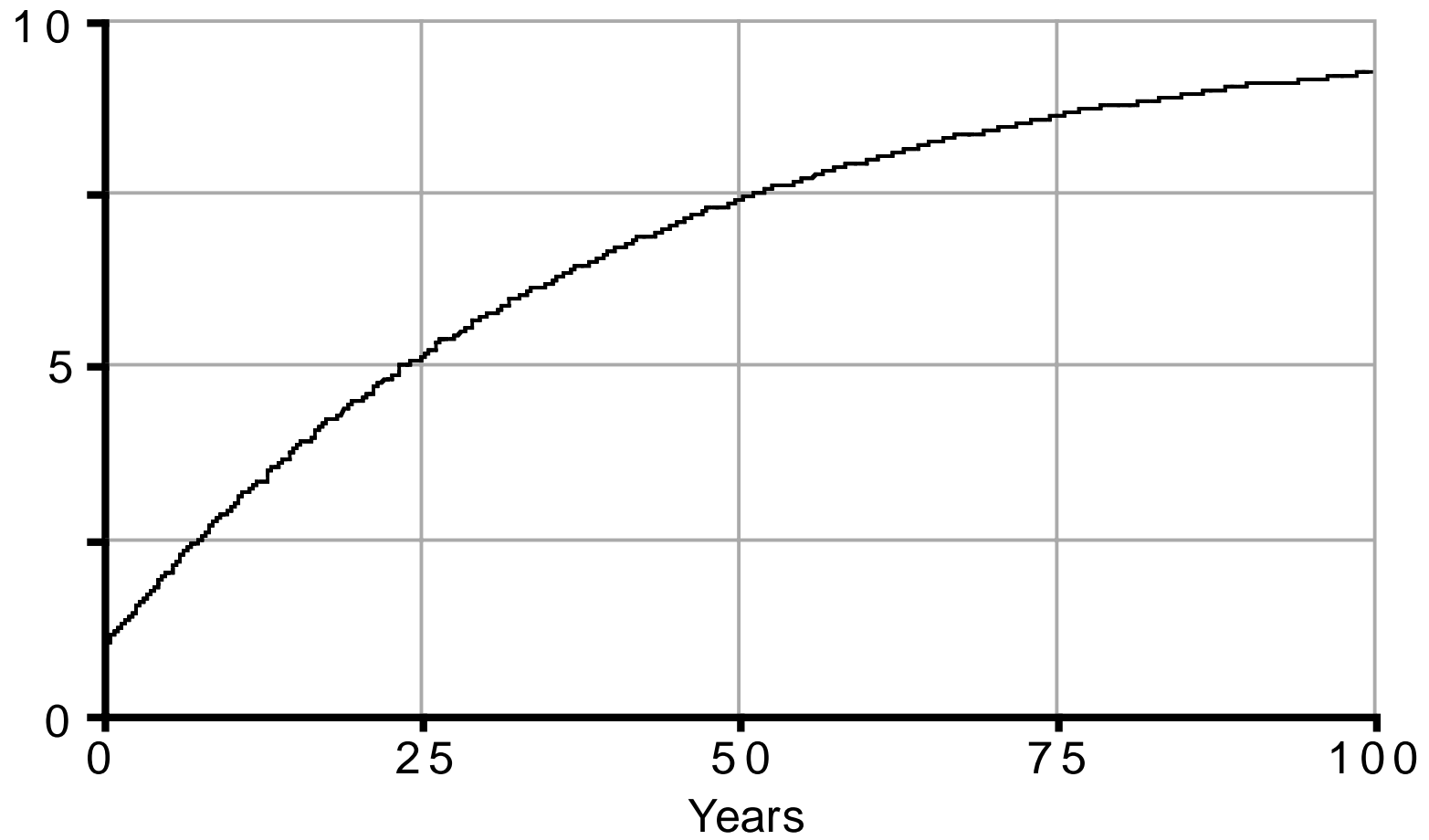
# Economic Growth

- $y = A(t) \times f(k)$ 
  - $y$  output per person per year
  - $A(t)$  technology factor, changes over time  $t$
  - $f(k)$  production function,  $k$  capital per person
- $\frac{dk}{dt} = (1 - h)y - \delta k$ 
  - $h$  fraction of output consumed,  $(1-h)$  invested
  - $\delta$  depreciation rate



