Current Trends and Challenges in University Commercialization

Clustering for 21st Century Prosperity

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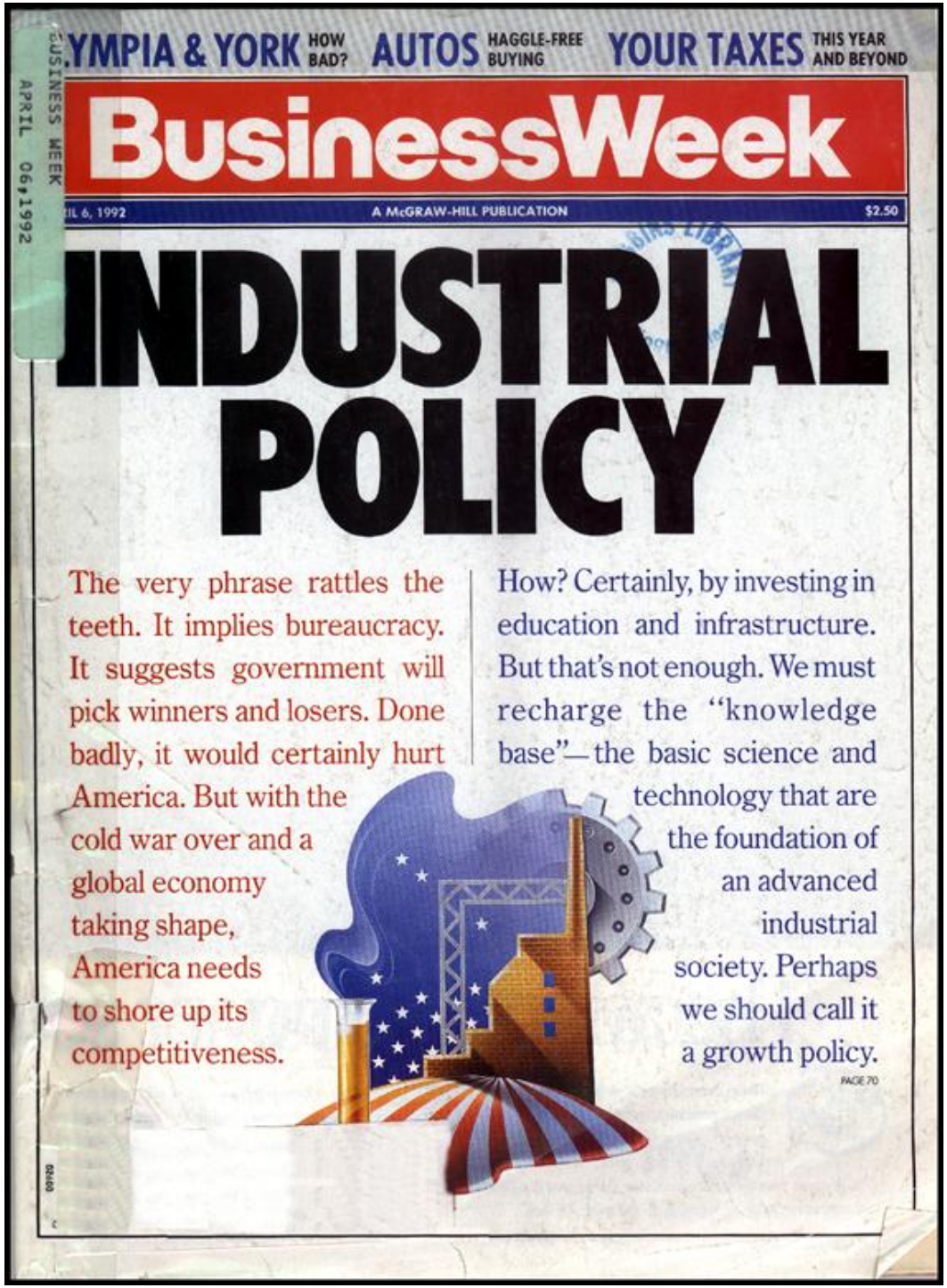
Association of University Technology Managers®
Advancing Discoveries for a Better World

Universities and Clusters

April 4, 1992


YMPIA & YORK HOW BAD?
AUTOS HAGGLE-FREE BUYING
YOUR TAXES THIS YEAR AND BEYOND
BusinessWeek
A McGRAW-HILL PUBLICATION
$2.50
INDUSTRIAL POLICY
The very phrase rattles the teeth. It implies bureaucracy. It suggests government will pick winners and losers. Done badly, it would certainly hurt America. But with the cold war over and a global economy taking shape, America needs to shore up its competitiveness.
How? Certainly, by investing in education and infrastructure. But that's not enough. We must recharge the "knowledge base"—the basic science and technology that are the foundation of an advanced industrial society. Perhaps we should call it a growth policy.
PAGE 70

