제6회 맑스코뮤날레 분과포럼
<건강/생명산업의 이윤창출구조>발표자료

제약산업의 정치경제학

건강과 대안 우석균

2013.5.12, 서강대 다산관 201B호

의약품과 노동, 기술발전

- “노동은…사용가치를 낳는 어머니로서 그 사회형태가 무엇이든 그것과는 무관하게 인간의 존재조건이며 인간과 자연사이의 물질대사를 매개하고 그리하여 인간의 생활을 매개하기 위한 자연필연성”(자본론)
- “기술에 대한 비판적 역사는 18세기의 발명들 중 어느 것을 보더라도 개인의 단독적인 업적이 얼마나 사소한 것인가를 보여 주었다고 하겠다”(자본론)

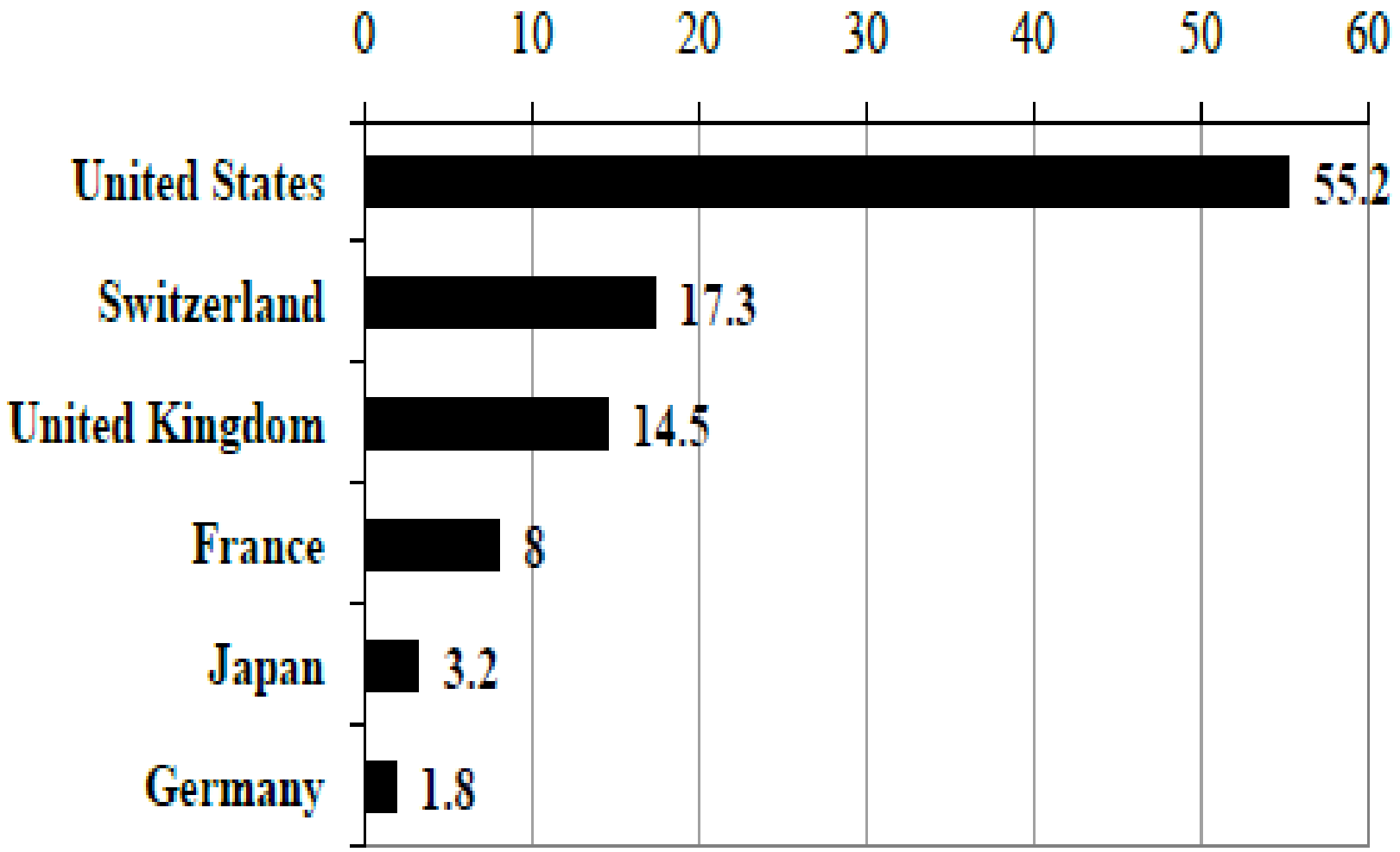
Fortune, FT 500 제약기업 (2006)

Company	Country	FT Global 500 Rank	Capitalization (Billion $)	Fortune Global 500 Rank	Revenues (Billion $)
Pfizer	US	13	183.4	101	51.3
Johnson and Johnson	US	14	176.2	104	50.5
GlaxoSmithKline	UK	19	151.9	143	37.8
Novartis	Switzerland	21	146	177	32.2
Roche	Switzerland	25	130.6	204	27.3
Sanofi-Aventis	France	28	128.6	159	33.1
Genentech	US	51	89.1	—	6.6
Amgen	US	56	86.2	—	12.4
AstraZeneca	UK	62	79.4	253	24
Merck	US	65	77	289	22
Abbott Laboratories	US	88	65.3	283	22.3
Wyeth	US	89	65.2	343	18.8
Eli Lilly	US	95	62.5	464	14.6
Takeda Pharmaceutical	Japan	130	50.6	—	9.6
Bristol-Myers-Squibb	US	138	48.2	321	19.2
Teva Pharmaceutical	Israel	216	32	—	5.3
Bayer*	Germany	233	29.2	163	34
Gilead Sciences	US	239	28.8	—	2
Schering Plough	US	246	28.1	—	9.5
Astellas Pharma	Japan	340	21.7	—	3.8
Schering	Germany	378	20.1	—	6.4
Novo Nordisk	Denmark	405	18.7	—	5.5
Genzyme	US	447	17.5	—	2.7
Daiichi Sankyo	Japan	467	16.7	—	5
Biogen Idec	US	481	16.2	—	2.4

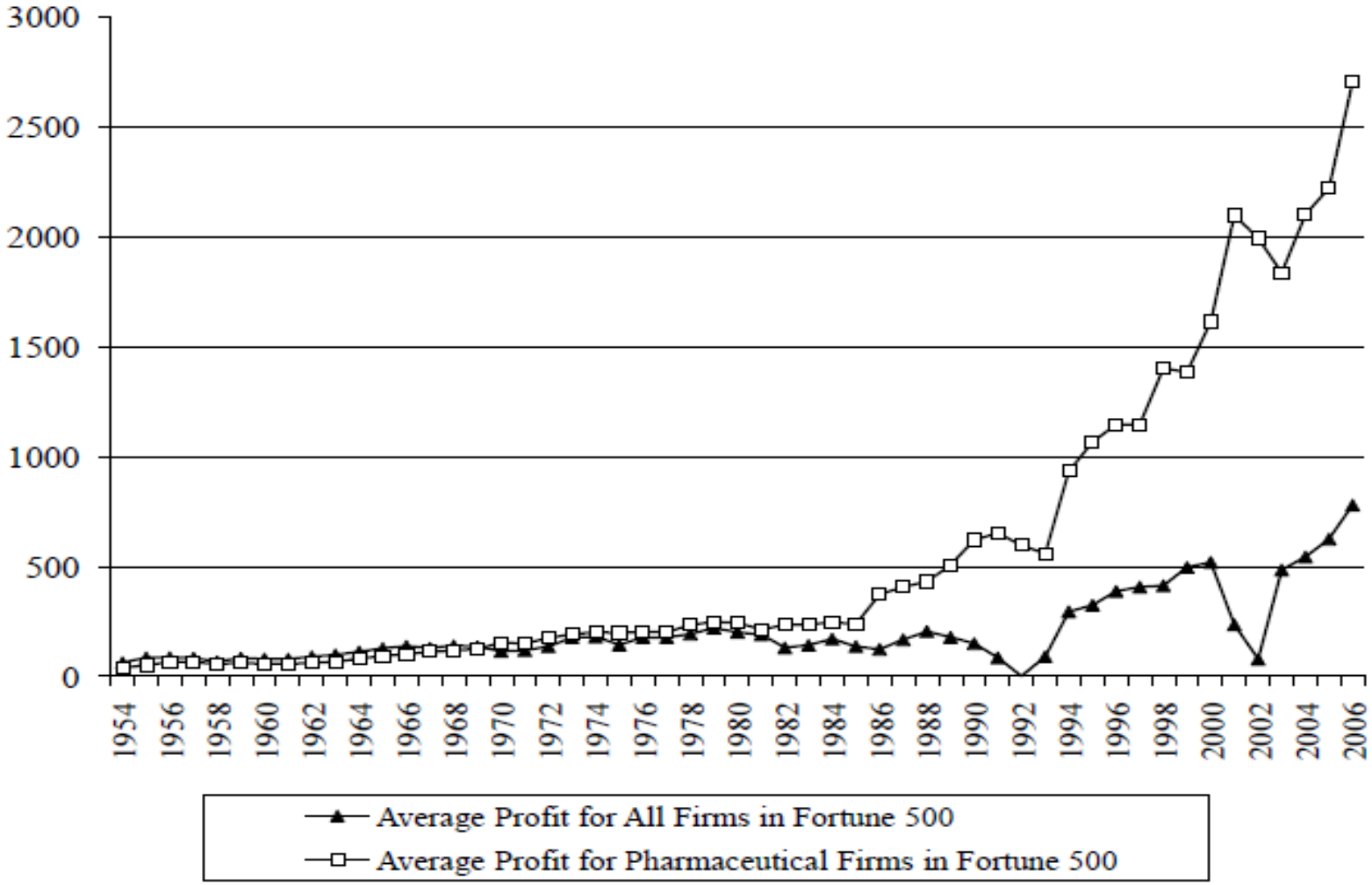
List of "Big pharma"

