



Institutional Environment and Evolutionary Dynamics

Johann Peter Murmann

&

Richard R. Nelson

Day 4 of Evolutionary Perspectives on Strategic Management

Goals for Day 4

Develop a deeper understanding that

1. Firm capabilities are built upon institutional foundations that lie outside the firm and made by a historical process involving many actors who all have limited foresight. (Readings: 1, 2)

2. Evolutionary dynamics are influenced by national institutions

(This is not apparent when only studies an industry in one country) Readings: 3

3. Firm strategy involves influencing the institutional environment

(Readings: 4, 5)

4. Good empirical work requires knowing the details of the context

Exercise applying ideas to some student projects

Approximate Schedule

- 8:30a- 10:00am **Institutional Foundations of Firm Capabilities**
- 10:15am-11:45pm: **National Institutions and Industry Dynamics**
- 12:30pm-2:00pm: **The Role of Firms/ Managers in Shaping Institutions**
- 2:00pm-2:30pm” **Exercise: Application of Ideas to 4 Students’ Empirical Context**
- 4:45pm-5:45pm: **Student Presentation & Discussion**

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Theory

Evolutionary Theories in the Social Sciences

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June 10, 2012



July 15, 2012. **Elinor Ostrom dies**

Geoffrey Hodgson writes about the importance of her work.

Her Nobel Prize Lecture provides a good overview of her life work. Read Noble Lecture.

NY Times Obituary.

Evolutionary History: Uniting History and Biology to Understand Life on Earth

We will provide our own review of the book in the future. In the meantime you can read Scrantons' review in Technology and Culture.

May 22, 2012

Christopher Kelly organized a workshop on the MODE AND TEMPO IN TECHNOLOGICAL CHANGE at ULCA Institute for Society and Genetics. Mike Alfaro spoke about the topic from the perspective of Phylogenetics, Robert Boyd from the perspective of Cultural Evolution, and Johann Peter Murmann from the perspective of Economic and Organizational Change. James Griesemer was the discussant. The video of the workshop available on the web: Video

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May 15, 2012: **Perspectives and Reflections on Nelson & Winter (1982)**

The 9th Atlanta Competitive Advantage Conference had a panel to celebrate the publication of Nelson and Winter's 1982 landmark book. The panel included Sid Winter, Connie Helfat, L.G. Thomas III, and Johann Peter Murmann. The slides from the panelists are here: Helfat's Presentation Slides
Murmman's Presentation Slides
Thomas's Presentation Slides

From the vault: Winter on Nelson (2000)
Nelson on Winter (2003)



March 26, 2012: **New Work on Coevolution**

Johann Peter Murmann has published an inductive case study entitled *Coevolution of Industries and Important Features of Their Environments*. Using a comparative historical method and drawing on evidence from five countries over a 60-year period, this paper spells out how coevolutionary processes work in shaping the evolution of industries and important features of their environments. Read the abstract and download paper here.



Jan 26, 2012 **Emerging Scholar Workshop: Evolutionary Perspectives on Strategic Management**

The Mack Center for Technological Innovation at the Wharton School will put on a new week-long workshop for emerging scholars in the field. The workshop is designed for scholars ranging from students who are completing the second year of doctoral studies to those who have recently completed a doctorate. Participants will learn from leading scholars in the field. The program will consist of a mix of seminar

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Two Murmann papers that may be useful for data collection



Constructing Relational Databases to Study Life Histories on Your PC or Mac

2010 - Historical Methods



Automatic Coding of Printed Materials

2007 - International Journal of Humanities and Arts Computing

Key assumptions are shared by evolutionary economists and historians

The social world undergoes not only quantitative but also qualitative change: there is novelty in the world that needs to be explained

Evolutionary economics just like linguistics or geology or biology is a historical science

Evolutionary Economics = Economics + Sociology + Political Science + History

What about Strategy Research?

Session 1: Institutional Foundations of Firm Capabilities

Nelson 2008 and Chandler 1990

Nelson 2008: What enables rapid economic progress: What are the needed institutions?

What are social technologies? What are physical technologies?

What are institutions?

How do new institutions come about?

Why is easier to improve physical technologies than social technologies?

Key Points in Nelson 2008

- Explicitly or implicitly, a large share of the writing [on institutions] is intended to shed light on the character and factors supporting generally used ways of doing things in contexts where the actions and interactions of a number of different agents determines what is achieved. We suggested that the concept of a “social technology” a useful one for thinking more coherently about these. (p. 2)
- The standard notion of a recipe is mute about how this is done. Sampat and I proposed that it might be useful to call the recipe aspect of an activity its “physical” technology, and the way work is divided and coordinated its “social” technology. (p. 2)
- From this perspective, virtually all economic activities involve the use of both physical technologies and social technologies. (p. 3)

Key Points in Nelson 2008

- My proposed analytic approach to institutions is to focus on the prevalent social technologies of interest, and be eclectic and inclusive about the “institutions” that support them. Under this orientation, institutions certainly turn out to be a diverse lot of things. But that strikes me as fine, actually illuminating, if the objective of the research is to explain why prevalent social technologies are what they are, and how they change. (p.3)

Session 1:



Scale and
Scope The
Dynamics of
Industrial
Capitalism
Alfred D.
Chandler, Jr.

Group questions: What “social technologies” a la Nelson (2008) needed to be invented for railroads to cover the entire United States in the 2nd half of 19th century and be a viable business?

Railway Network in USA 2012



Transcontinental Railway Link 1869



Chicago Railroad Yard

1930



2012



Population Growth

Year	New York	Philadelphia	Chicago
1700	4937	4400	
1790	33,131	42,520	
1830	197112	161410	
1850	515547	340045	
1870	942292	674022	298977
1910	4,766,883	1,549,008	2,185,283
1930	6930446	1950961	3376438
1950	7891957	2071605	3620962
1970	7895563	1949996	3369357
1990	7322564	1585577	2783726
2000	8,008,278	1,517,550	2,896,016

Session 1:

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Session 1: Institutional Foundations of Firm Capabilities

Scale and
Scope The
Dynamics of
Industrial
Capitalism
Alfred D.
Chandler, Jr.

- Chandler 1990
- Warm up question: What is most interesting thing that you learned in Chandler?
- What is Chandler trying to explain?
- What is the key explanatory concepts is he using?

Enablers/constraints on Rise of Large Corporations in U.S.A.



Foundations

“ICEBERG MOEL”

Enablers/constraints on Rise of Large Corporations in U.S.A.

The Large
Corporation



'3 M'

Investments
or M & A

Manufacturing
Marketing/Distribution
Management

Mergers
Acquisitions

Foundations

Economies of
Scale & Scope

Feasible

Large Demand

Railroad
Telegraph

Mechanized
Production
Technologies
Electricity, etc.

Large country

Population Growth

Cartels unstable

Development of
Investment Banking
& Financial Markets

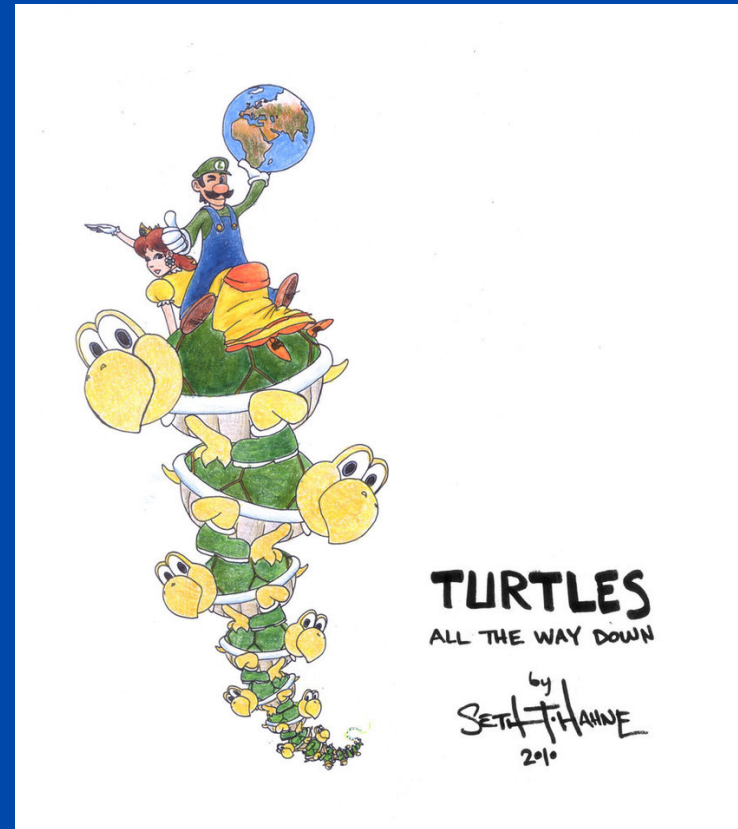
Business & engineering
schools

Anti-Trust Laws

Some Additional Useful Theoretical Ideas

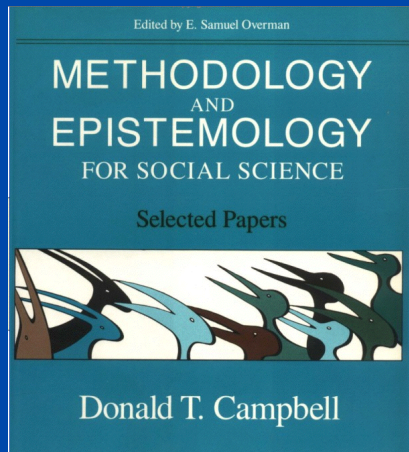
- What is the relationship between physics, chemistry and biology?

