KILLING THE GOLDEN GOOSE?

CORPORATE INVESTMENT IN SCIENCE
THE STANDARD MODEL OF INNOVATION

Willis Whitney
GE

Kenneth Meese
Kodak

Frank Jewett
AT&T Bell Labs

Boundary of the Firm

Research Projects

Research

Development

The Market

Acknowledgement: David Hounshell, Carnegie Mellon

GM’s Technical Center

Bell Labs

IBM’s Watson Lab

Hughes Research Lab

DuPont Corporation’s Experimental Station

Xerox’s Palo Alto Research Center
THE GOLDEN AGE OF CORPORATE RESEARCH

Walter Brittain  
*Bell Labs*

Clinton Davisson  
*Bell Labs*

William Shockley  
*Beckman Instruments*

Irvin Langmuir  
*GE*

Leo Esaki  
*IBM*

Fill Anderson  
*Bell Labs*

Jack Kirby  
*Texas Instruments*
BACK TO THE FUTURE?

OPEN INNOVATION (1850-1900)
### INDEPENDENT INVENTORS

<table>
<thead>
<tr>
<th>Inventor</th>
<th>Image</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edison</td>
<td><img src="image" alt="Edison" /></td>
<td>Assigned inventions to multiple firms</td>
</tr>
<tr>
<td>Westinghouse</td>
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**Figure 2: Market for Inventions: Britain and the U.S., 1870-1900**

- **Notes:** The figure shows the ratio of all assignments to patents issued in the U.S.; whereas for Britain, the ratio comprises assignments and licenses relative to patents issued.

**1. Assigned Inventions to Multiple Firms**

**2. Funded by Local Capital**

**3. Declined Nationally After 1890**
THE PRESENT

DISENGAGEMENT FROM RESEARCH
US FIRMS ARE WITHDRAWING FROM RESEARCH

US business expenditure on basic and applied research, as share of total business funded R&D, 1980-2012, 3 year moving average, and total business funded R&D in constant 2009 dollars


Source: NSF S&E Indicators, 2016, Appendix tables 4.6-4.8

Source: Arora, Belenzon and Patacconi, SMJ 2017
THE USE OF SCIENCE IS STABLE OVER TIME

U.S. utility patents citing S&E articles, by patenting and publishing sector: 1998–2010,
Source NSF Science and Engineering Indicators, 2012, Appendix Table 5-49
The value of publications has dropped, for both investors and managers.
WHY?

Capitalism’s unlikely heroes

LONG-TERM

SHORT-TERM
Scientific publications are a **public good**...
So why should firms **invest** in research?

“Research is an input into inventive activity”
*Arora, Belenzon, Sheer, NBER 2017*
WHAT IS SUBSTITUTING FOR INTERNAL RESEARCH?

1. UNIVERSITIES
2. TECH SPECIALISTS
3. STARTUPS
4. OTHERS

Academic R&D, patenting, and licensing in the US
Source: NSF S&E Indicators

Gross royalties/total academic R&D, 3yr moving average

New U.S. patent applications filed, in tens / total academic R&D in $M, 3 yr moving average, left axis

% R&D / Sales, selected industries
2006-2007

- Business-performed R&D/ sales (%)
- Company-funded R&D/ sales (%)

3.8 3.5 8.5 8.4 7.9 7.9 11.2 10.9 11.5 5.1 25.5 18 2.4 2.4 1.4 1.3

All Chemicals Computer and electronic SW and comp serv Aero and defense manuf R&D and related services Automotive manufacturing All other
THANK YOU

Based on the research paper:
"Killing the Golden Goose? The Decline of Science in Corporate R&D"
Ashish Arora (Duke University)
Sharon Belenzon (Duke University)
Andrea Patacconi (Norwich Business School)