Company	Country	FT Global 500 Rank	Market Value (Billion $)	Revenues (Billion $)
1- Pfizer	US	13	183.4	51.3
2- Johnson and Johnson	US	14	176.2	50.5
3- GlaxoSmithKline	UK	19	151.9	37.8
4- Novartis	Switzerland	21	146	32.2
5- Roche	Switzerland	25	130.6	27.3
6- Sanofi-Aventis	France	28	128.6	33.1
7- Genentech	US	51	89.1	6.6
8- Amgen	US	56	86.2	12.4
9- AstraZeneca	UK	62	79.4	24
10- Merck	US	65	77	22
11- Abbott Laboratories	US	88	65.3	22.3
12- Wyeth	US	89	65.2	18.8
13- Eli Lilly	US	95	62.5	14.6
14- Takeda Pharmaceutical	Japan	130	50.6	9.6
15- Bristol-Myers-Squibb	US	138	48.2	19.2
16- Bayer	Germany	233	29.2	34
17- Schering Plough	US	246	28.1	9.5
Total	-	-	**1597.5**	**425.2**

National Share of Global Capitalization for Big Pharma in 2006



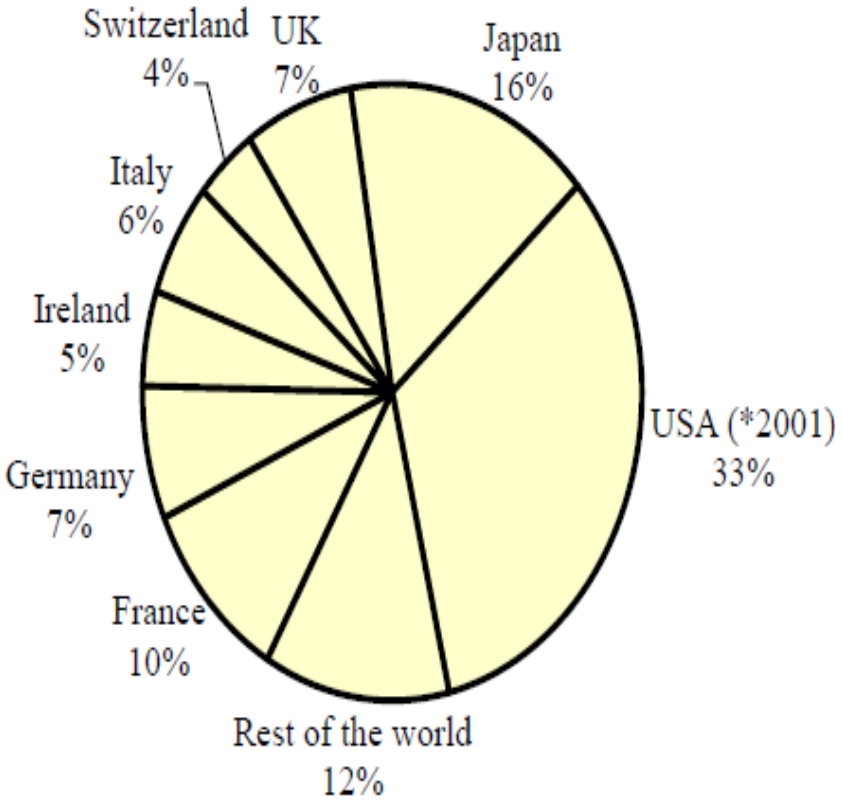
Profits of an average U.S. dominant pharmaceutical firm as compared to an average Fortune 500 firm

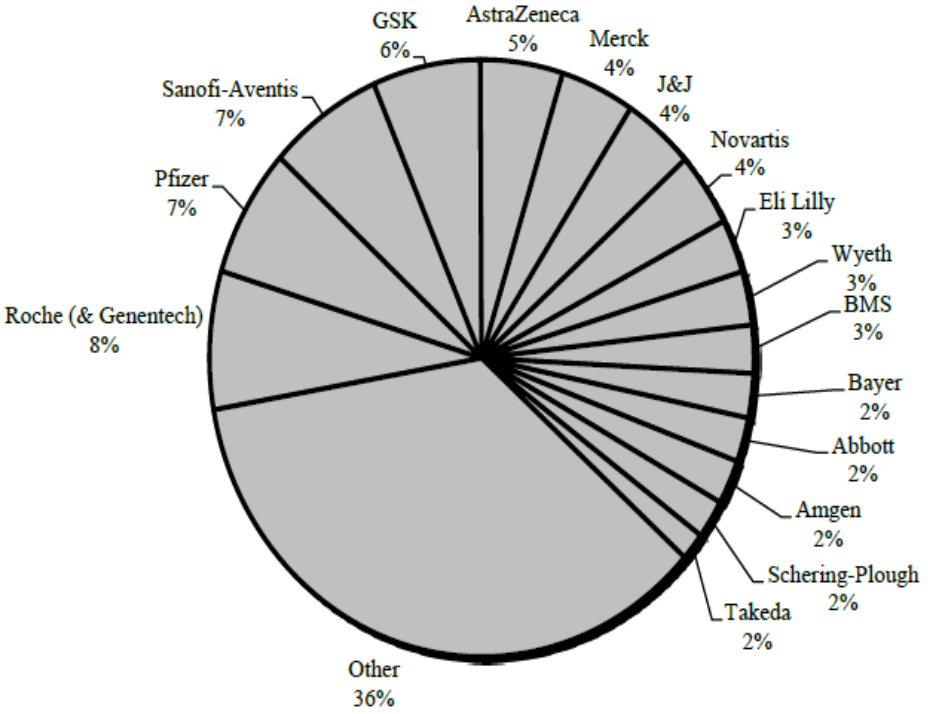


Global Sales in Pharmaceuticals and Growth by Region in 2005

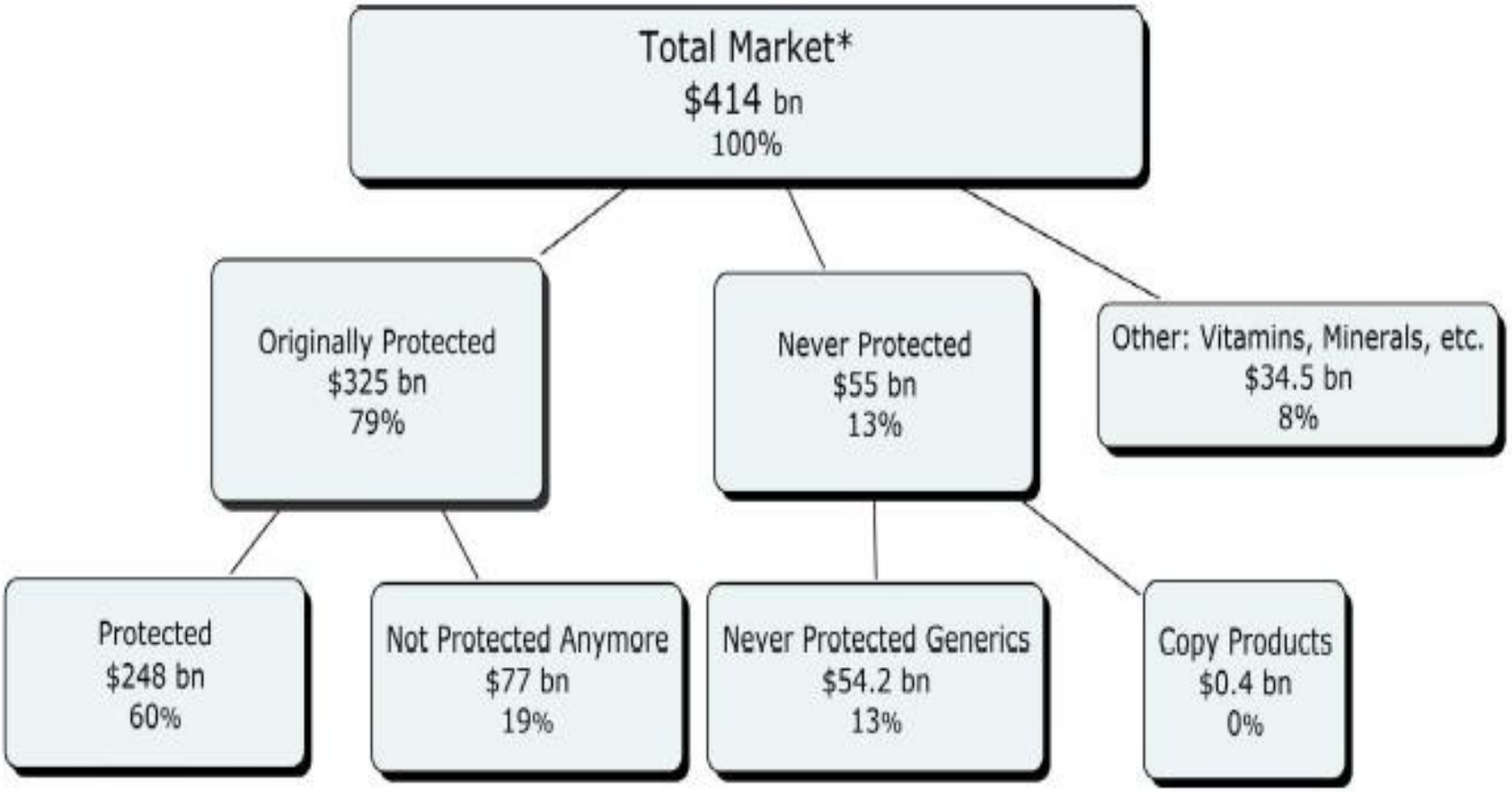
World Audited Market	2005 Sales (billion $)	% Global sales	% Growth 2000-2005 (constant $)
North America	265.7	44.1	+ 71
Europe	169.5	28.2	+ 111.9
Japan	60.3	10	+ 31.8
Asia, Africa and Australia	46.4	7.7	+ 81.3
Latin America	24.0	4	+ 28.3
Non-Audited (estimation)	36.1	6	—
World	602	100	+ 74