Levels of Institutions



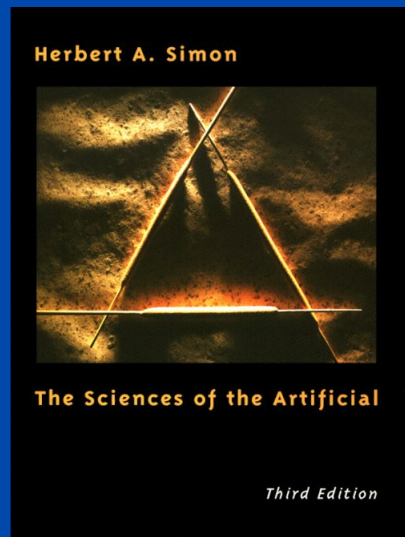
“Turtles all the way down”

Clifford Geertz's, "Thick Description: Towards an Interpretive Theory of Culture", in his 1973 book *The Interpretation of Culture*

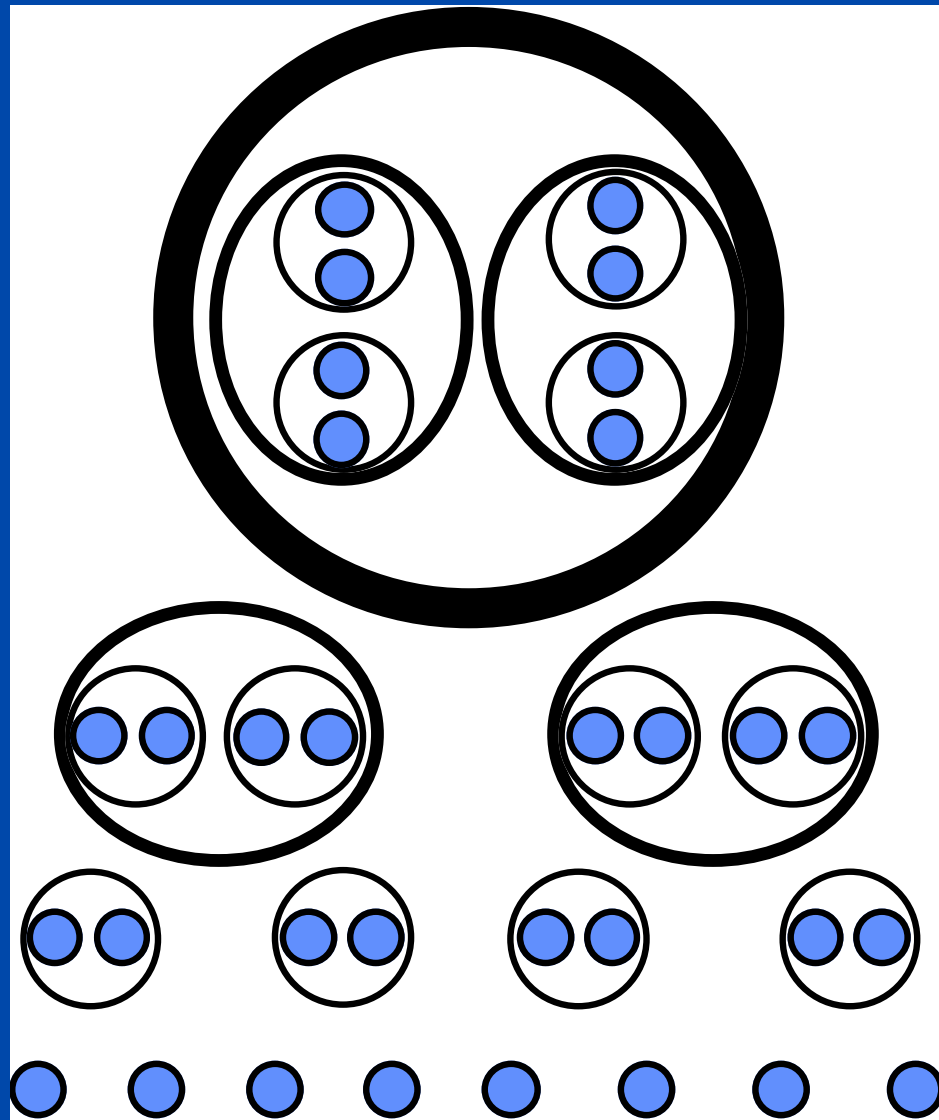


Key Idea

Many phenomena
display
a hierarchical
organization



A Four Level Hierarchy



System Level

First-order Subsystems

Second-order Subsystems

Component Level

Whole

The Global Economy

Country Economies

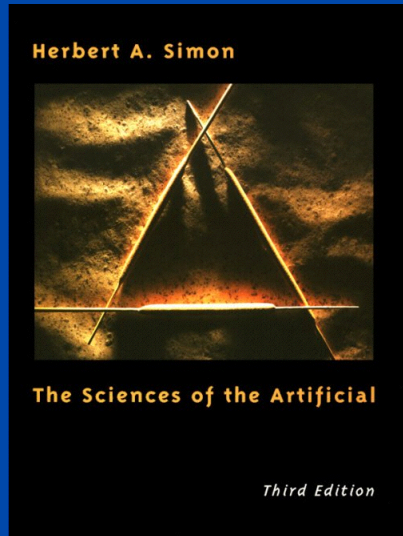
Industries

Firms

Parts

Products & Services

Frequency of Interactions



It is probably true that in social as in physical systems the higher-frequency dynamics are associated with the subsystems and the lower-frequency dynamics with the larger systems.

Simon, Herbert A. (1996-10-01). *The Sciences of the Artificial*, 3rd Edition (pp. 203-204). MIT Press. Kindle Edition.

Williamson 2000

Williamson: *The New Institutional Economics*

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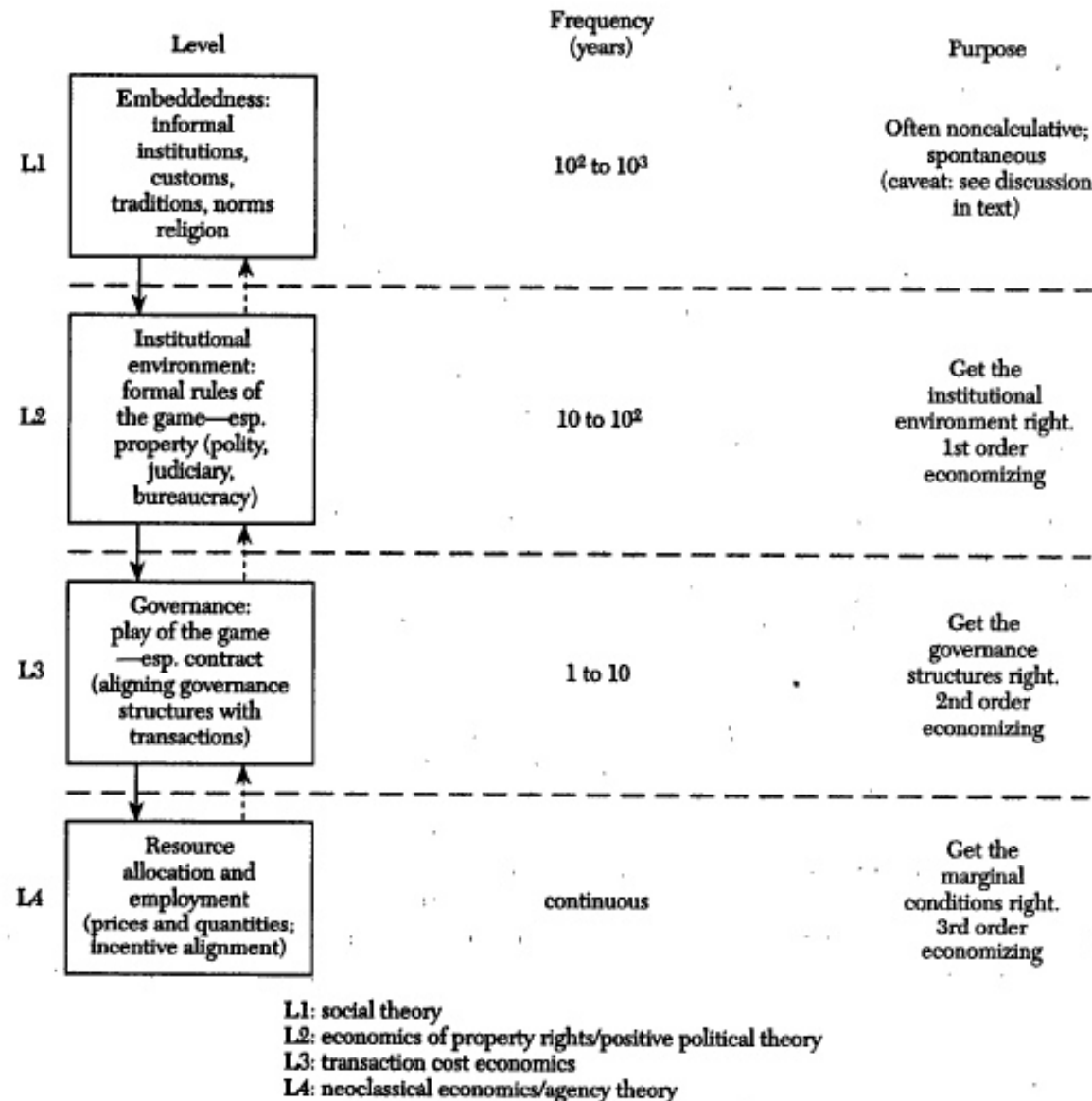
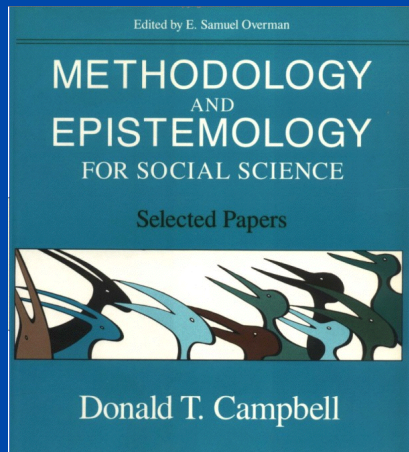


Figure 1. Economics of Institutions



Hierarchy of Selection Processes

It is important to recognize: what are selection criteria at one level are but trials of the criteria at the next higher, more fundamental, more encompassing, less frequently invoked level (Campbell, 1974, p. 421).