October 19, 1992


HOT SPOTS
AMERICA'S NEW GROWTH REGIONS ARE BLOSSOMING DESPITE THE SLUMP
AT LEAST 600,000 PEOPLE HOLD HIGH-TECH JOBS IN THESE PLACES
BOOMTOWN BOISE
Major industries: Semiconductor chips, laser printers
25 companies, 14,300 jobs
Startups: Micron Technology, Extended Systems
BOISE
BIOMED MOUNTAINS
Major industries: Medical devices, artificial organs
75 companies, 8,000 jobs
Startups: Becton Dickinson Vascular Access, Utah Medical
SALT LAKE CITY
PROVO/OREM
GOLDEN TRIANGLE
Major industries: Biotechnology, communications
163 companies, 11,000 jobs
Startups: Hybritech, Qualcomm
SAN DIEGO
TUCSON
OPTICS VALLEY
Major industries: Lasers, electro-optics
40 companies, 1,000 jobs
Startups: Wyko, Photometrics
MEDICAL ALLEY
Major industries: Medical instruments, health care
500 companies, 40,000 jobs
Startups: ATS Medical, Pharmacia Deltec
MINNEAPOLIS/ ST. PAUL
SOFTWARE VALLEY
Major industry: Software
175 companies, 12,000 jobs
Startups: WordPerfect, Novell
CHAMPAIGN/ URBANA
SILICON PRAIRIE
Major industry: Software
63 companies, 3,500 jobs
Startups: Wolfram Research, Kuck & Associates
TELECOM CORRIDOR
Major industries: Telecommunications systems and components, software
500 companies, 50,000 jobs
Startups: Intervoice, Cyrix, Convex Computer
RICHARDSON
AUSTIN
SILICON HILLS
Major industries: Computer manufacturing, chips
450 companies, 55,000 jobs
Startups: Dell Computer, CompuAdd
CERAMICS CORRIDOR
Major industries: Ceramics, electronics packaging
110 companies, 31,500 jobs
Startups: Hi-Tech Ceramics, Xylon Materials
PRINCETON CORRIDOR
Major industries: Biotech, telecommunications
400 companies, 132,400 jobs
Startups: Cytogen, Liposome
CORNING
PRINCETON
PHILADELPHIA
MEDICAL MILE
Major industries: Biotech, medical products
500 companies, 166,000 jobs
Startups: Magainin, Cephalon
SILICON STRIP
Major industries: Software, medical technology
400 companies, 15,000 jobs
Startups: MicroProse, Integrated Health
WASHINGTON WEST
Major industry: Systems integration
1,100 companies, 80,000 jobs
Startups: Legent, Landmark Systems
ORLANDO
LASER LANE
Major industries: Lasers, electro-optics
35 companies, 5,000 jobs
Startups: Schwartz Electro-Optics, Laser Photonics

Ingredients of a High Tech Cluster

- A major research university
- Quality of life
- Build on local industry
- Cooperation between local university, business and gov't.
- Technology transfer from the university
- Funding sources -- state, VC, angels
- Incubators

<u>Phases of Economic Development</u>

- Start-ups
- New division of major US company
- Foreign companies move in
- Export led growth

The Pharmaceutical Industry in Massachusetts

Pharmaceuticals in Massachusetts

- In 1975, one pharmaceutical company in Massachusetts
  - US HQ of Astra AB
- Two events:
  - Spin-outs from Harvard, MIT, BU
  - Massachusetts Biotechnology Research Park


biogen idec


Alkermes


genzyme


Takeda


AMGEN


AstraZeneca


Organon


DAINIPPON
SUMITOMO
PHARMA


Bristol-Myers Squibb
Company


DSM


MERCK
Research Laboratories


Shire

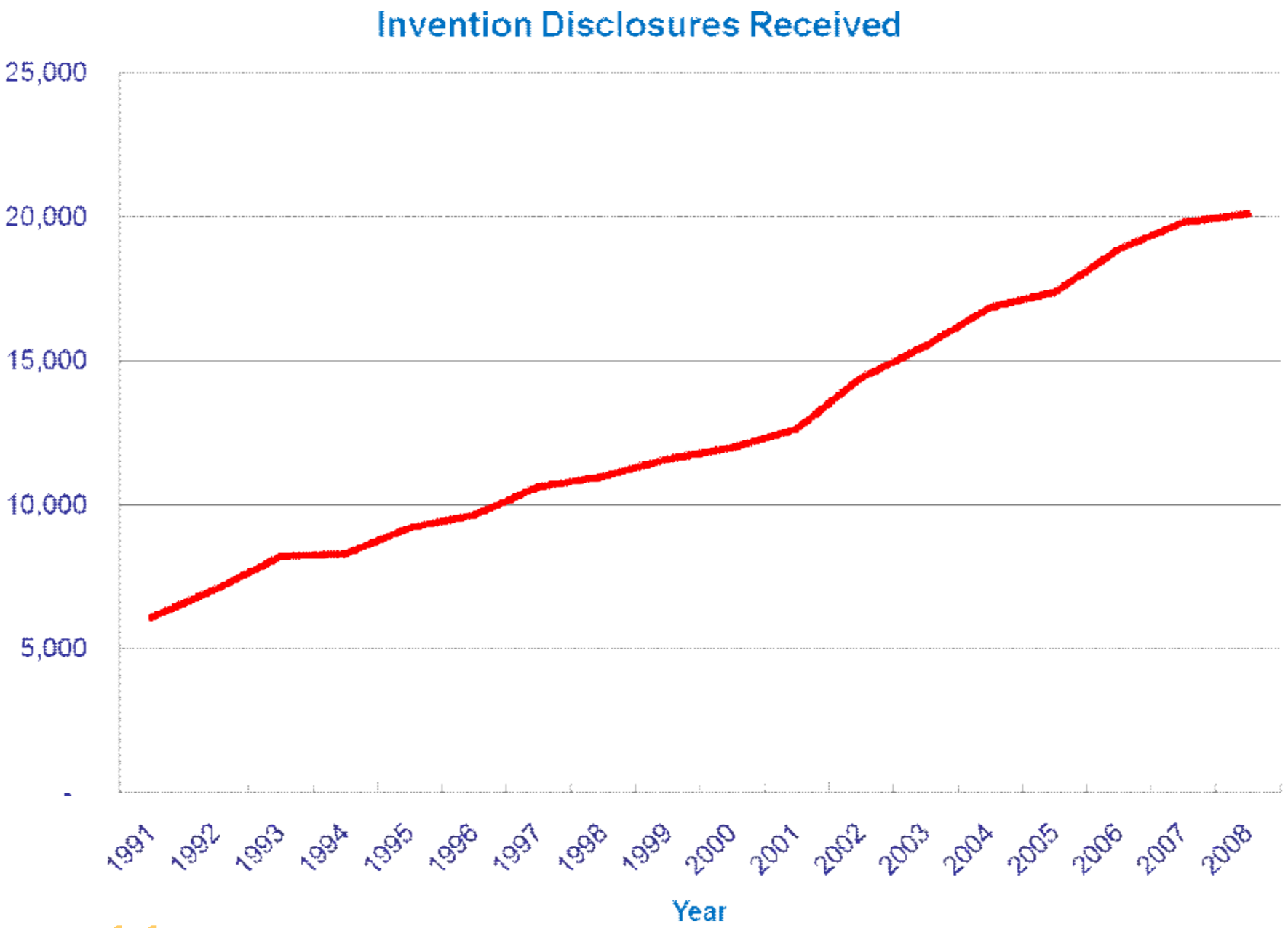

sanofi aventis
tiel c'est la santé.