Drug Sales as a Share of Total Market, 2007

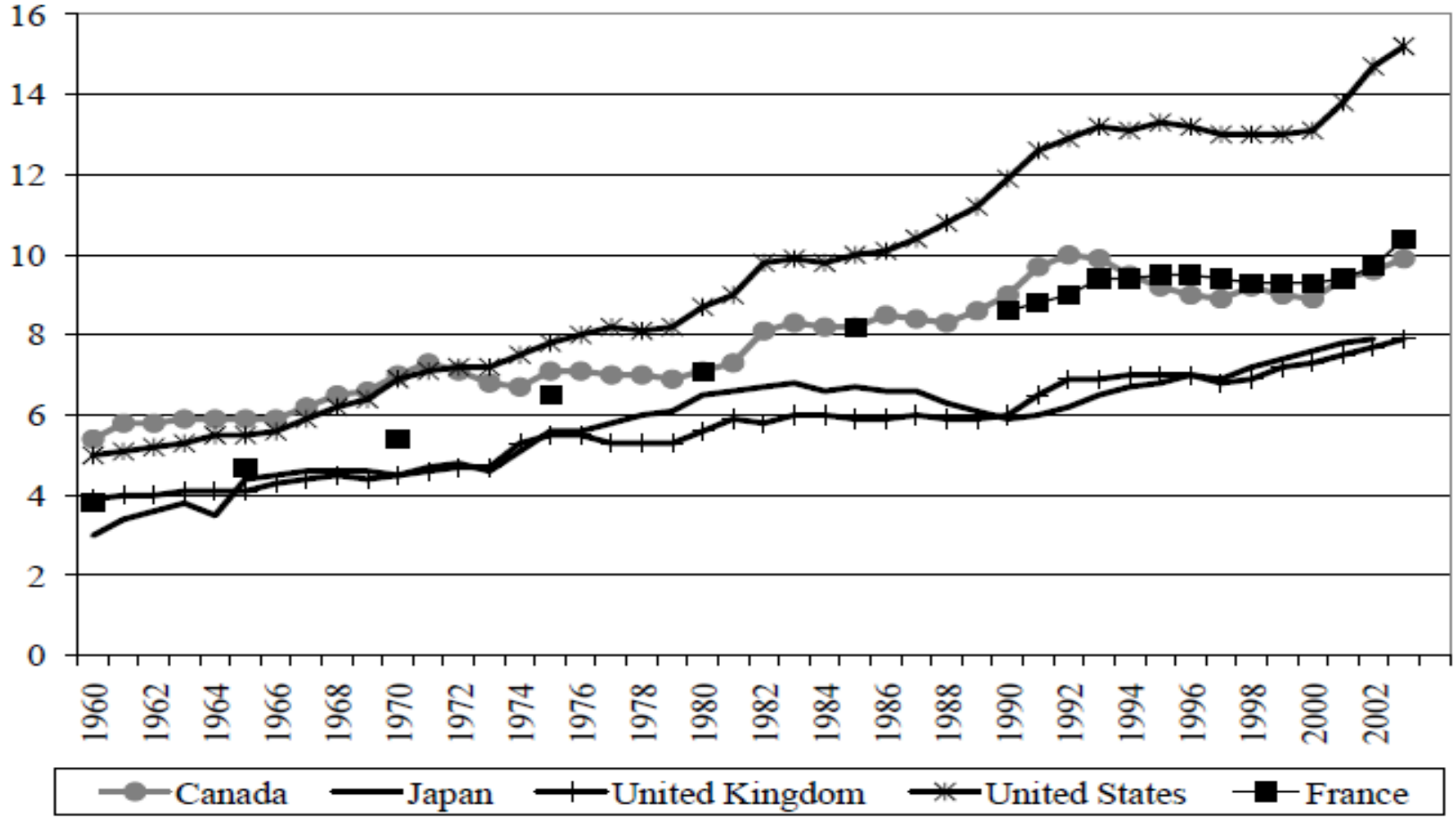




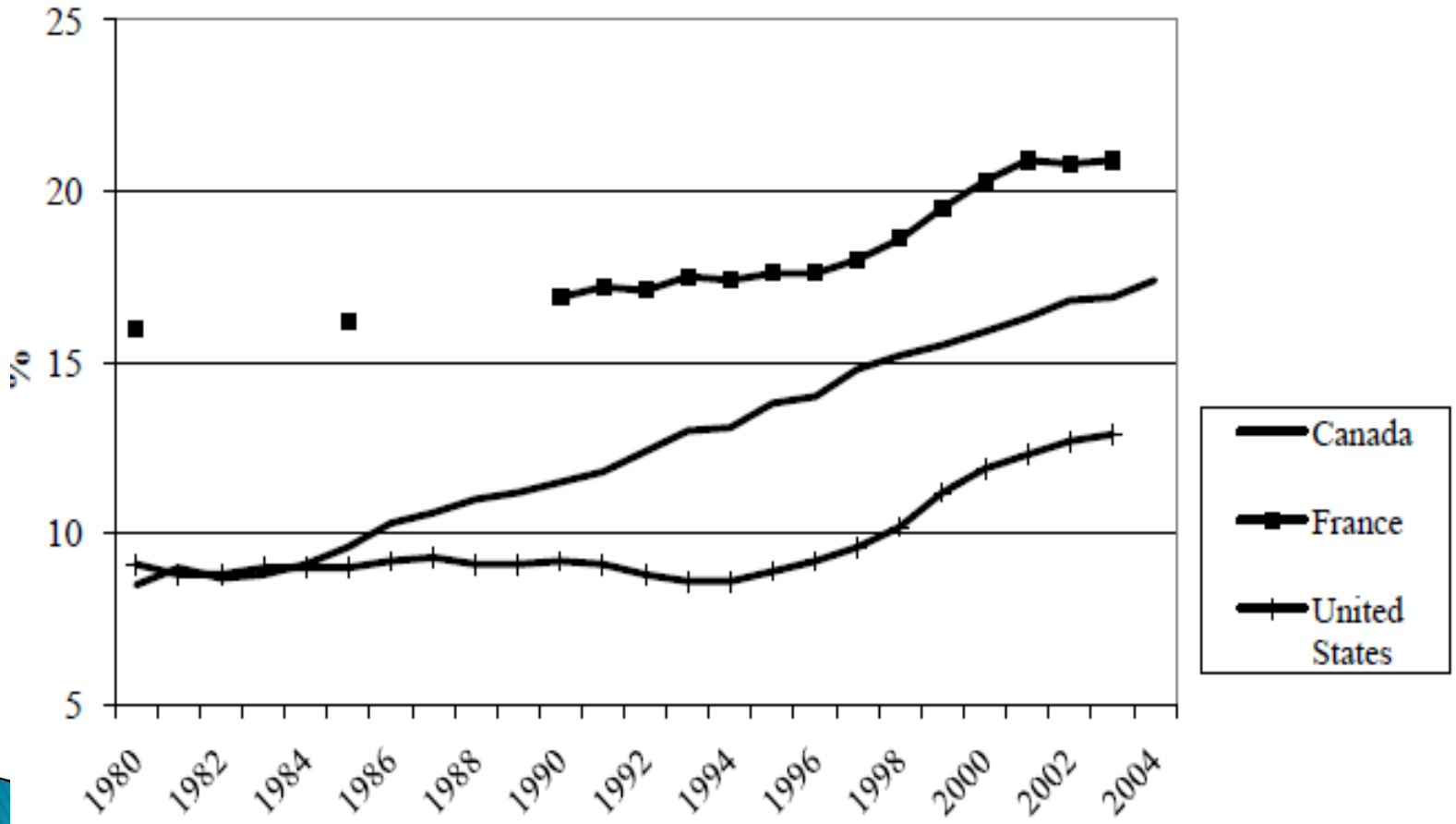
Market Segmentation of the Top 8 Markets in 2005



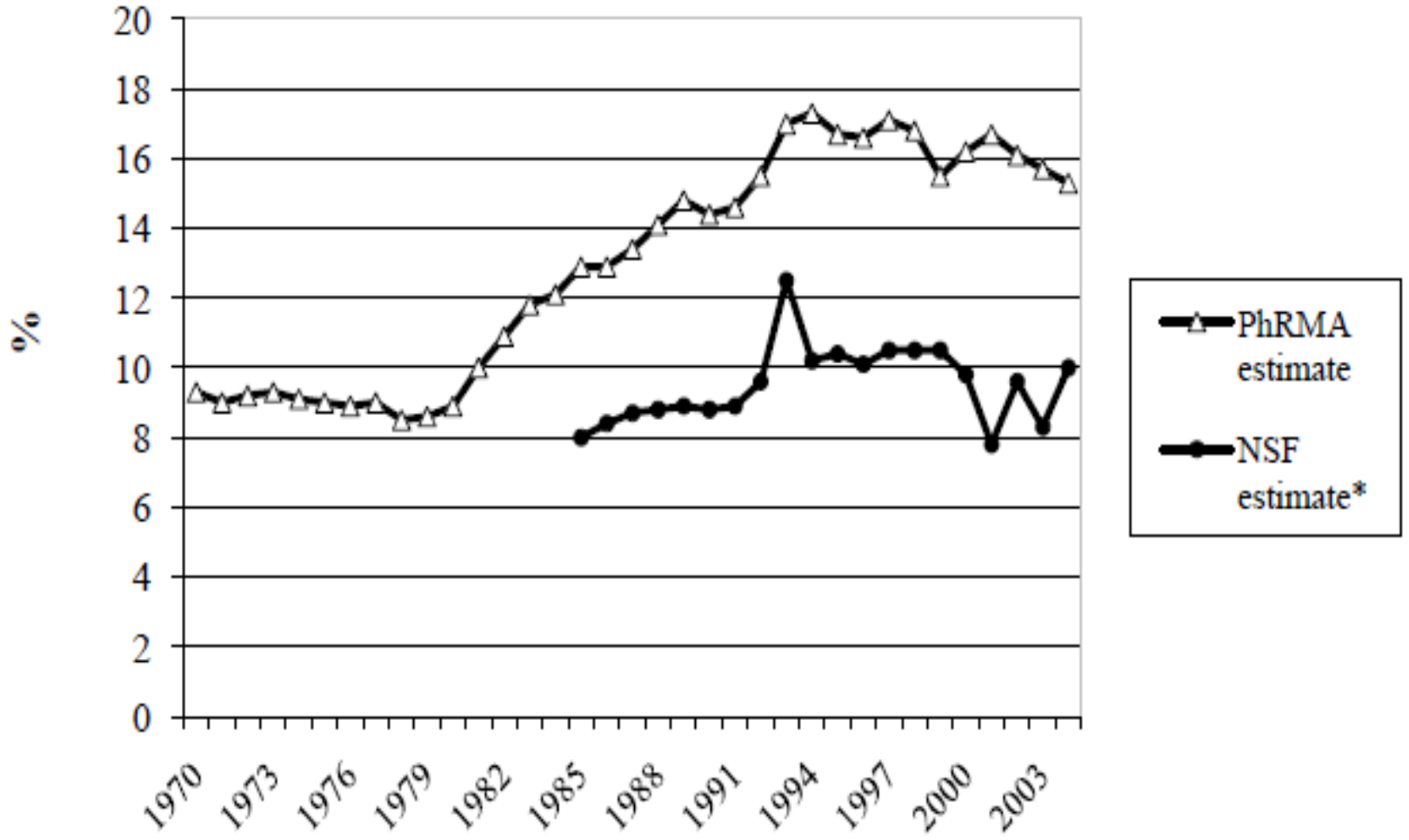
National Health Expenditures as Percentage of GDP, 1960–2003