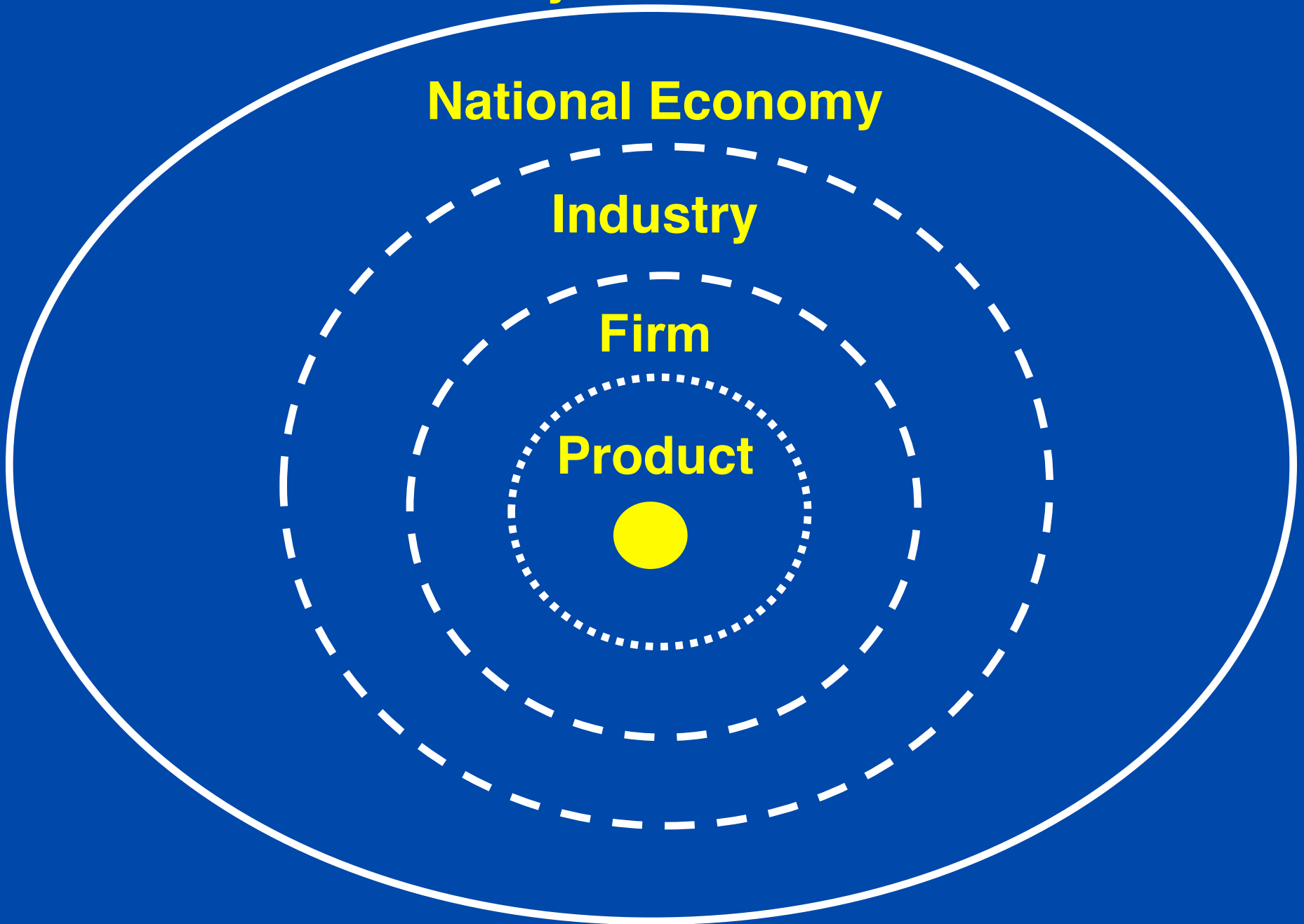
The Global Economy

National Economy

Industry

Firm

Product



Session 2: National Institutions and Industry Dynamics

Background of Murmann 2003

Theoretical: Nelson and Winter (1982)

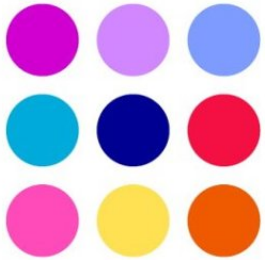
Empirical:

population level studies (Hannan & Freeman, 1977-1993, Tushman and Anderson, 1986)

Historians of Technology (Aitken, 1976, 1985; Hughes, 1983; Vincenti 1990)

Knowledge and
Competitive Advantage

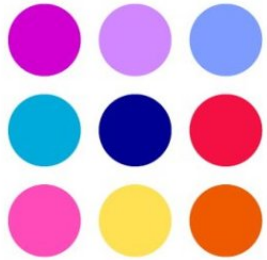
Johann Peter Murmann *The Coevolution of Firms,
Technology, and
National Institutions*



Murmann (2003)

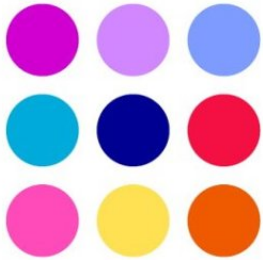
Chapter 2:

Country-Level Performance Differences and their Institutional Foundations



Ch 2

1. Why is this industry a useful case study?
2. What are the key institutions differences across the three countries? Why do they matter?
3. Why is the book an evolutionary perspective on industry development?
4. How much detail do you need to figure out causes of industry and firm evolution?
5. What did you not see in Chandler that you see in the account of the dye industry?



Chapter 2

C. BACKGROUND INFORMATION ON THE THREE COUNTRIES

D. NATIONAL RESEARCH AND TRAINING SYSTEMS

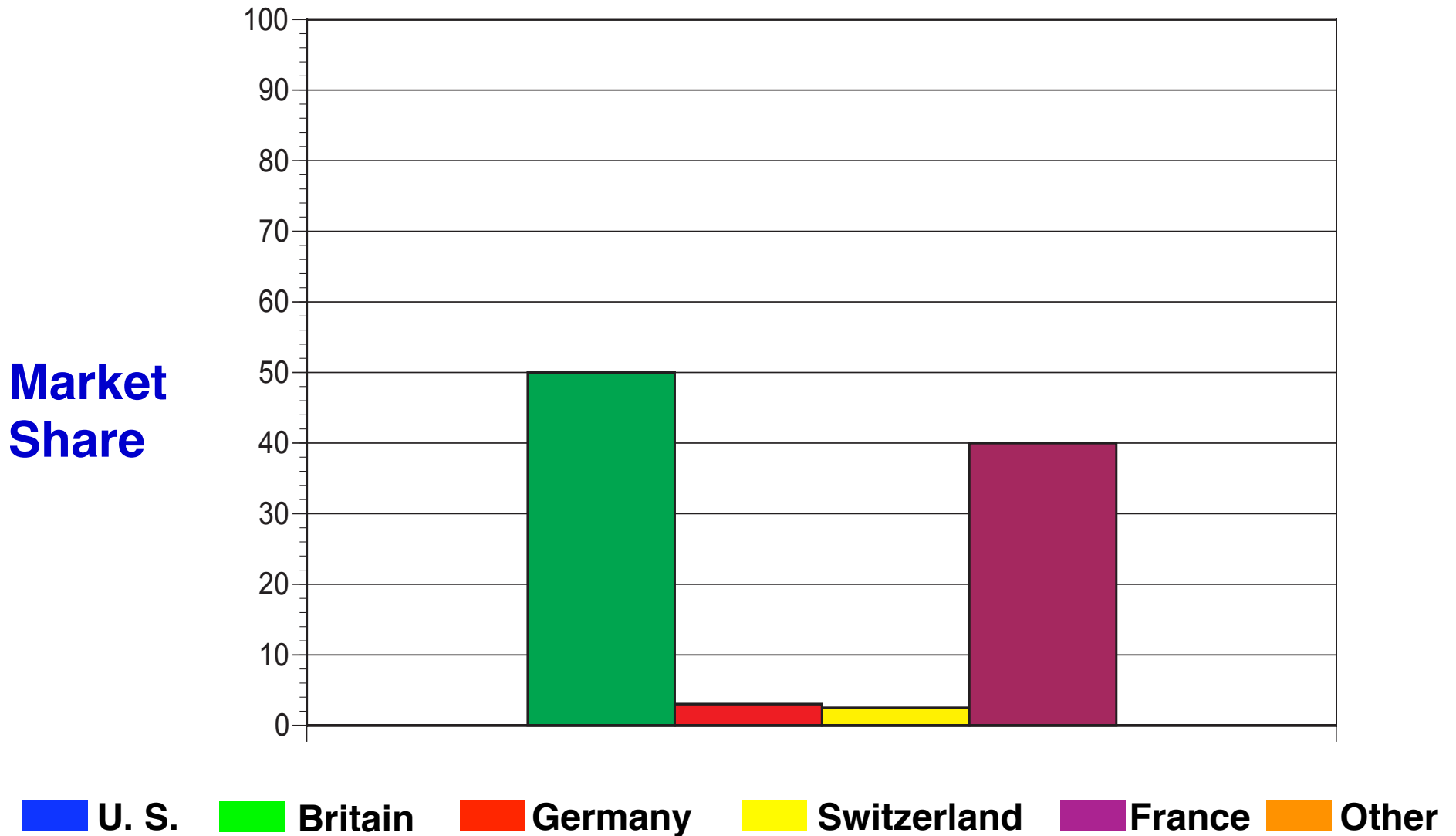
E. SUPPORTING ORGANIZATIONS AND THE STATE