NOVARTIS


VERTEX

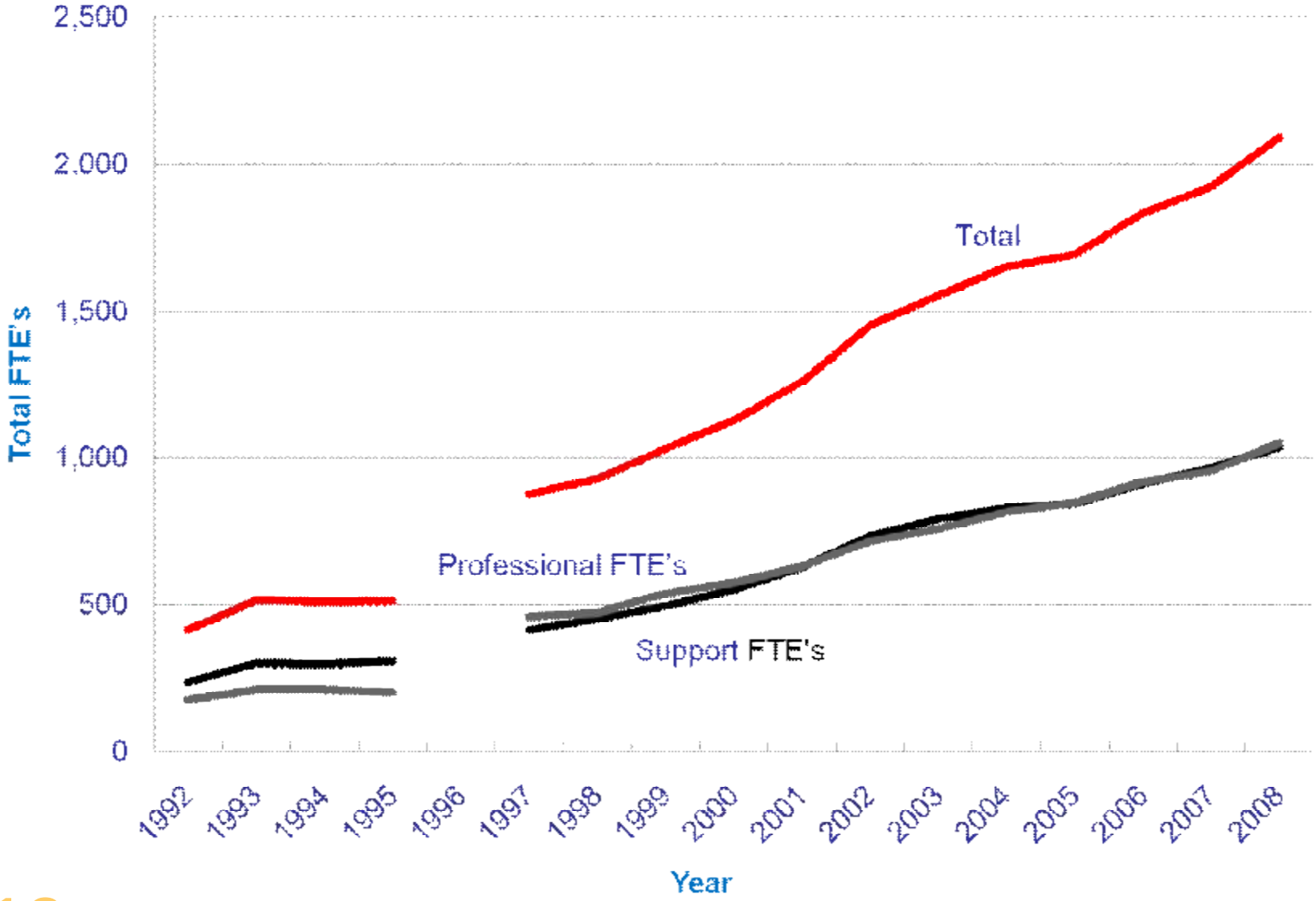

Pfizer

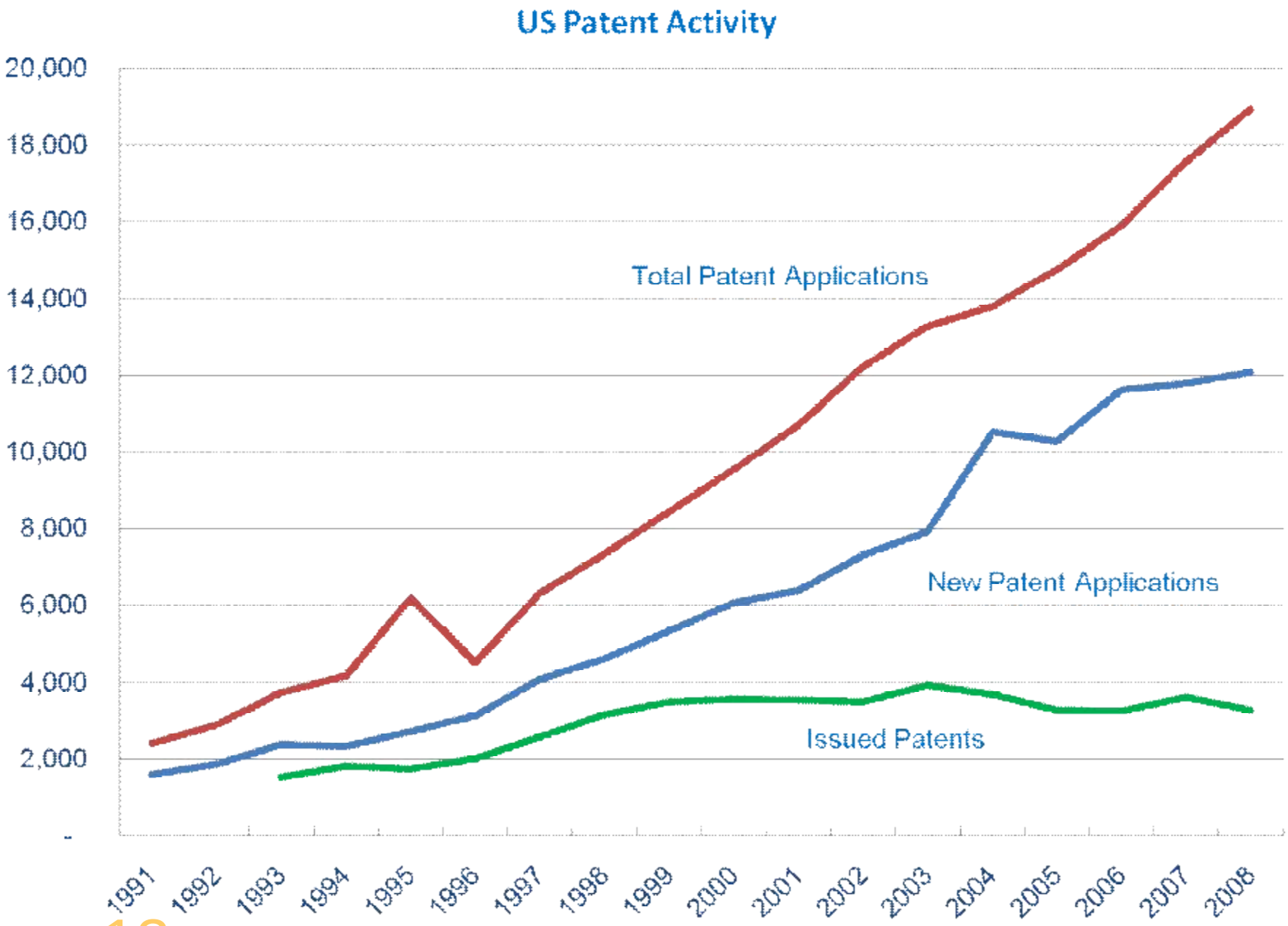
Current Trends and Challenges in University Commercialization