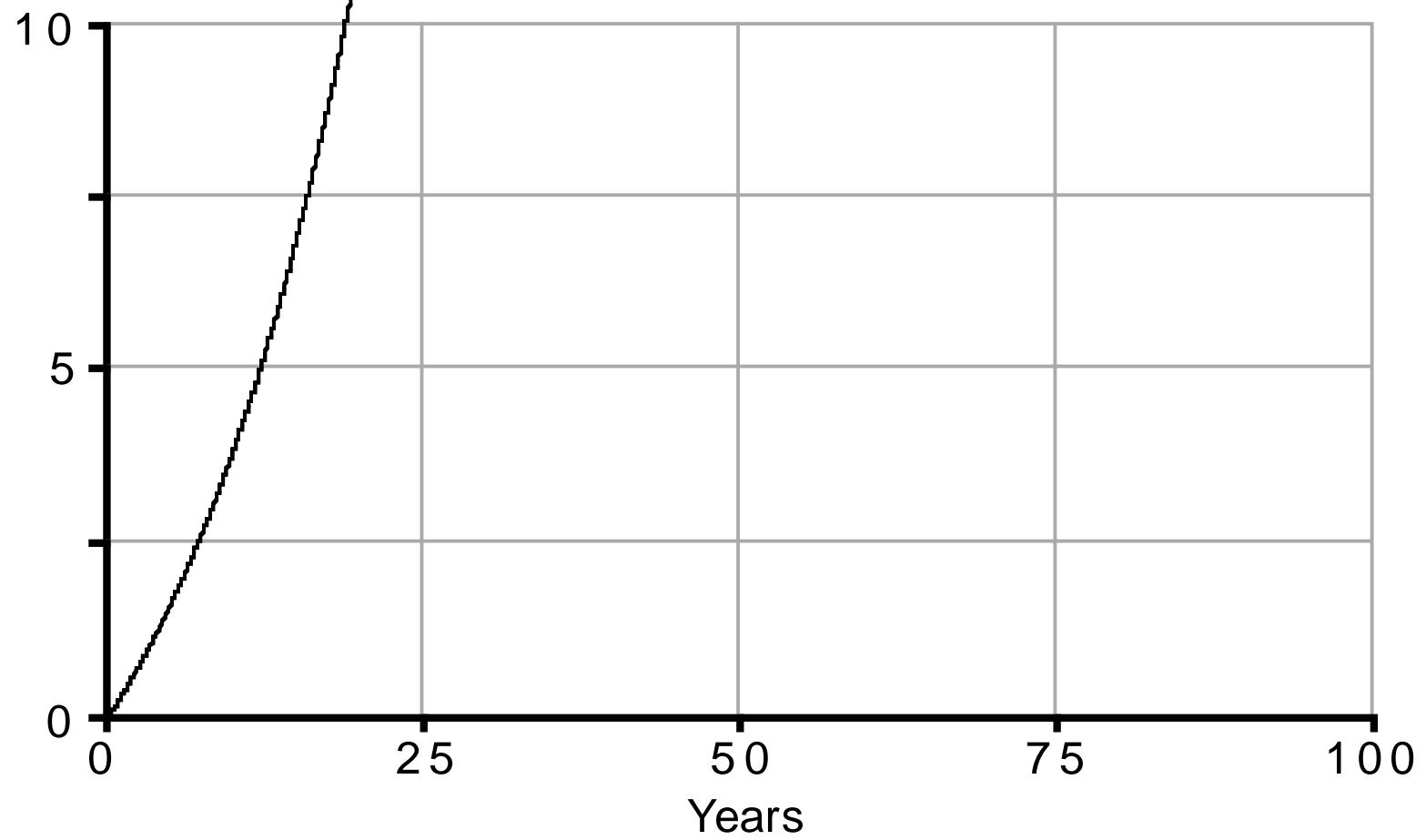
# Production over Time in Growth Model with No Productivity Growth