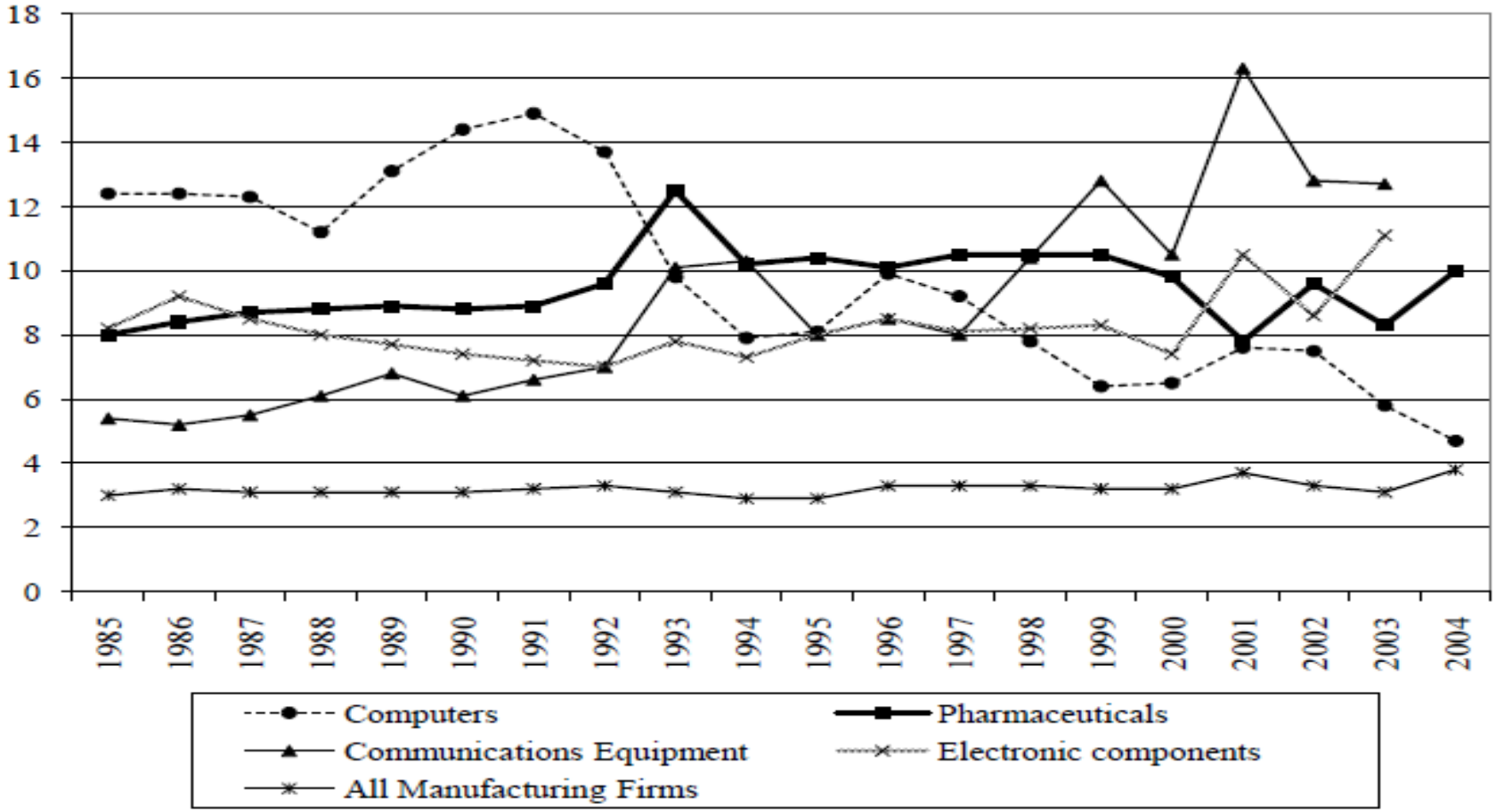
Pharmaceuticals' Share of Total Health Expenditures (Canada, France, United States)



R&D Spending as a Percentage of Sales in the American Pharmaceutical Business (1970–2004)



R&D Spending as a Percentage of Sales in Different American Business Sectors

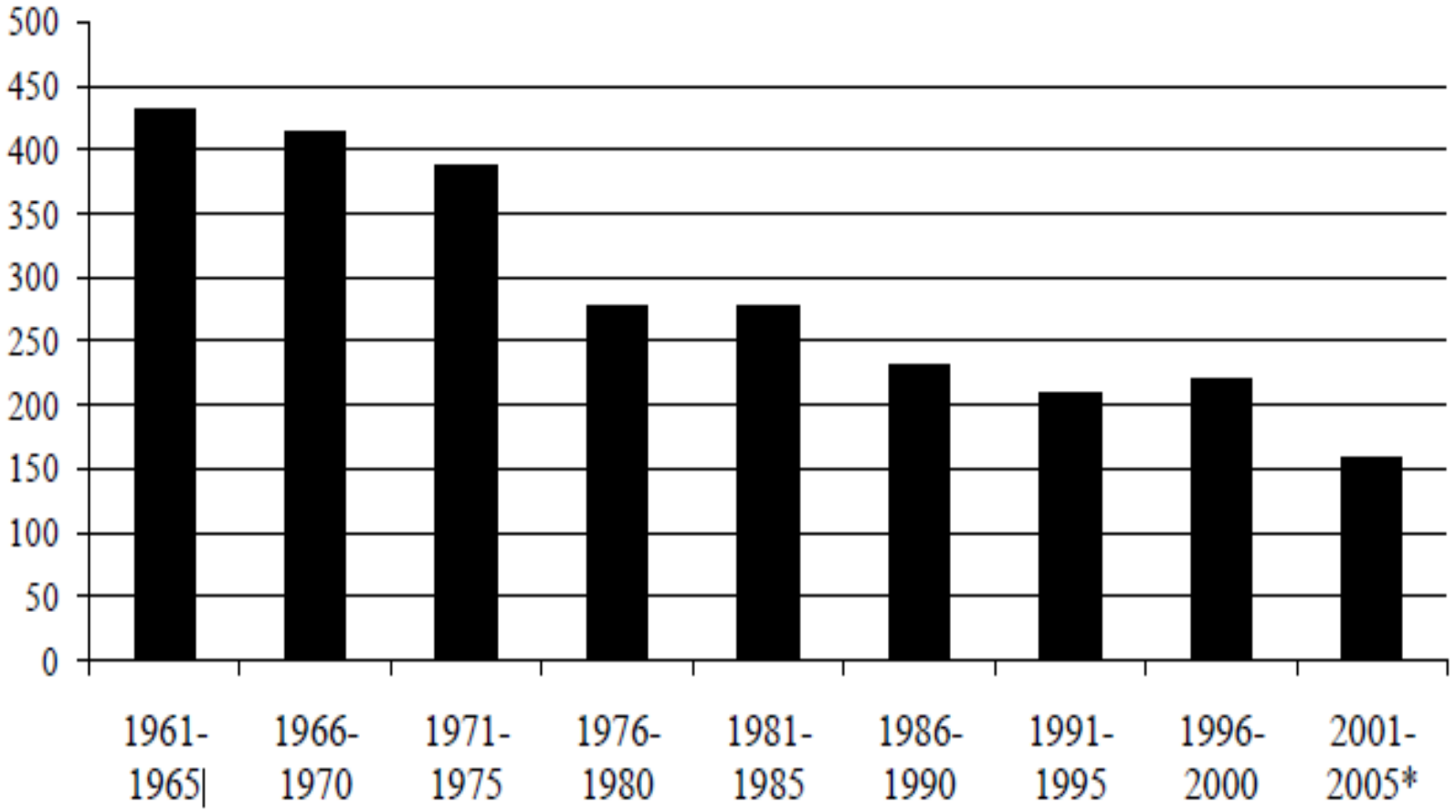


*: The NSF data are in two series: 1985-1997 based on the SIC and 1999-2003 based on the NAIC. Since no data were available for 1998, I used the average of the 1997 and 1999 values. No estimate was reported in 1991 for communications equipment, I used the average of the 1990 and 1992 values for that industry.