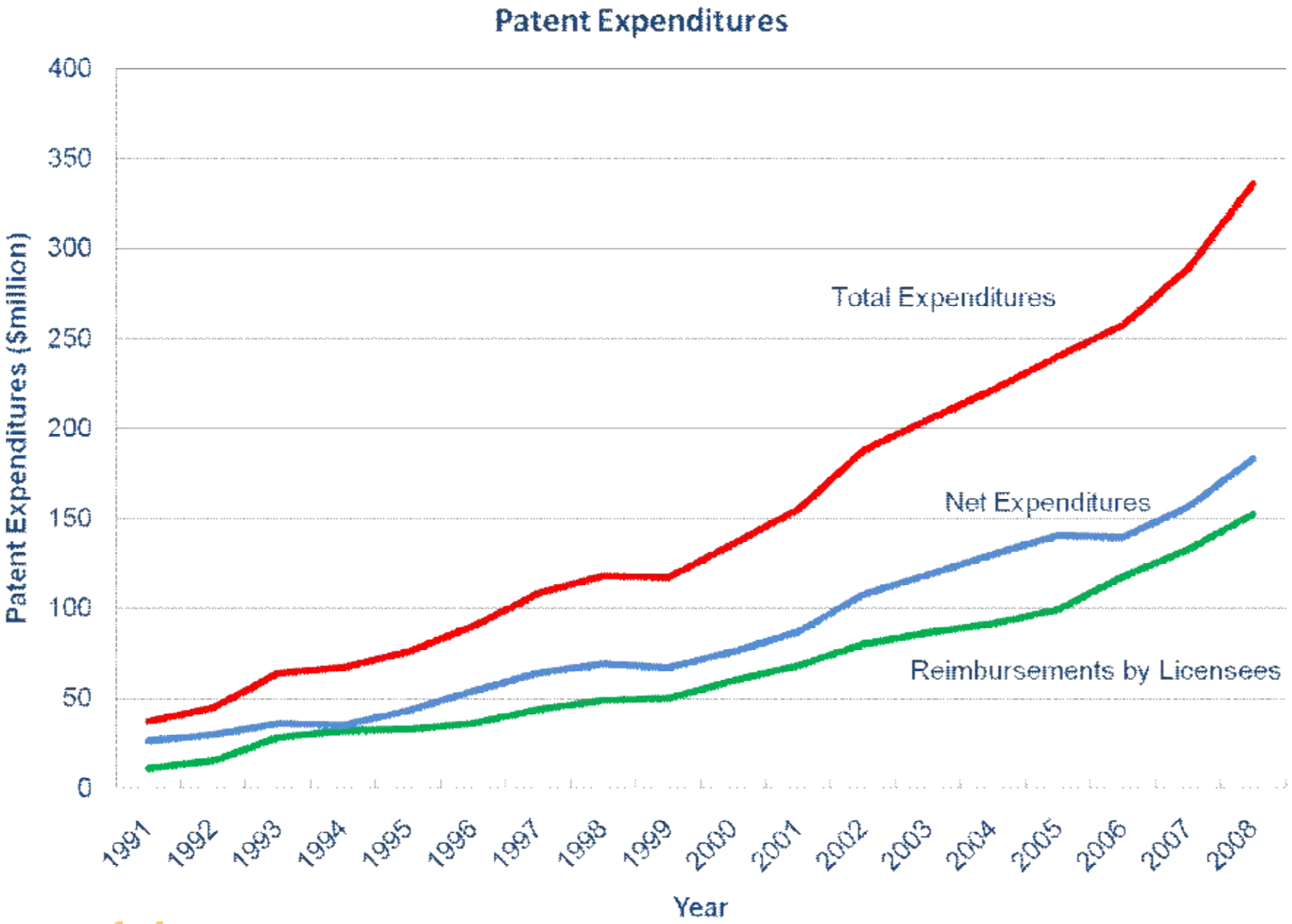


Source: AUTM 2008 Licensing Activity Survey unless otherwise noted

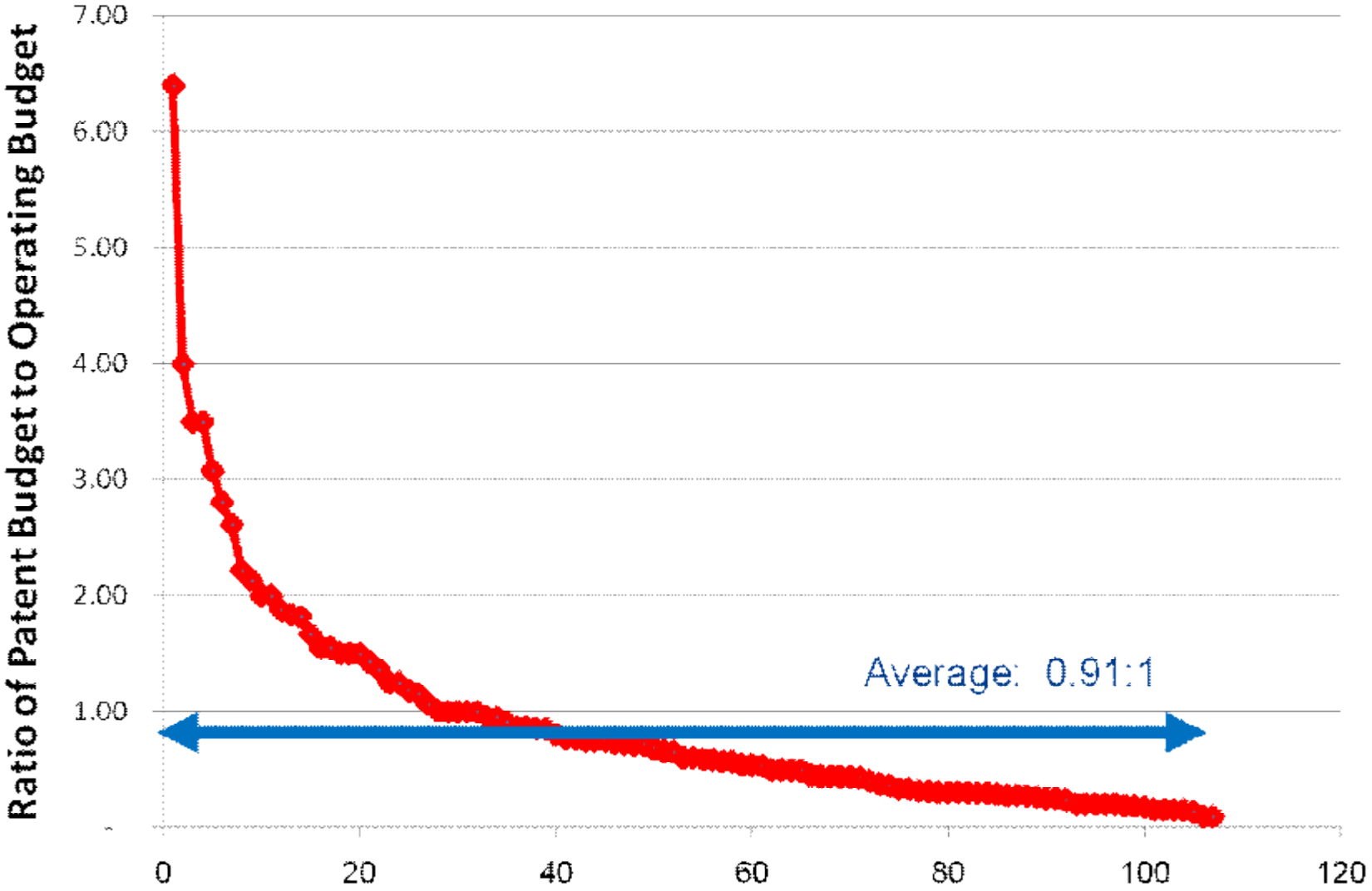
US Technology Transfer Employment



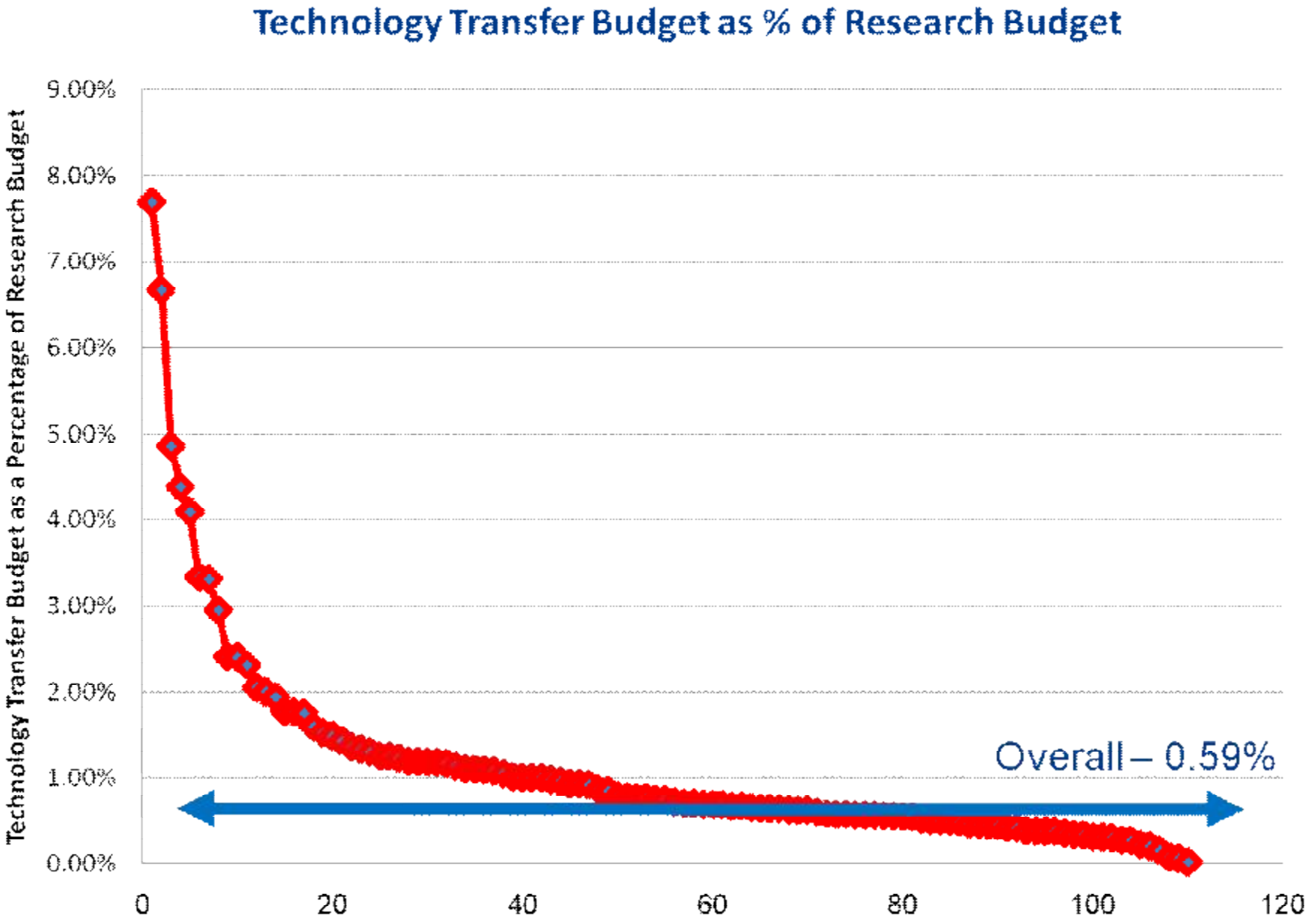

US Patent Activity