F. THE ACADEMIC-INDUSTRIAL KNOWLEDGE NETWORK

G. SOCIAL ORGANIZATION OF PRODUCTION AT THE SHOP FLOOR

H. INTELLECTUAL PROPERTY RIGHT REGIMES

British and French Firms are the Leaders in Dye Industry in 1862

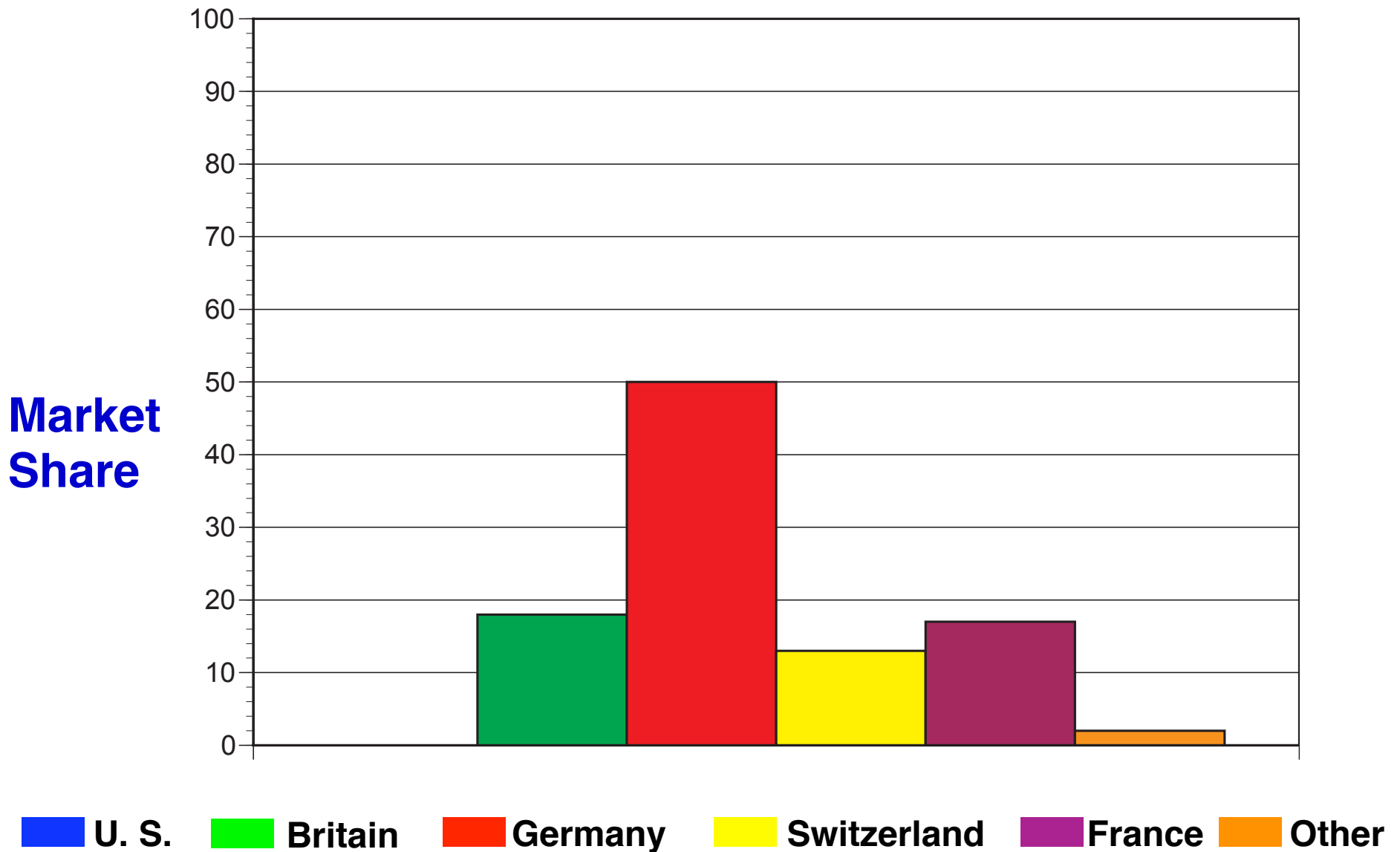


The Expert Predictions

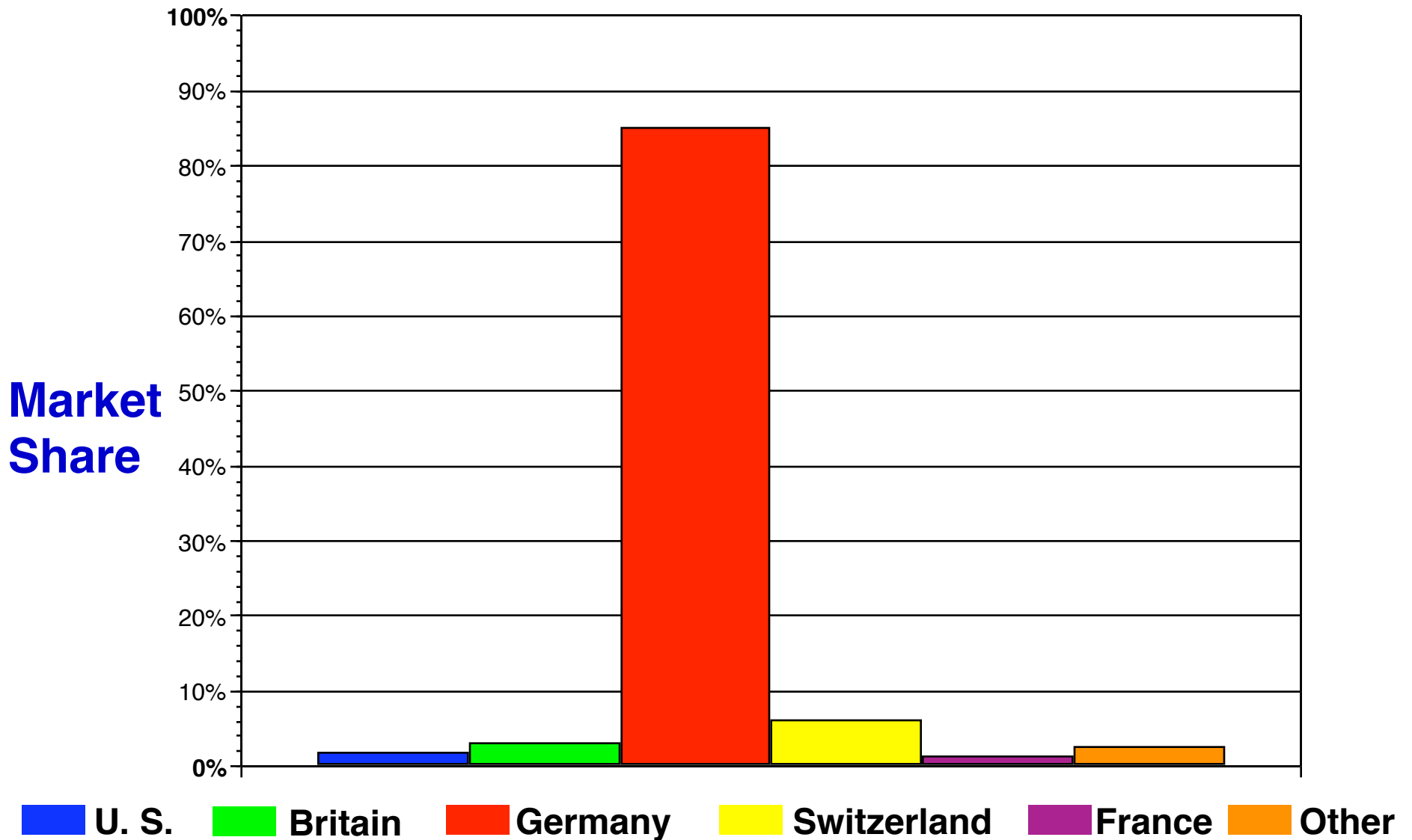
A]t no distant date...[England will be] the greatest colour producing country in the world.

—**August Wilhelm Hofmann** (1863, p. 120) in his
Report on the Chemical Section of the
International Exhibition of 1862

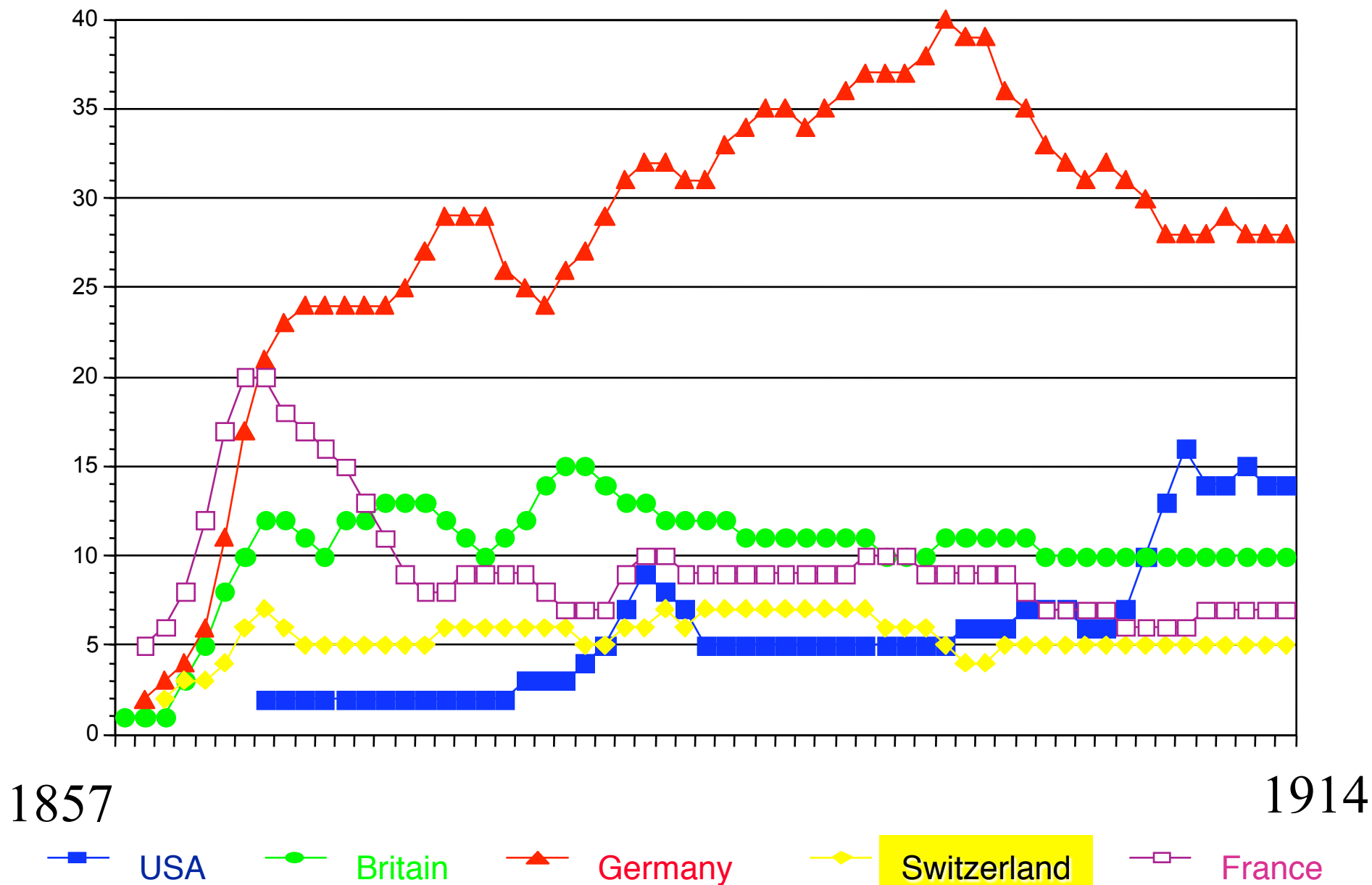
German Firms are Leaders in the Dye Industry in 1873