Average Production Costs for Each New Drug at the Level of Individual Firms in the U.S. (1950–2002)

Authors	Years	Average Cost (Current Million $)	Average Cost (Constant 2003 Million $)
Schnee (1972)	1950-1967	0.5	3.4
Hansen (1979)	1963-1975	54	105
DiMasi et al. (1991)	1970-1982	231	343
DiMasi et al. (2003)	1983-1994	802	864
Gilbert et al. (2003)	1995-2000	1100	1180
Gilbert et al. (2003)	2000-2002	1700	1700

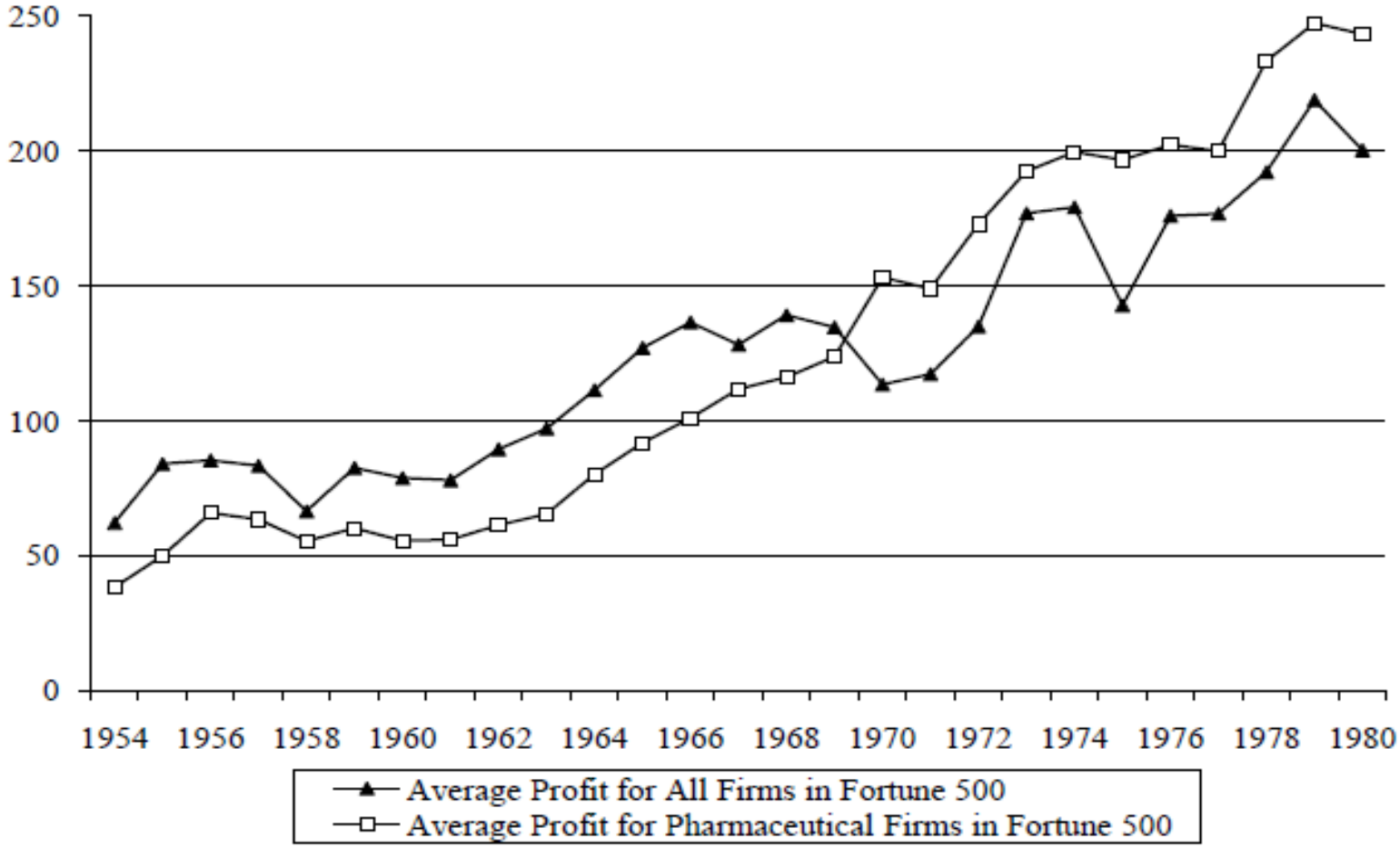
Global Introductions of New Chemical Entities 1961-2005



Classification of New Drugs Available for Prescription in France According to their Therapeutic Advance

	1981-1985	1986-1990	1991-1995	1996-2000	2001-2005	2006-2008
Major advance	1	5	0	1	0	2
Important advance	16	12	13	26	11	3
Some advance	32	38	59	63	35	28
Eventually useful	62	84	121	130	90	83
No advance	177	165	298	189	184	205
Possible dangers	6	20	20	12	48	65
Inadequate information	12	27	30	40	19	20
Number of new drugs	306	351	541	461	387	396

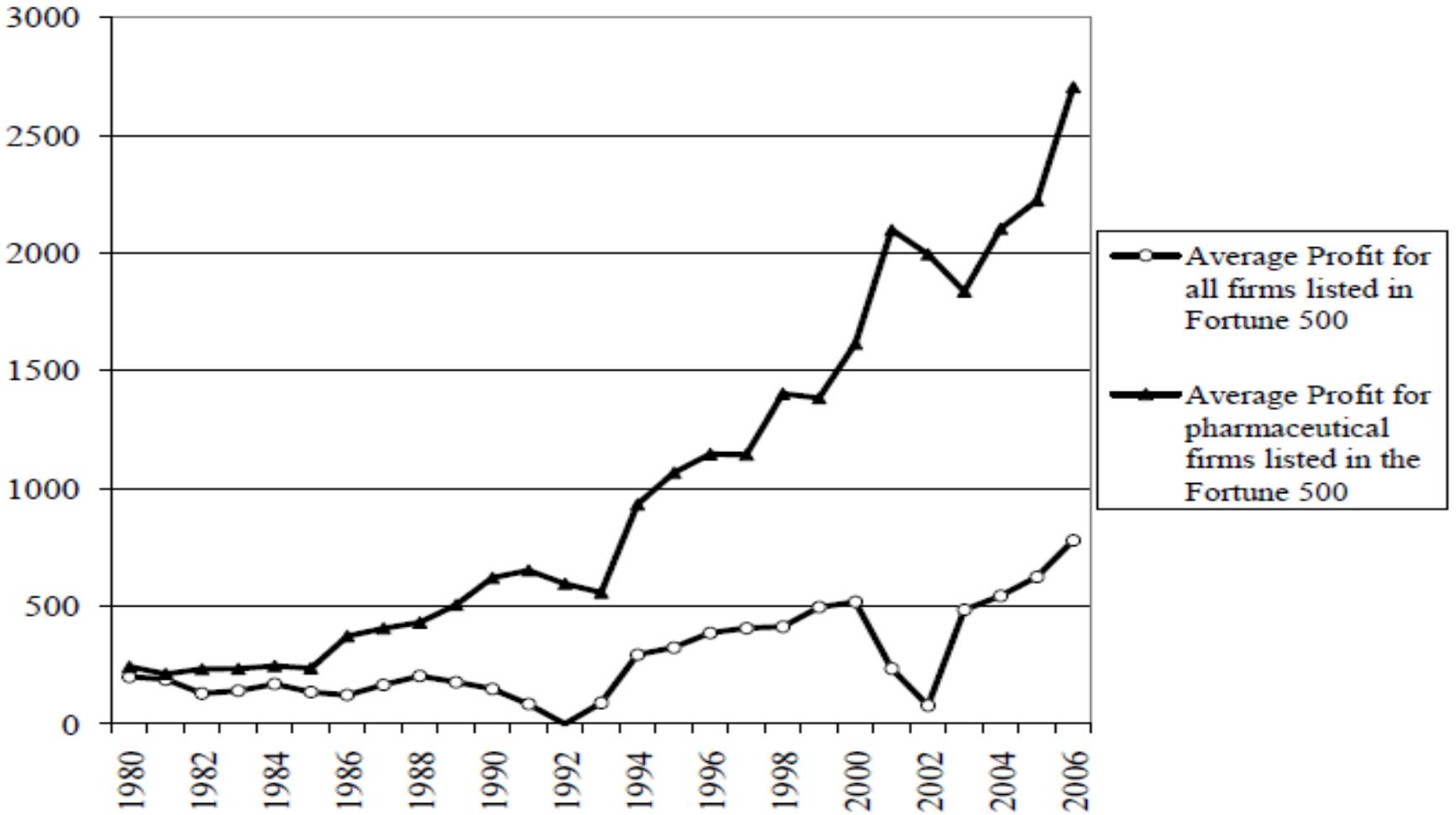
Profits of an average U.S. dominant pharmaceutical firm as compared to an average Fortune 500 firm (in millions of constant 1984 US$)



