ECONOMICS OF THE MARKET FOR MEDICINES

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Office of Health Economics
November 2007

Agenda

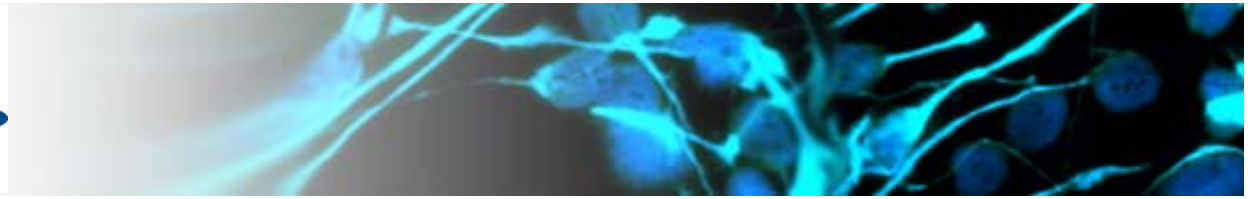
1. **The supply side – R&D**
2. Demand for medicines
3. NICE – the cost-effectiveness '4th hurdle'
4. Regulating medicine prices

Characteristics of Medicines Markets

- Supply is R&D intensive, which implies:
  - Intellectual property rights (patents)
  - Long lead times
  - High risk
  - Dynamic competition is as important as static
  - Generic competition after patent expiry

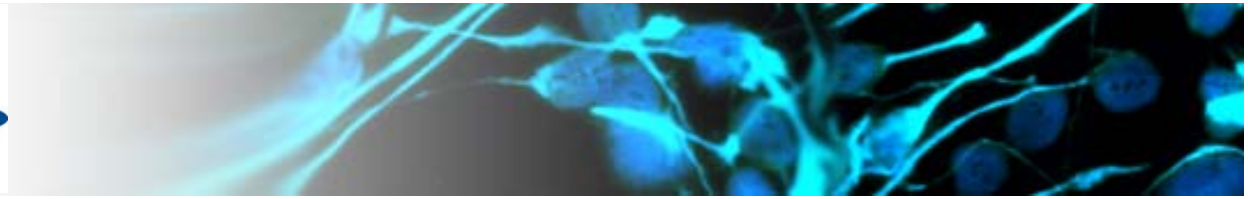
- Demand is regulated – governments and social insurers are major buyers of medicines

- Prices are regulated



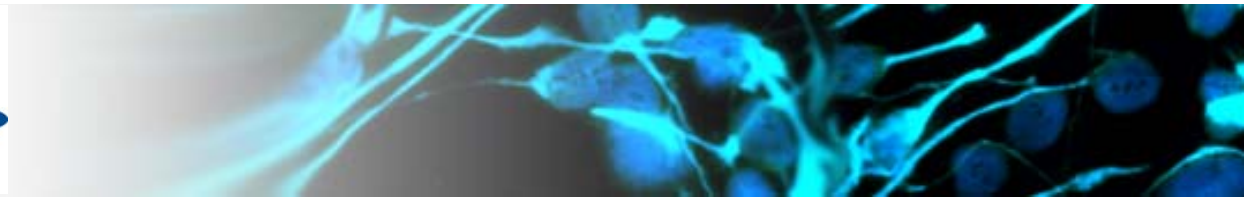
Supply Side – Main Characteristics (1)

- Patents are an incentive for dynamic efficiency – by promising temporary monopoly if successful
- Patents last 20 years; first 9-11 of which are spent getting the medicine to market, i.e. research & development (R&D)
- Commercial success in R&D-based companies has hitherto depended on finding ‘blockbusters’