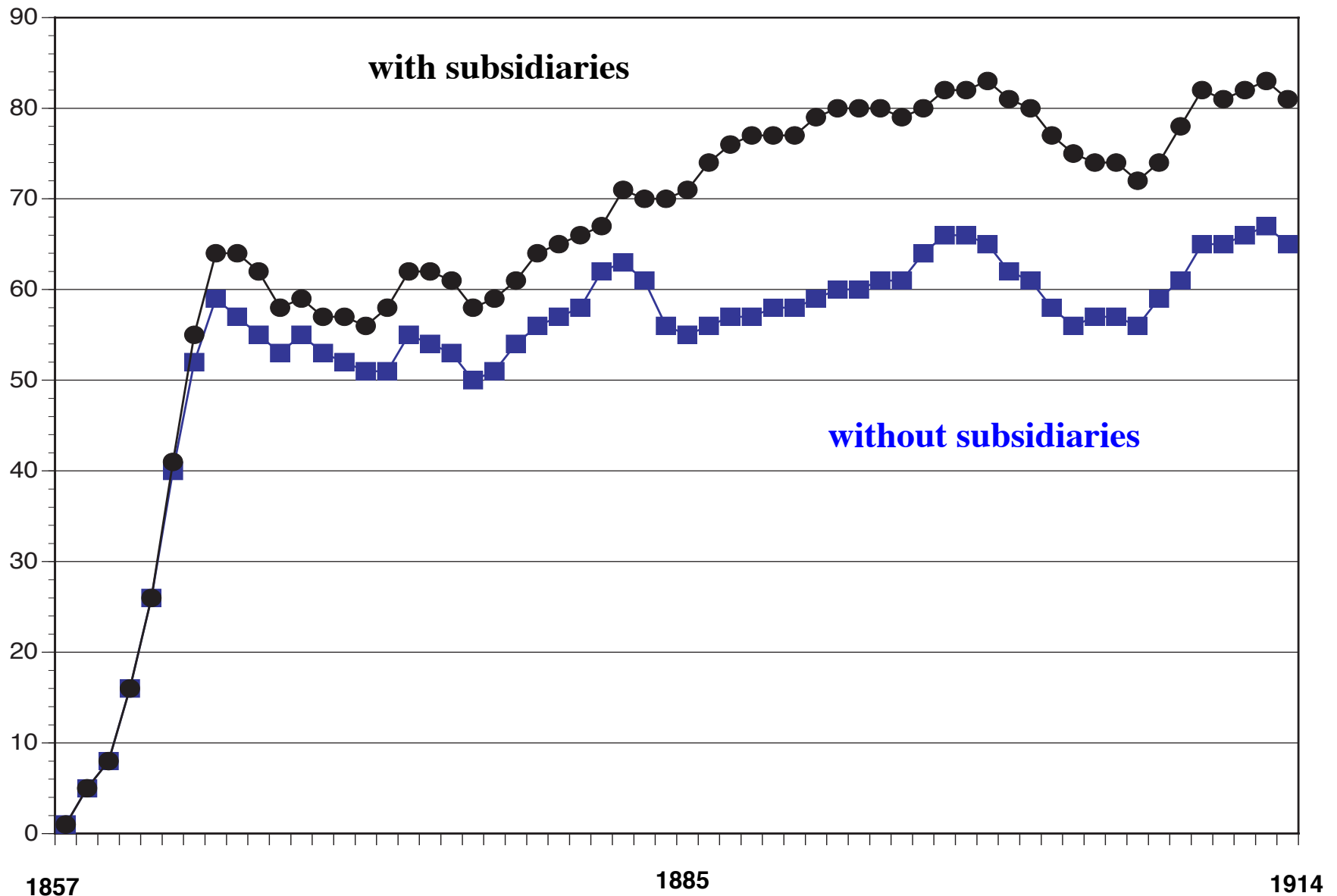
German Firms Dominate World Dye Industry in 1913



Number of Dye Firms by Country, 1857-1914



Number of Dye Firms in the World, 1857-1914



With and without counting subsidiaries both domestic and foreign

Industry Demography 1857-1914

	Number of Firm Entries	Number of Firm Exits	Firm Failure Rates
Germany	118	94	80%
France	68	57	83%
Britain	53	43	81%
United States	28	18	64%
Switzerland	32	26	81%

Source: Murmann (in Advance) @ Organization Science

National Patent Regimes

	<i>Before 1877</i>	<i>After 1877</i>
Britain	Product Patents	Product Patents
Germany	No Patents	Process Patents
U.S.	Product Patents	Product Patents
France	Product Patents	Product Patents
Switzer- land	No Patents	No Patents

Concentration in Each Country, 1913

Firm	Country	Domestic Production Share	Global Market Share	Sum of Global Share
Bayer	Germany	22%	20.0%	20.0%
BASF	Germany	22%	20.0%	40.0%
Hoechst	Germany	22%	20.0%	60.0%
Levinstein	U.K.	30%	2.0%	62.0%
Read Holliday	U.K.	30%	2.0%	64.0%
Schoellkopf	U.S.	50%	1.7%	65.7%
Heller Merz	U.S.	21%	0.7%	66.4%

German Share of Aromatic Organic Chemistry Publications cited in France

	Papers devoted to aromatics	German Share
1864	14%	35%
1867	38%	85%
1870	40%	96%
1874	35%	97%



Dye Development at Bayer in 1906

New dye molecules marketed	36
Dye molecules tested on larger scale	60
New dye molecules synthesized	2656
Theoretically possible dye molecules	Billions

Session 3: The Role of Firms/ Managers in Shaping Institutions



Murmann (2003)

Chapter 4:

The Coevolution of National Industries and Institutions

Nelson, R. R. (1995). "Why Should Managers Be Thinking About Technology Policy?" Strategic Management Journal 16: 581-588.

Session 3: The Coevolution of National Industries and Institutions

Chapter 4:



B. FORGING A NATIONAL SCIENCE CAPABILITY

WHY

C. LOBBYING FOR A SUPPORTIVE PATENT SYSTEM

Session 3: The Coevolution of National Industries and Institutions

Chapter 4:

B. FORGING A NATIONAL SCIENCE CAPABILITY

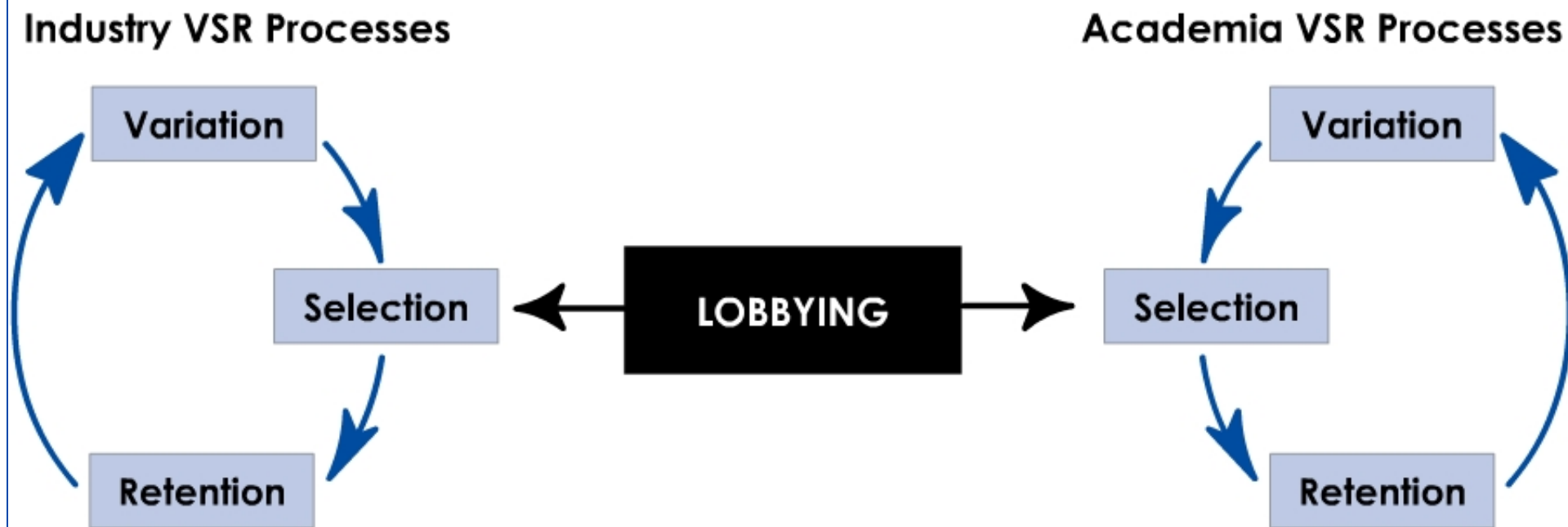


Why was German dye industry more able to increase the capability in organic chemistry (and less importantly in chemical engineering)?