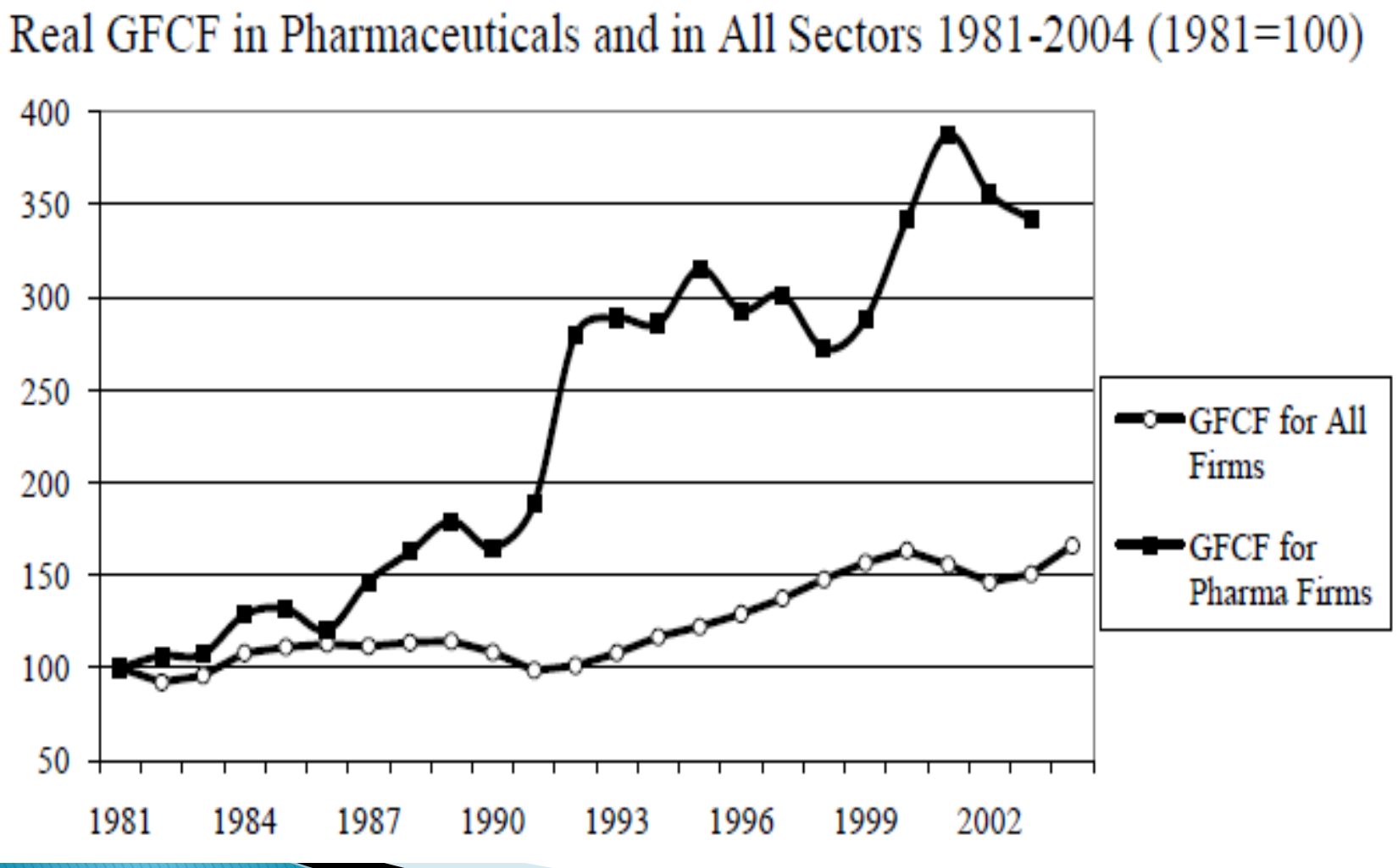
The U.S. Regulatory Revolution in Pharmaceuticals

Year	Regulations
1963	Regulations issued for good manufacturing practices
1966	Preclinical guidelines issued for reproductive, teratology, perinatal and postnatal studies
1968	Preclinical guidelines issued for toxicity testing
1970	Regulations specifying requirements for "well-controlled investigations" to produce "substantial evidence" of efficacy
1970	30 day delay for initiation of testing in humans after submission of Investigational New Drug (IND) application.
1972	Preclinical guidelines issued for chemistry, expanding requirements for drug manufacture, and quality control
1977	Clinical guidelines issued for various drug classes
1978	Regulations specifying good laboratory practices (standards for test protocols, quality control, recordkeeping, equipment, facilities, etc.)

Profits of an average U.S. dominant pharmaceutical firm as compared to an average Fortune 500 firm (in millions of constant 1984 $)



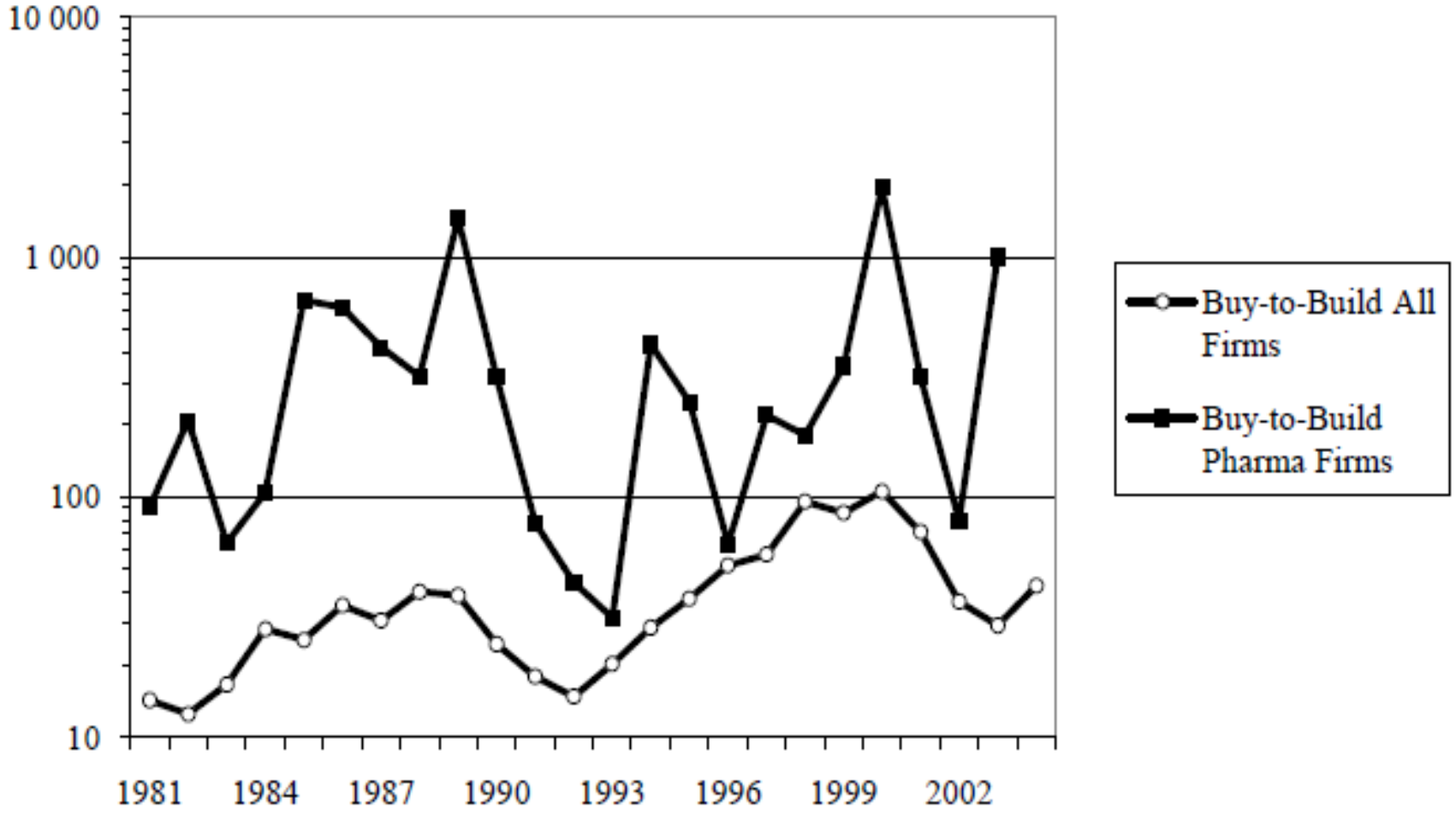
Real GFCF in Pharmaceuticals and in All Sectors 1981-2004 (1981=100)



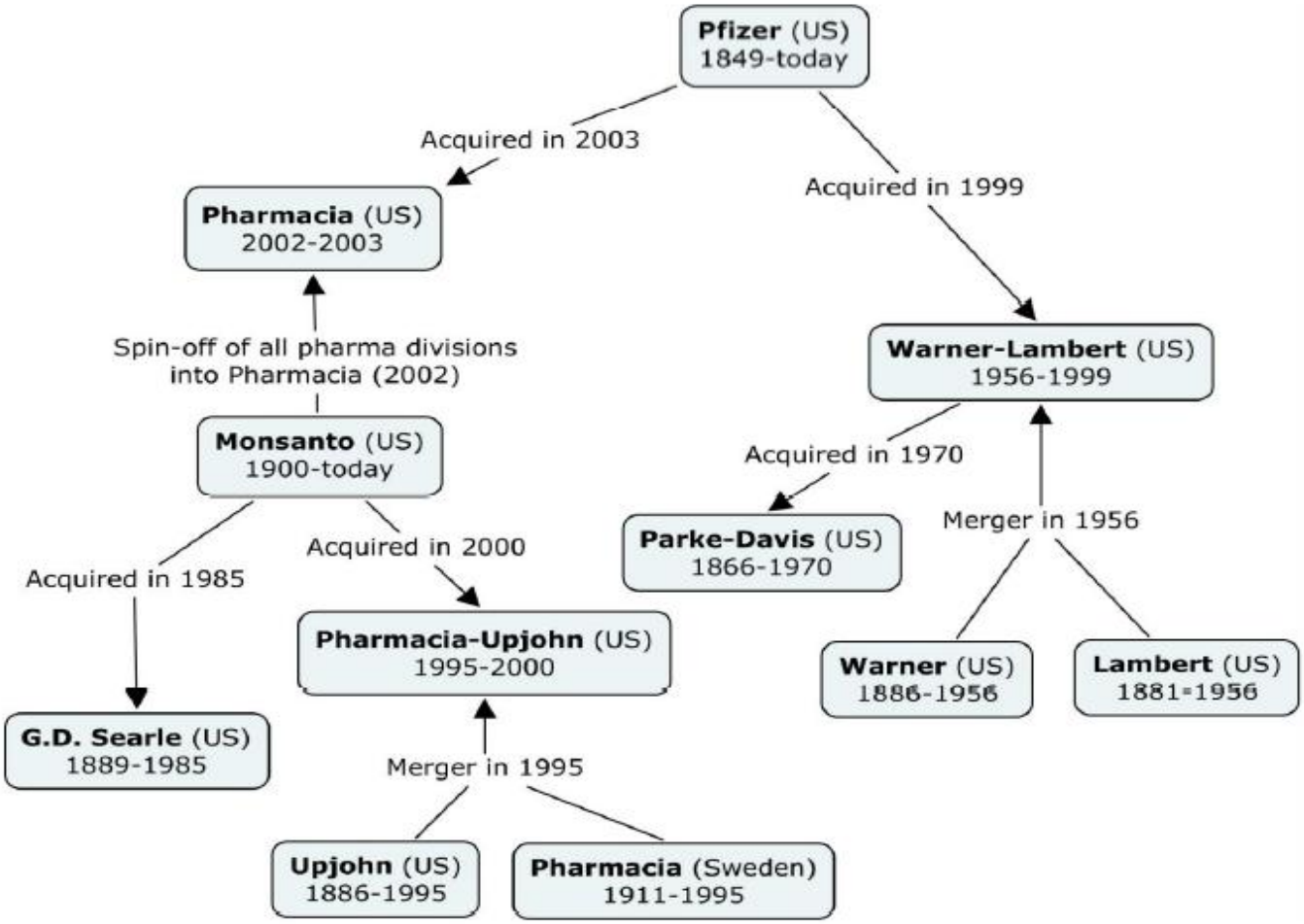
Networks of Agreements with Biotech Groups for Four Representative Dominant Pharmaceutical Firms, 1984–1992