Production

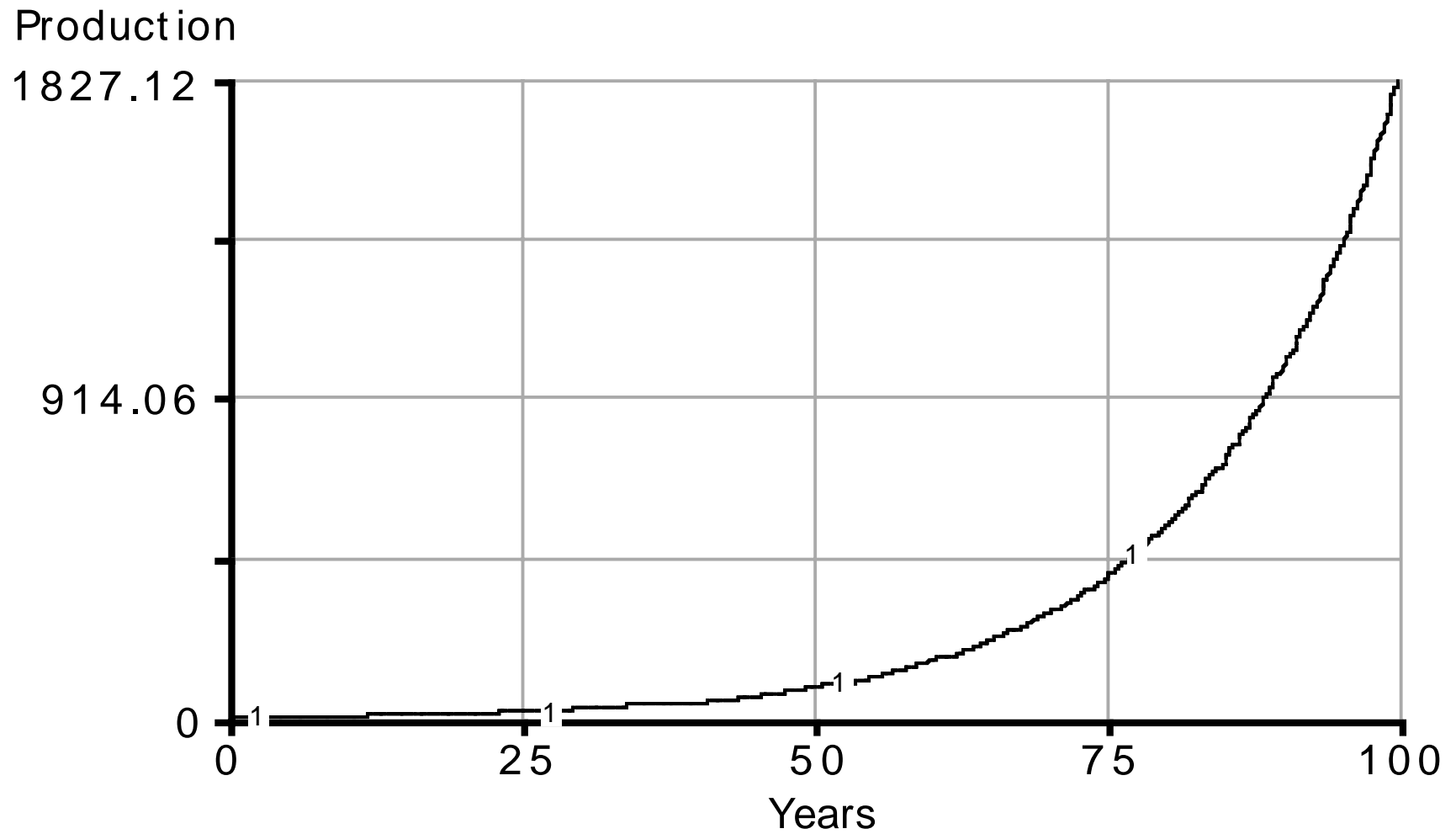


# Production over Time in Growth Model with 3% Annual Productivity Growth

Production



Production over Time in Growth Model with 3% Annual Productivity Growth



# You Have Learned

Technology drives economic growth:

- Pins
- Solow's analysis: causes 80-90% of growth
- Estimates biased downward
- Differences by nation, time; convergence
- UK environment for technology
- Technology vs. competitiveness; Schumpeter
- Economic growth models