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
-
Total Patent Applications
New Patent Applications
Issued Patents
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008


Patent Expenditures
Patent Expenditures ($million)
400
350
300
250
200
150
100
50
0
Total Expenditures
Net Expenditures
Reimbursements by Licensees
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
Year

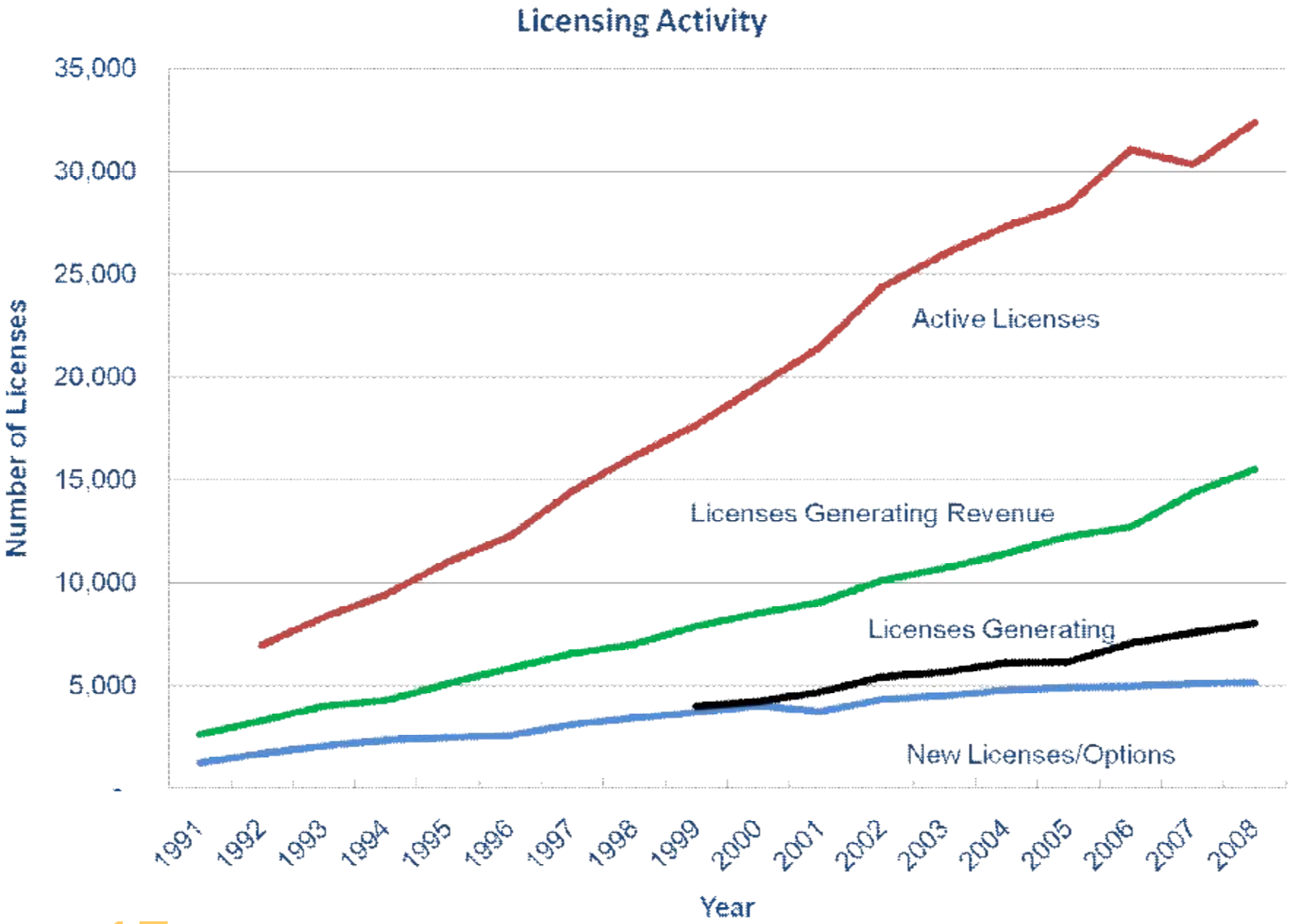
People or Patents
-- Ratio of Patent Budget to Operating Budget