Dominant Firms	Networks of Agreements
Ciba-Geigy (now part of Novartis)	Affymax; Agricultural Genetics; Agri-Diagnostics; ALZA; Aphton; Applied Microbiology; Biogen; Biosys; Calgene; Chiron; Collaborative Research; Genencor; Genentech; ISIS Pharmaceuticals; North Carolina Biotechnology Center; Noven. Pharmaceuticals; Panlabs; Plantorgan; Tanox Biosystem
Hoffmann La Roche (now Roche)	Ajinomoto; Immunex; Alpha 1 Biomedicals; Amgen; Angenics; Biogen; Boehringer Ingelheim Vetmedica; Chiron; Cortecs; Dainippon Pharmaceutical; Genentech; Genica Pharmaceuticals; Genzyme; Immunomedics; Interferon Sciences; Metpath; Protein Design Labs; SangStat Medical; Scios; Summa Medical; Syntex; Xenova; XOMA.
Merck	AB Astra; ALZA; Behringwerke; Biogen; Celltech Group; Chiron; Immulogic Pharmaceutical; Immunetech Pharmaceuticals; Imperial Cancer Research Technology; INBio; MedImmune; Panlabs; Repligen; Shionogi; Singapore Biotechnology; Biologicals S.A.; Syva; Vical.
Pfizer	Advanced Polymer Systems; ALZA; Celltech; Collaborative Research; Ecogen; Genzyme; Ligand Pharmaceuticals; The Liposome Co.; Microvascular Systems; MPS (IGI); Moleculon; Natural Product Sciences; Neurogen; Oncogene Science; Petroferm; Scios; XOMA.

Value of M&As in Proportion to Gross Capital Formation for U.S. Pharmaceuticals and All U.S. Sectors, 1981–2004 (log scale)

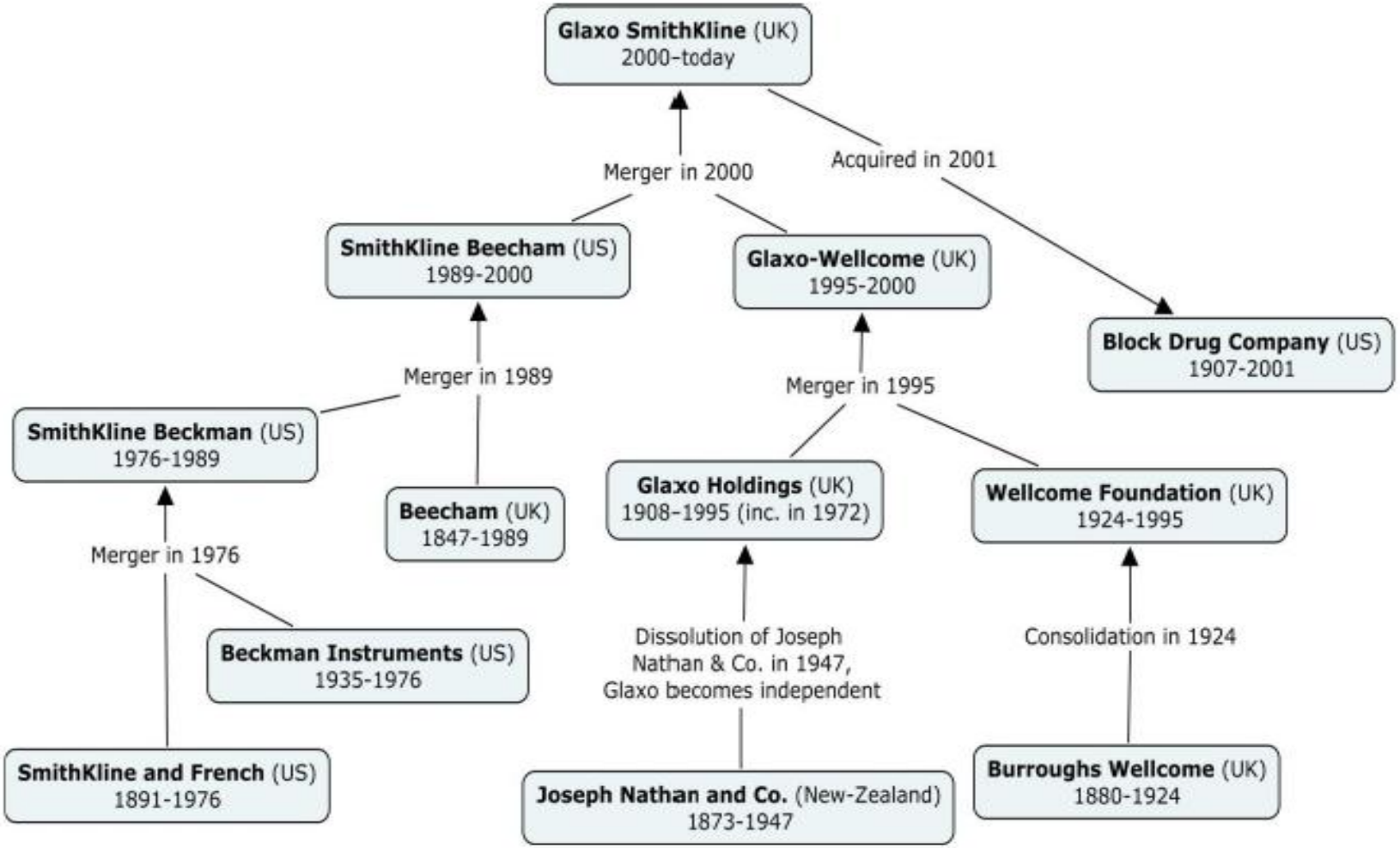


Pfizer's Corporate Family Tree

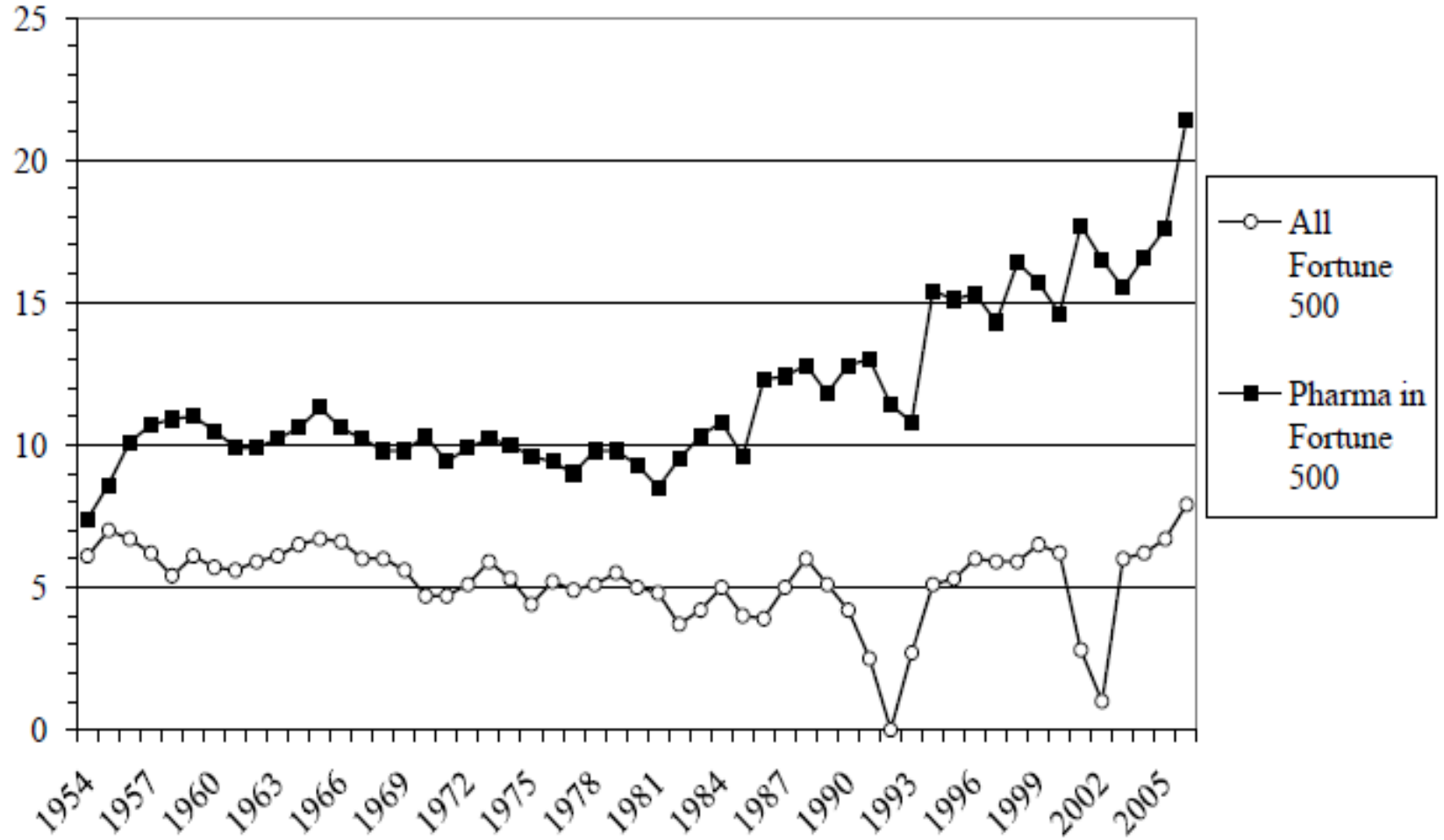


Sources: Pfizer's corporate website; Chandler (2005);
Derdak (various years); Hoover & al. (various years).