Lobbying: Cross-national Differences

Number of successful joint lobbying efforts to support organic chemistry

Germany > Switzerland > Britain > France > U.S.



Global Share of Organic Chemistry Publications

	1852	1862	1877	1907
Germany	29%	38%	50-67%	35-47%
France	35%	23%	15.2%	12.2%
Britain	24%	23%	5.9%	16.2%
United States			0.9%	3.6%
Switzerland			7.4-24%	5.0-17%

Session 3: The Coevolution of National Industries and Institutions

Chapter 4:



C. LOBBYING FOR A SUPPORTIVE PATENT SYSTEM

What kind of Lobbying is going on?
Why is lobbying more effective in
Germany than in Britain and USA?

National Patent Regimes

	<i>Before 1877</i>	<i>After 1877</i>
Britain	Product Patents	Product Patents
Germany	No Patents	Process Patents
U.S.	Product Patents	Product Patents
France	Product Patents	Product Patents
Switzer- land	No Patents	No Patents

Globally Leading Firms

Yellow = product patents granted

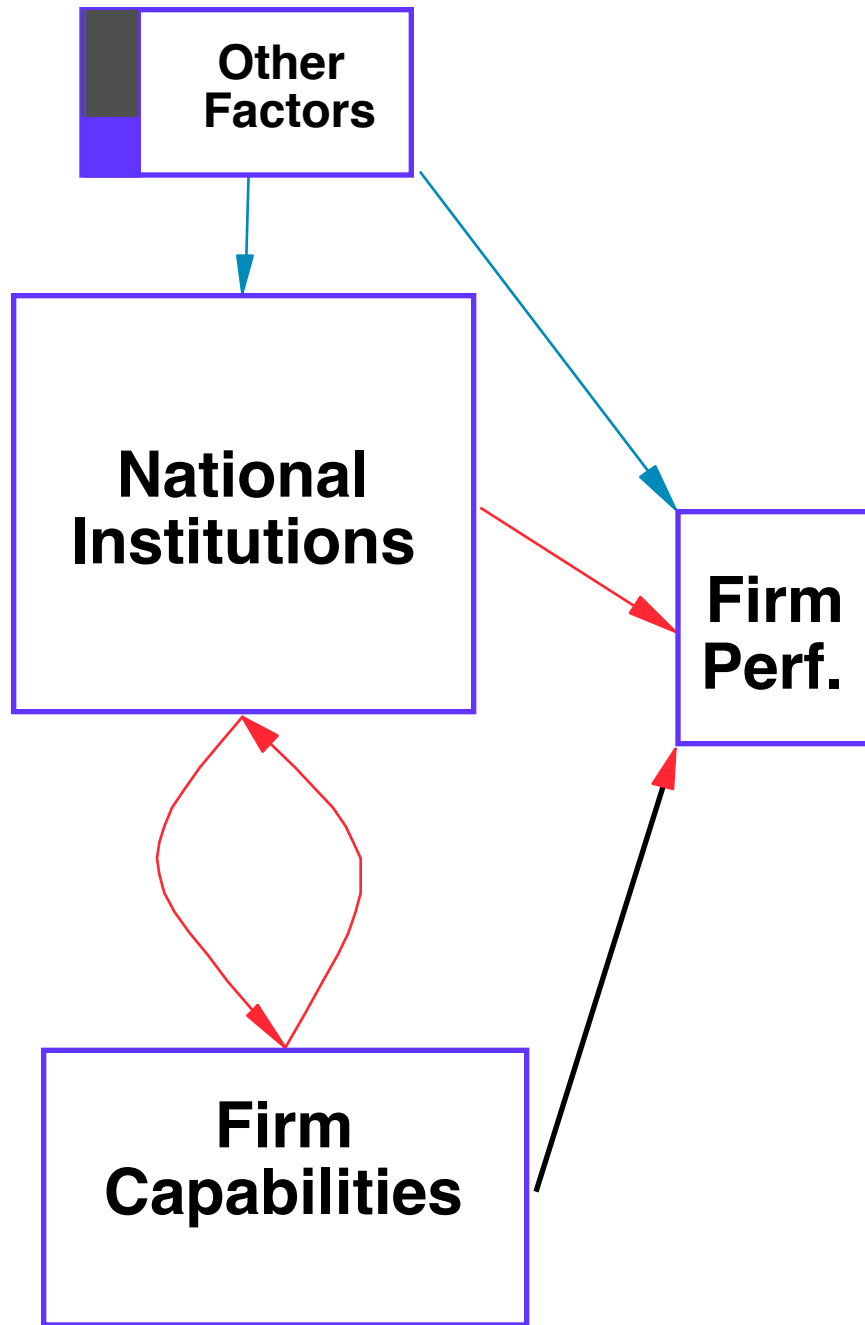
	<i>Before 1867</i>	<i>After 1886</i>
Britain	Perkin Simpson, Maule & Nicholson	
Germany		Bayer, BASF, Hoechst
U.S.		
France	La Fuchsine Poirrer	
Switzer- land		Geigy

Globally Leading Firms

Yellow = product patents granted

Blue = process patents granted

	<i>Before 1867</i>	<i>After 1886</i>
Britain	Perkin Simpson, Maule & Nicholson	
Germany		Bayer, BASF, Hoechst
U.S.		
France	La Fuchsine Poirrer	
Switzer- land		Geigy

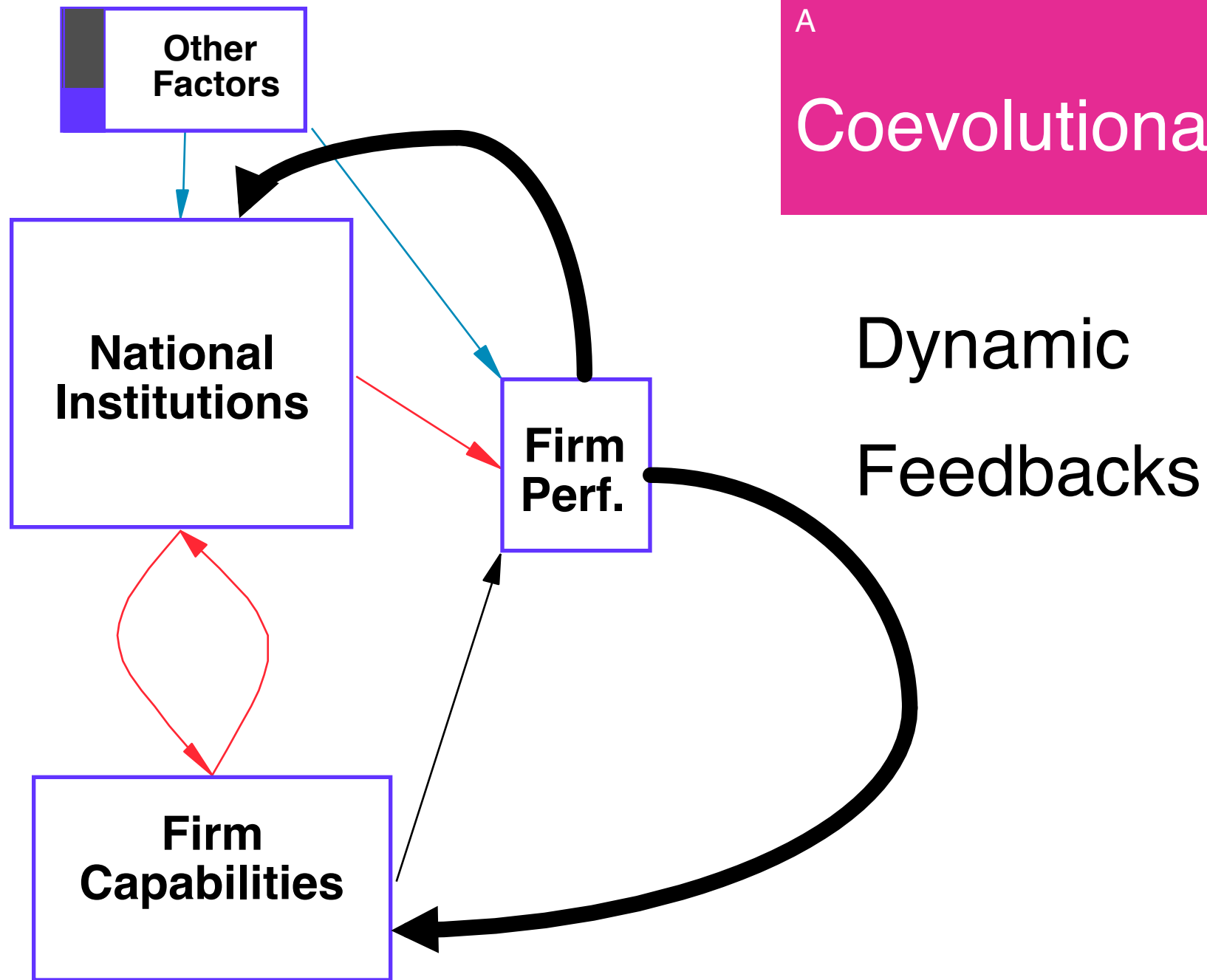


A

Coevolutionary

A

Coevolutionary



Session 3: Nelson 1995

Why Should Managers Be Thinking About Technology Policy?

1. What are the key reasons?

What evidence is being cited?

Session 3: Nelson 1995

- a. Should public support of applied R&D go to individual firms, or to industries collectively, and how should such applied R&D programs be governed?
- b. How should industry-focused basic research programs be structured, and governed?
- c. What should be proprietary, and what should be public, about what emanates from such publicly supported programs?