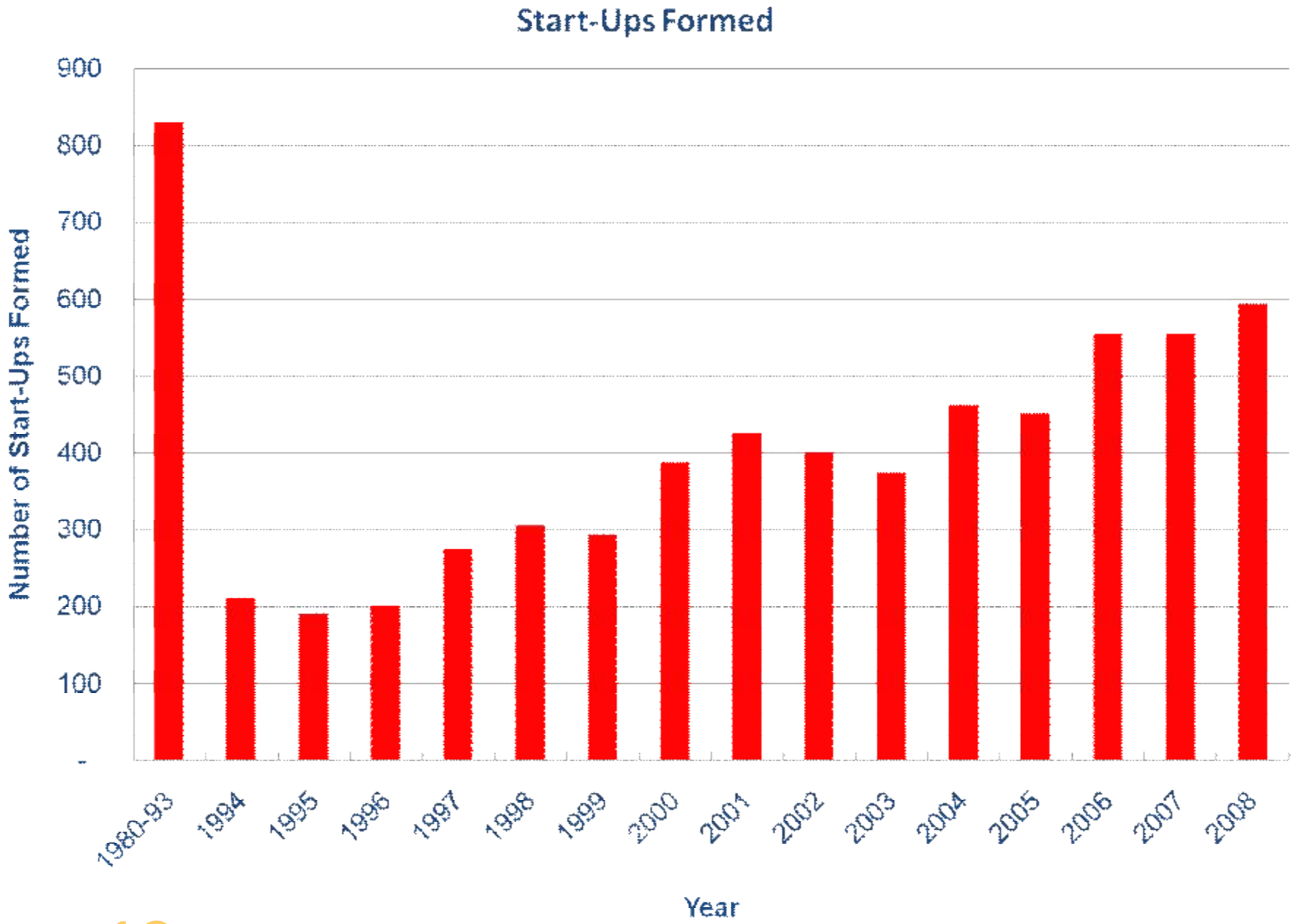


Source: Abrams, Leung & Stevens, 2010



Source: Abrams, Leung & Stevens, 2010


Licensing Activity
35,000
30,000
25,000
20,000
15,000
10,000
5,000
Number of Licenses
Active Licenses
Licenses Generating Revenue
Licenses Generating
New Licenses/Options
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
Year


Start-Ups Formed
Number of Start-Ups Formed
900
800
700
600
500
400
300
200
100
-
1980-93
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
Year

2008 Licensing Activity Survey

Invention Disclosures	20,115	
New US Patent Applications filed	12,072	60.0%
Licenses Signed	5,132	25.5%
US Patents Issued	3,280	16.3%
Start-Ups formed	595	3.0%
Active Licenses	20,115	

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Why Is This So Hard?

- Academic inventions are embryonic
- Average success rate (2008) 25.6%
- Median success rate (2008)
  - All institutions 21.7%
  - More than $200 million research 22.9%
  - Over 100 disclosures 19.7%
  - MIT (2004-2008) 22.2%
  - Stanford (2004-2008) 23.0%
  - WARF (2004-2008) 34.0%

Why Is This So Hard?