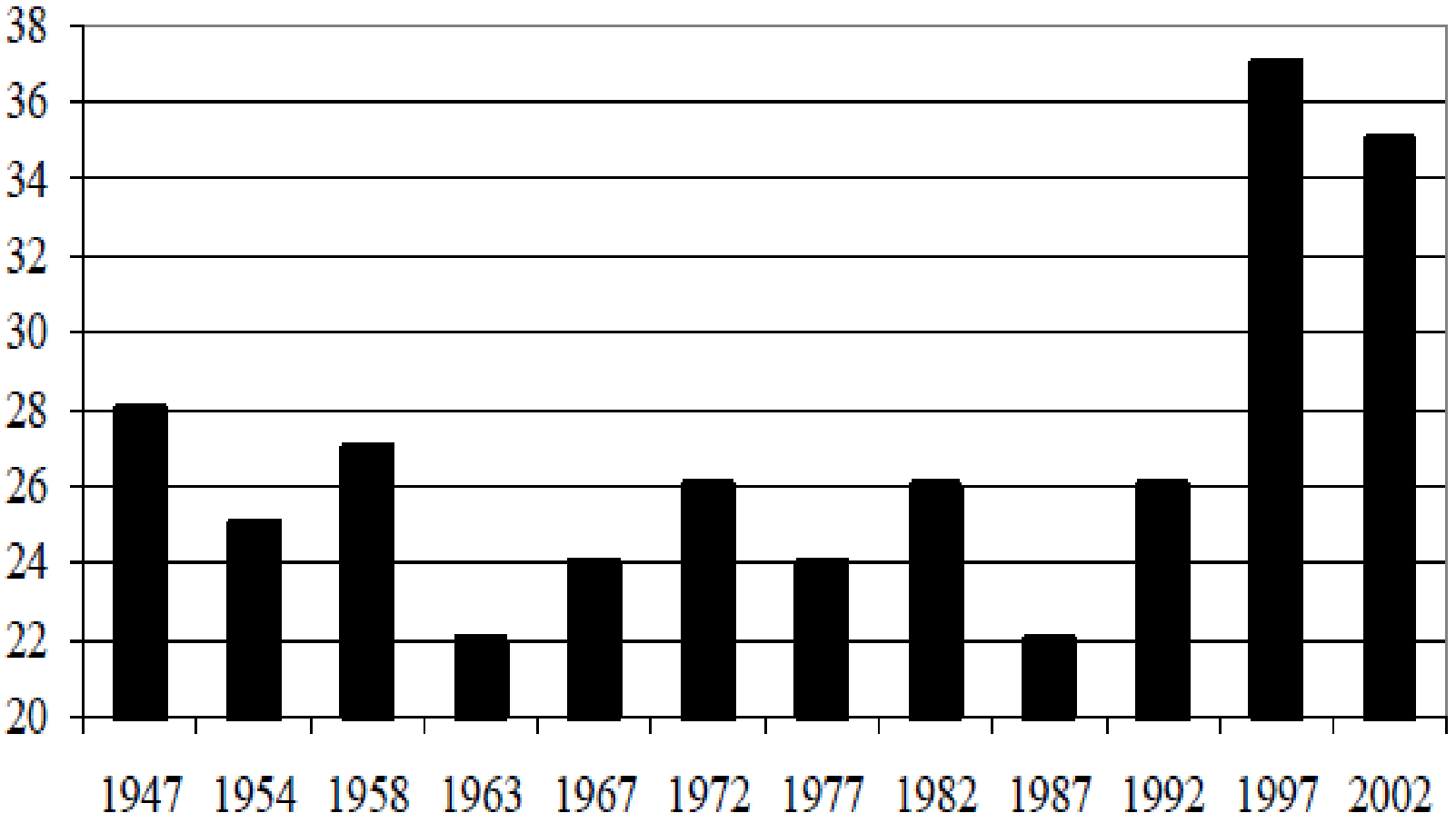
GlaxoSmithKline's Corporate Family Tree



Differential ROR between Big Pharma and all Fortune 500 firms, 1954–2006



Historical Evolution of the CR4 in the U.S. Pharmaceutical Sector



Cooperation Agreements Between U.S. Dominant Pharma and Federally Funded U.S. Research Institutions, 1984-1991

U.S. Big Pharma	Agreements with U.S. Research Institutions
Abbott Labs	- National Institute of Health - University of Chicago
American Home Products (now part of Wyeth)	- Columbia University - Stanford University - National Technical Information Service
Bristol-Myers Squibb	- University of Alabama - MIT - National Technical Information Service - Yale University - US Dept. of Health and Human Services - National Cancer Institute - Oxford University
Johnson and Johnson	- Columbia University - MIT - Scripps Clinic
Eli Lilly	- Columbia University - Scripps Clinic - MIT
Merck	- Duke University - Purdue University - Massachusetts General Hospital
Monsanto (Biopharmaceutical division now part of Pfizer)	-California Institute of Technology -Columbia University -Washington University
Schering-Plough	-Massachusetts General Hospital -Oregon State University -Pennsylvania State University -Scripps Clinic
SmithKline Beecham (now part of GlaxoSmithKline)	-Ohio State University -Walter Reed Army Medical Center -National Institute of Health -Stanford University -University of Cambridge -John Hopkins University -Washington Research Foundation
Sterling Drugs (now part of Sanofi-Aventis)	-Purdue University -Memorial Sloan-Kettering and Columbia University
Upjohn (now part of Pfizer)	-California Institute of Technology -US Department of Commerce -Battelle Memorial Institute -University of Kansas -Stanford University -National Cancer Institute

Selected Legislation Enabling a Competitive R&D Policy for U.S. Big Pharma in the 1980s

Year	Legislation	Effect
1980	Stevenson-Wydler Act	Increases technology transfer from public organizations to private firms
1980	Bayh-Dole Act	Increases patenting of public research to accelerate technology transfer to private firms
1981	Economic Recovery Tax Act	Extends tax credits to companies for their R&D efforts
1982	Court of Appeals for the Federal Circuit	Increases the enforcement of patent rights and raises costs of infringement
1983	Orphan Drug Act	Provides tax credits and greater monopolies for innovations concerning rare diseases
1983	Memo on Government Patent Policy	Generalizes the advantages of the Bayh-Dole Act to all firms
1984	National Cooperative Research Act	Affords a special antitrust status to R&D joint-ventures among companies
1984	Waxman-Hatch Act	Extends up to five years patent protection for delays necessary for FDA approval
1986	Federal Technology Transfer Act	Increases technology transfer from public organizations to private firms
1987	Presidential Executive Order 12591	Increases technology transfer from public organizations to private firms

Cost Structures for Big Pharma in 2006 (Billion $, 2006 Exchange Rates)

Firms*	Revenues	Manufacturing	Marketing & Administration	R&D
Abbott Laboratories	22.5	9.8	6.3	2.3
Amgen	14.3	2.1	3.7	3.4
AstraZeneca	26.5	5.6	9.3	3.9
Bristol-Myers Squibb	17.9	6.0	6.3	3.1
Eli Lilly	15.7	3.5	4.9	3.1
GlaxoSmithKline	43	9.3	13.5	6.5
Johnson & Johnson	53.3	15.1	17.4	7.7
Merck	22.6	6	8.2	4.8
Novartis	36	10.3	11.4	5.3
Pfizer	48.4	7.6	15.6	7.6
Roche Group	32	7.4	9.4	4.6
Sanofi-Aventis	36.9	9.5	10	5.5
Schering-Plough	12	3.7	4.7	2.1
Takeda	10.4	2.4	4.5	1.5
Wyeth	20.4	5.6	6.5	3.1
TOTAL	**411.9**	**103.9**	**131.7**	**64.5**
% of Revenues	**100**	**25.2**	**32**	**15.7**

Intellectual Property Right?

- IP as *commodity form* rooted in circulation – getting immaterial goods and services to market
- IP as *revenue category* as means of appropriating & redistributing surplus value, especially as intellectual labour gets separated from material production
- IP penetrates into labour process as *formal and/or real subsumption* (work-for-hire, smart machines, expert systems) to appropriate absolute and/or relative s/v
- IP as *primitive accumulation* (by dispossession)
- IPR as *commodity fetishism* as legitimation of profitoriented, market-mediated knowledge-based economy
- *Contradiction between use- and exchange-value* aspects of the commodity form and its elaborations

Role of intellectual property

Role of intellectual property and IPR become more important, more that

- capital accumulation depends on valorization of knowledge,
- intellectual labour is commodified,
- intellectual production involves long gestation periods high fixed costs,
- distinct fractions, branches, or enterprises come to specialize in intellectual production for the market, and
- there is a secondary market in titles to revenue flows from intellectual property.

- IPRs become essential to overall organization of capitalist production in an age of specialization and inimical to overall dynamic of accumulation
- they undermine operation of intellectual commons as a ‘free gift of human nature’ or a ‘universal productive force’ available for appropriation and exploitation by each and every capital at each and every point in circuit of capital

IPR, Contradictions & Dilemmas

- **Social source of creativity vs substitutable factor of production**
- **Use-value versus exchange-value**
- **Intellectual commons versus intellectual property**
  - Want free input versus want to charge for output
  - Problem of anti-commons (search costs, transaction costs, multiple-marginalization and royalty-stacking)

- Guarantee of the average rate of profit versus monopoly privilege facilitating super profits
- Technological rents generated by new knowledge disappear when latter generalized – if they can be generalized or invented around
- Leads to search for new institutional and juridical solutions that balance contradictions and dilemmas, without ever removing them
- They are inherent in knowledge in profitoriented, market-mediated economy