Session 3: Nelson 1995

2. How easy or difficult it it for firms to influence technology policy?

3. What are means to achieve this?

Key Points in Nelson 1995

My basic message is that government technology policy often matters importantly to firms, managers of innovation and technology should pay attention to what is going on on the technology policy front, and business in fact has a considerable say about what those policies turn out to be. (p. 581)

I do not want to argue in any way against the position that a principal role of government policy is to establish an environment within which business firms have strong incentives to invest in industrial innovation. However, in many cases establishing that environment has involved some quite specific and directed 'technology policies'. (p. 583)

Key Points in Nelson 1995

Without denying the importance of firm-specific investments and decisions, or broad national environment, this third body of theorizing focuses on particular national activities and investments that are, usually by intention, aimed to help particular industries or to advance particular technologies. (p. 584).

The general theoretical proposition is that the environment within which firms in a particular industry operate must be seen as including a wide variety of institutions, ranging from regulatory authorities to universities to government departments, who have an explicit interest and involvement in the industry in question, and whose policies can make a big difference to the competitive advantage of the firms in that industry. (p. 584).

Some Answers to Key Questions in Nelson 1995

1. Should public support of applied R&D go to individual firms, or to industries collectively, and how should such applied R&D programs be governed?

Industry wide research not focused on companies. Governance: Unbiased industry representation. Doing research outside specific firms. Industry must help guide research allocation. If industry is not involved duplication. Funding of some firms over others is not going to be politically viable.

2. How should industry-focused basic research programs be structured, and governed?

Industry must lobby for basic research, move funding from DOD to NSF. Finding institutional replacement for corporate central R&D is challenging. Just spreading the money around is not sufficient. Nelson thinks university affiliated labs are the best option.

3. What should be proprietary, and what should be public, about what emanates from such publicly supported programs?

First, It is not clear that research findings whose principal use is in further research be patentable at all?

Session 4: Exercise-Application of Ideas to Some Students' Empirical Context

Splitting Participants in two groups:

1. Energy Sectors (comparing photovoltaics to electric utilities)
2. Life Science (comparing pharmaceuticals to plant biotech)

Prepare a Presentation (no longer than 10 minutes)

Questions?

How do the two sectors differ (are similar) in terms of the institutions that support its functioning today. (Rank order them by institutions by importance).

Did some institutions matter historically for the development of the sector but no longer matter today?

Session 4: Exercise Timeline

1. Energy Sectors (comparing photovoltaics to electric utilities)
Leaders: Joern & Nel
2. Life Science (comparing pharmaceuticals to plant biotech)
Leaders: Alesandra & Mahka

Timing

2:00-2:30 Work in your group to analyze question

4:30-4:50 Put together presentation

4:50-5:10 Two 10 min presentations (by group)

5:10-5:30 Compare findings across tw groups.



 Germany 1 - 2 Italy  -



Conclusion:
**Empirical Research on Firm & Industry
Evolution is Detective Work**



Sketch of Framework for Industry Comparisons

		Country	World	Firm
Quantitative Variables	Demand	Size of market Rates of market growth Imports Number of consumers	Size of market Rates of market growth Imports Number of consumers	Sales Sales Growth Number of customers
	Supply	Number of producers Entry/Exit rates of producers Concentration ratio Exports Cost structure Capital intensity Frequency of product and process innovations Capacity Investment rates and distribution	Number of producers Entry/Exit rates of producers Concentration ratio Exports Cost structure Capital intensity Frequency of product and process innovations FDI and portfolio control	Variety of products offered Date of production start Market share Percentage of sales in particular industry Exports Cost structure Capital intensity Frequency of product and process innovations Capacity Investment rates
	Finance	Profit Rates Size of foreign direct investment Share of FID of all investments Source of funds	Profit Rates Size of foreign direct investment Share of FID of all investments Source of funds	Profit Rates Size of foreign direct investment Share of FID of all investments Source of Funds Investment in R&D

Murmann, J. P. (Forthcoming). Marrying History and Social Science in Strategy Research.

History and Strategy (Advances in Strategic Management, Volume 29).

M. Cusumano, S. Kahl and a. B. Silverman. Bingley, UK, Emerald Group Publishing Limited: 89-116.

		Country	World	Firm
Qualitative Variables	Users	What are the salient characteristics of users and how do they evolve How do producers find out about user needs	How diverse are the needs of users across countries?	What user segment does is served? How does this change How does the firm find out user needs
	Products	What is the type of product or service (final consumer good, intermediate good, primary good; standalone product, subassembly, component in system)		How do products reach the users; does the firm market and sell directly, or are other organizations involved; are there changes
	Production	How are production skills formed (internal, other firms or external organizations)	Is global production concentrated in few countries	What prior experience did the firm have What factors determine export vs. international investment decisions
	Policies/Regulations	Does government have many policies/regulations tailored to the industry; do they have a demonstrable effect on country competitiveness in the industry How do policies/regulations change over time	What trade regimes exist and how do they change	What is the strategy of the firm What kinds of policies (routines) does the firms develop for its operation What is the relationship among policies (routines)
	Supporting Institutions	What is the role of trade association and how does their change over time Are there any other institutions that are crucial for the industry	Are there any supranational non-firm actors (e.g. UN, WTO)	Does the firm have specific alliances with other actors?

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History and Strategy (Advances in Strategic Management, Volume 29).

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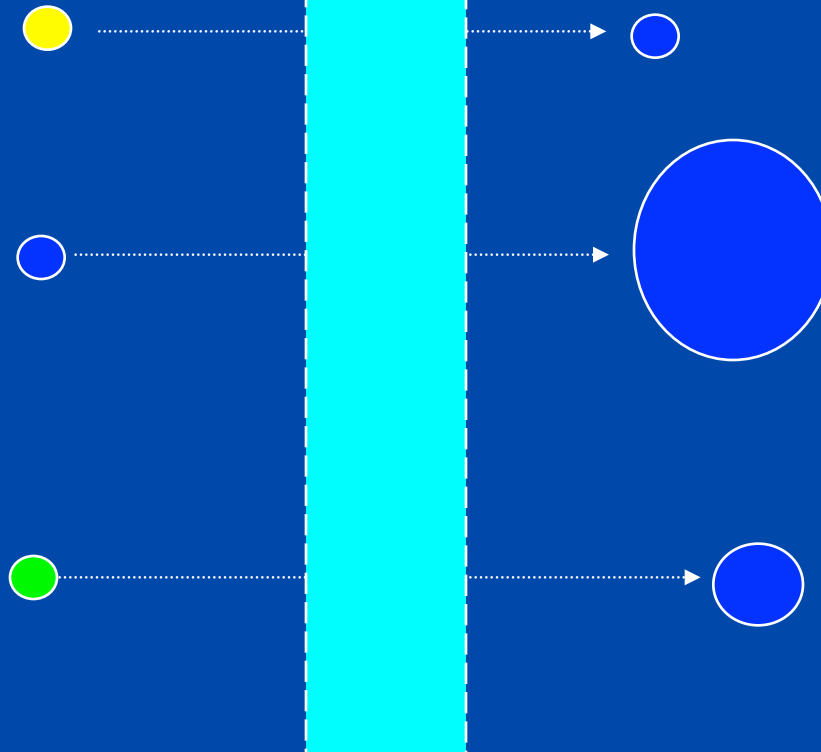
Supplementary Slides