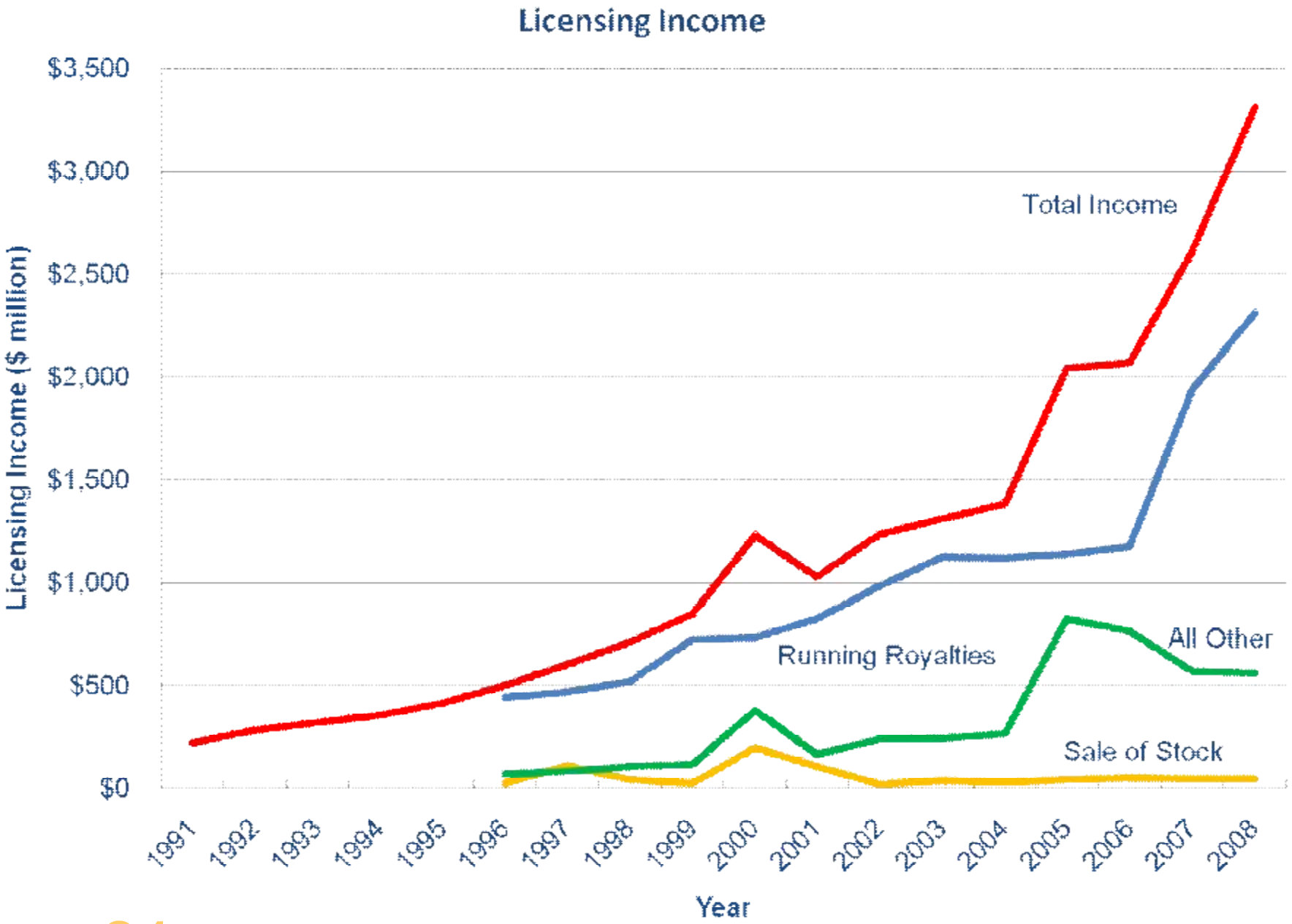
- Should we be more selective?
  - Research Corporation Technologies accepted 228 inventions from 1991-2008
    - ~13/year
    - 29% licensing success rate

Why Is This So Hard?

- Should we invest more to make them less embryonic?
- Translational Research
  - von Liebig (UCSD) and Deshpande (MIT) Centers
  - Philanthropically funded
    - Von Liebig $10 million
    - Deshpande $20 million
  - Founded 2001 and 2002

	Von Liebig		Deshpande	
Annual Investment	$1.2 mm		$1.7 mm	
Projects Funded	66		64	
Licenses	4	6%	1	2%
Start-Ups	16	24%	10	16%
Capital Raised	$71 mm		$88.7 mm	

Source: Kauffman Foundation, 2008


Licensing Income
$3,500
$3,000
$2,500
$2,000
$1,500
$1,000
$500
$0
Licensing Income ($ million)
Total Income
Running Royalties
All Other
Sale of Stock
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
Year

Financial Performance

Financial Contribution	Number	%
Loss making	68	52.3%
Gross profitable	27	20.8%
Net profitable	14	10.8%
Self sustaining	21	16.2%
Total	130	

Source: Abrams, Leung & Stevens, 2010

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Why Such a Difficult Business Model?

- Income is distributed very unevenly
  - A business of a few “big hits”
  - 153 drugs, vaccines, biologics and *in vivo* diagnostics* approved by FDA
    - 1985 - 2009
  - Northwestern monetized its Lyrica royalties December 2007
    - 50% interest
    - $700 million
  - Only 198 licenses generated over $1millio in income in 2008
    - Out of 15,498 generating some sort of income
    - 1.3%

* Source: Stevens, Jensen, Wyller, Chatterjee, London and Rohrbaugh, forthcoming

Was Bayh-Dole an Unfunded Mandate?

- Supplied no new funding
- Intended to be funded through IDC
  - Then we got the 26% administrative cap!
  - Much longer timeline to sustainability from income than expected
    - And patents expire!

One Man's Proposal

- Entrepreneurial Postdoctoral Fellowships
  - For graduating Ph.D. students or current postdocs
    - Commercialize the science they're working on
  - Statewide selection
    - Competitive peer review
  - Two years support
    - Proof-of-concept scientific experiments
    - Business plan development
  - Business school for entrepreneurial education
  - Mentorship program