An Adaptation Process of Change

Population of Firms at Time 1

Heroic
Managers

Population of Firms at Time 2



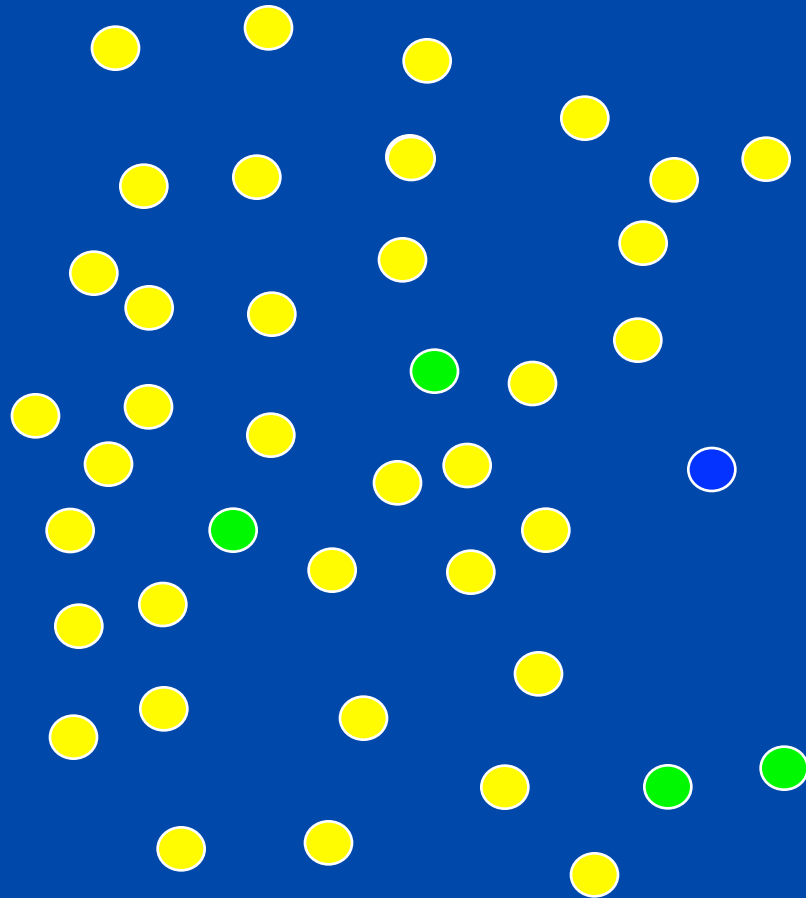
● Standard Firm

● Firm with Informal R&D

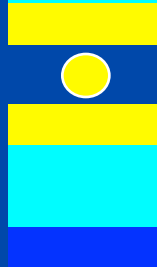
● Firm with Formal R&D

Industrial Change: A Selection Process

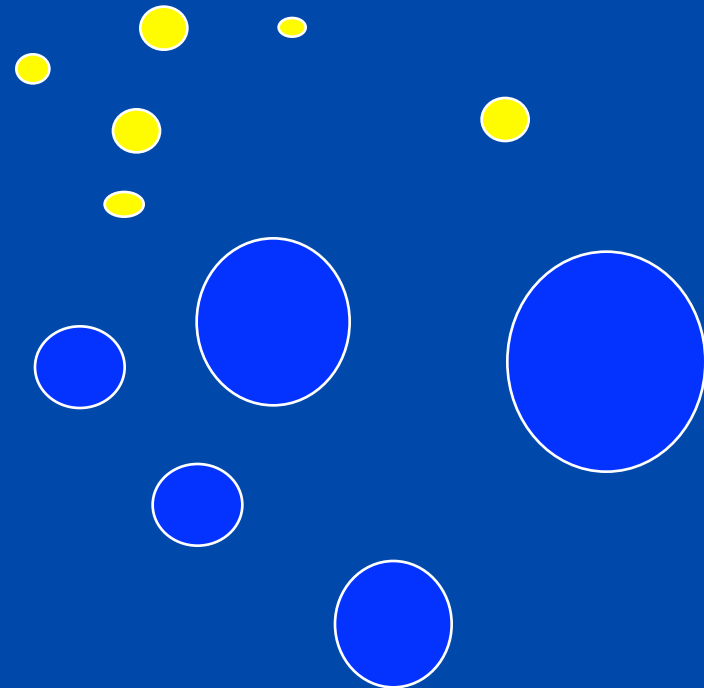
Population of Firms at Time 1



Selection
Filter



Population of Firms at Time 2

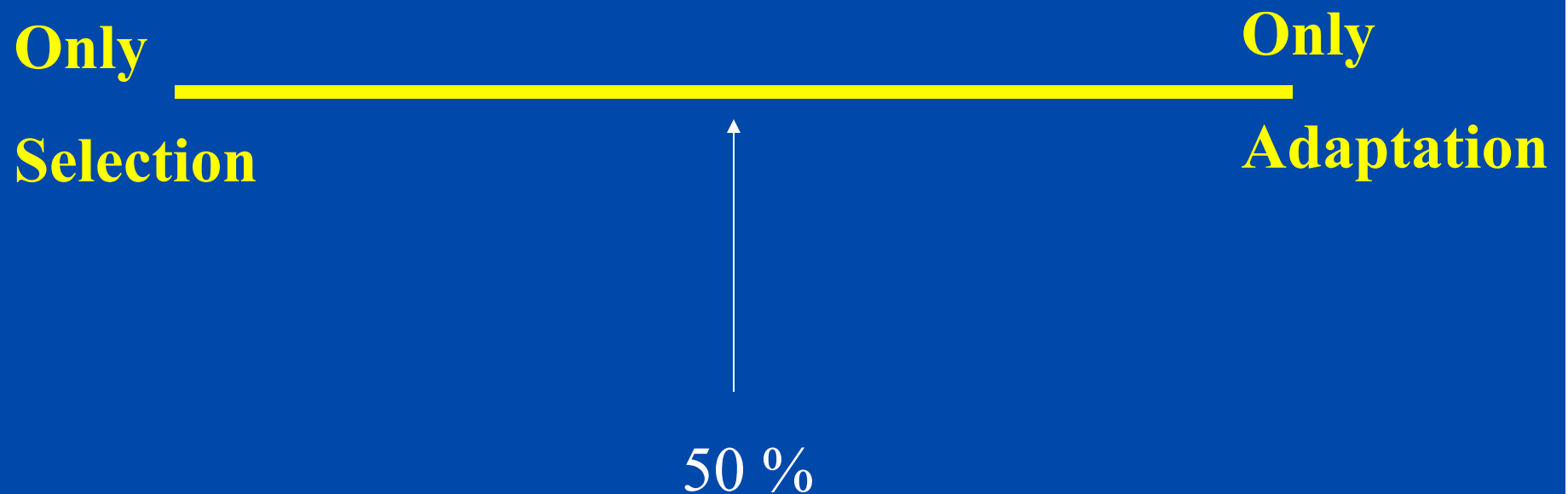


● Standard Firm ● Firm with Informal R&D ● Firm with Formal R&D

Task 3: Calling for more studies on the relative role of selection versus adaptation

1. Individual firm adaptation logic of industry change
2. Population selection logic of industrial change

How much Adaptation versus Selection is there in Industrial Change ?



How much Adaptation versus Selection is there in Industrial Change ?

**Only
Selection**

**Only
Adaptation**



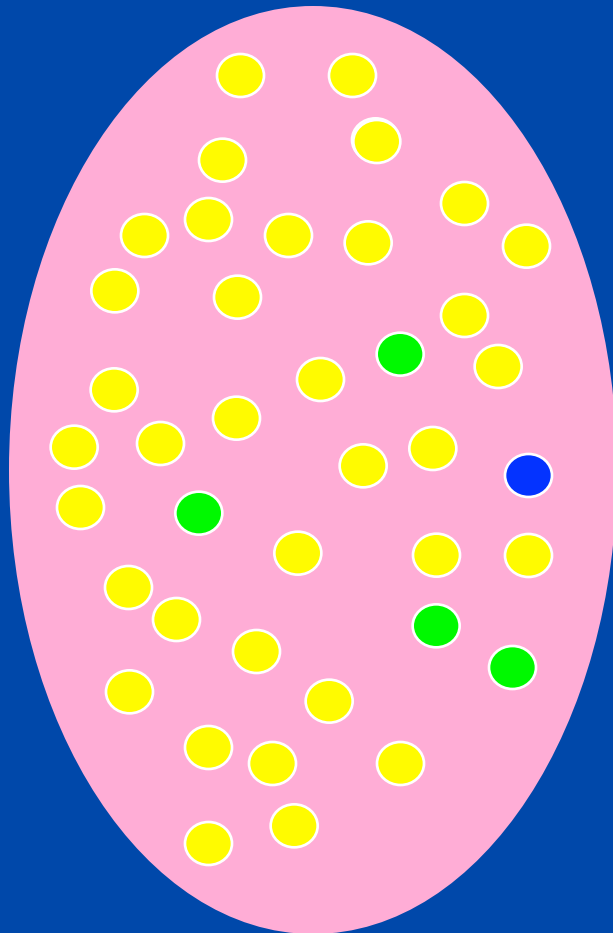
75 / 25 %

How much Adaptation versus Selection is there in Industrial Change ?

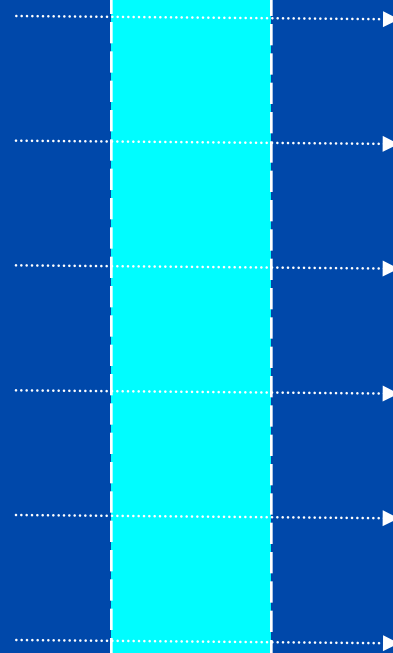


The Firm as Viewed as an Evolving Population

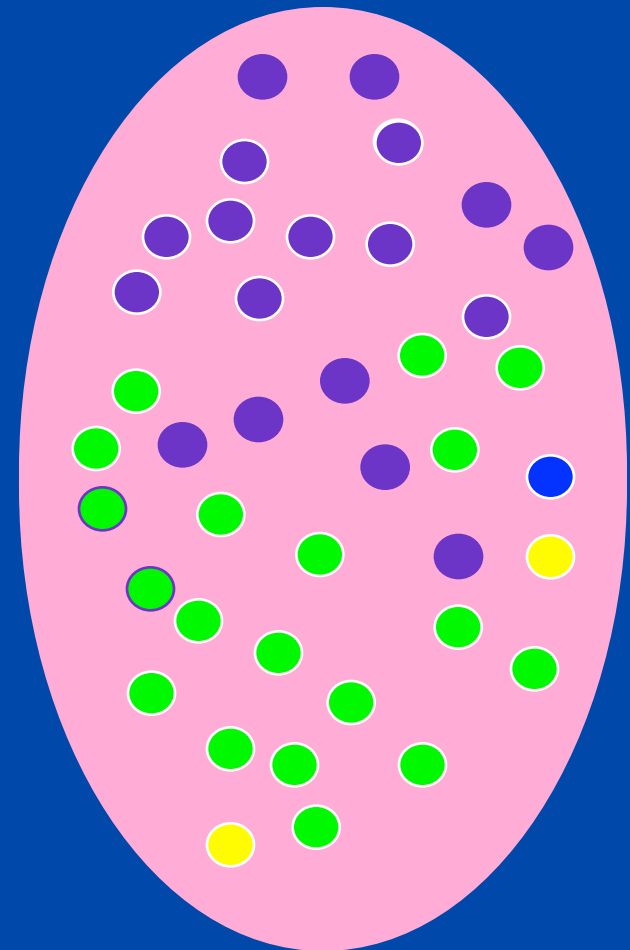
Firm at Time 1



Selection
Filter



Firm at Time 2



e.g.
Profits



Character 1



Character 2



Character 3

Firms try to make changes but often still don't survive.



Danneels, E. (2011).

"Trying to become a different type of company: dynamic capability at Smith Corona."

Strategic Management Journal 32(1): 1-31.

Henderson et al published list firms that have sustainable competitive advantage

Let's figure out what these firms did differently from their less successful counterparts!



Henderson, A. D., M. E. Raynor and M. Ahmed (2012).

"How long must a firm be great to rule out chance?
Benchmarking sustained superior performance without
being fooled by randomness."

Strategic Management Journal 33(4): 387-406.