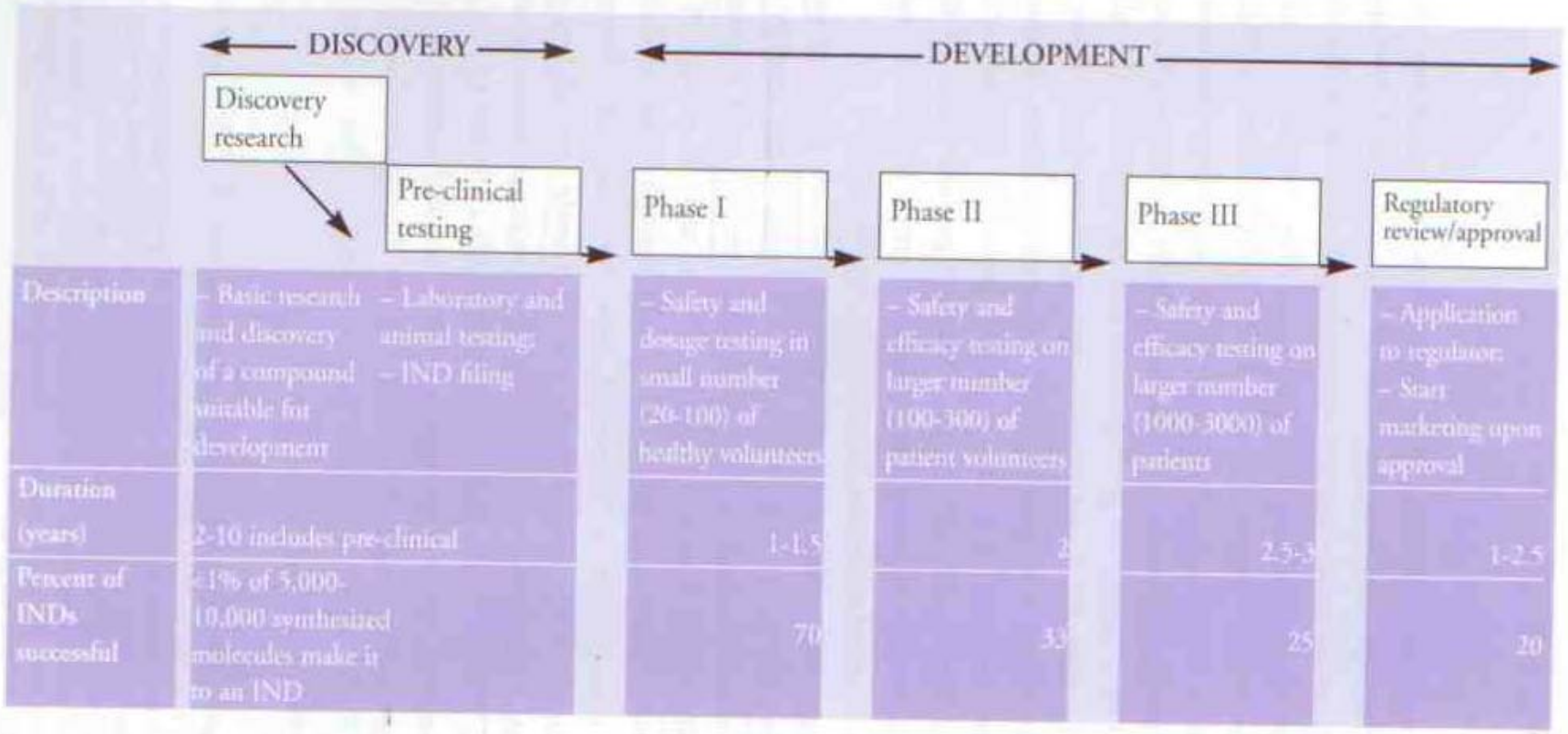
Supply Side – Main Characteristics (2)

- Average R&D cost of a new medicine up to launch > US$800 million
- Includes costs of failures
- Out of pocket costs ≈ 50%
- Opportunity cost of capital ≈ 50%
- Only ≈ 30% of launched medicines earn revenues that exceed their lifetime costs



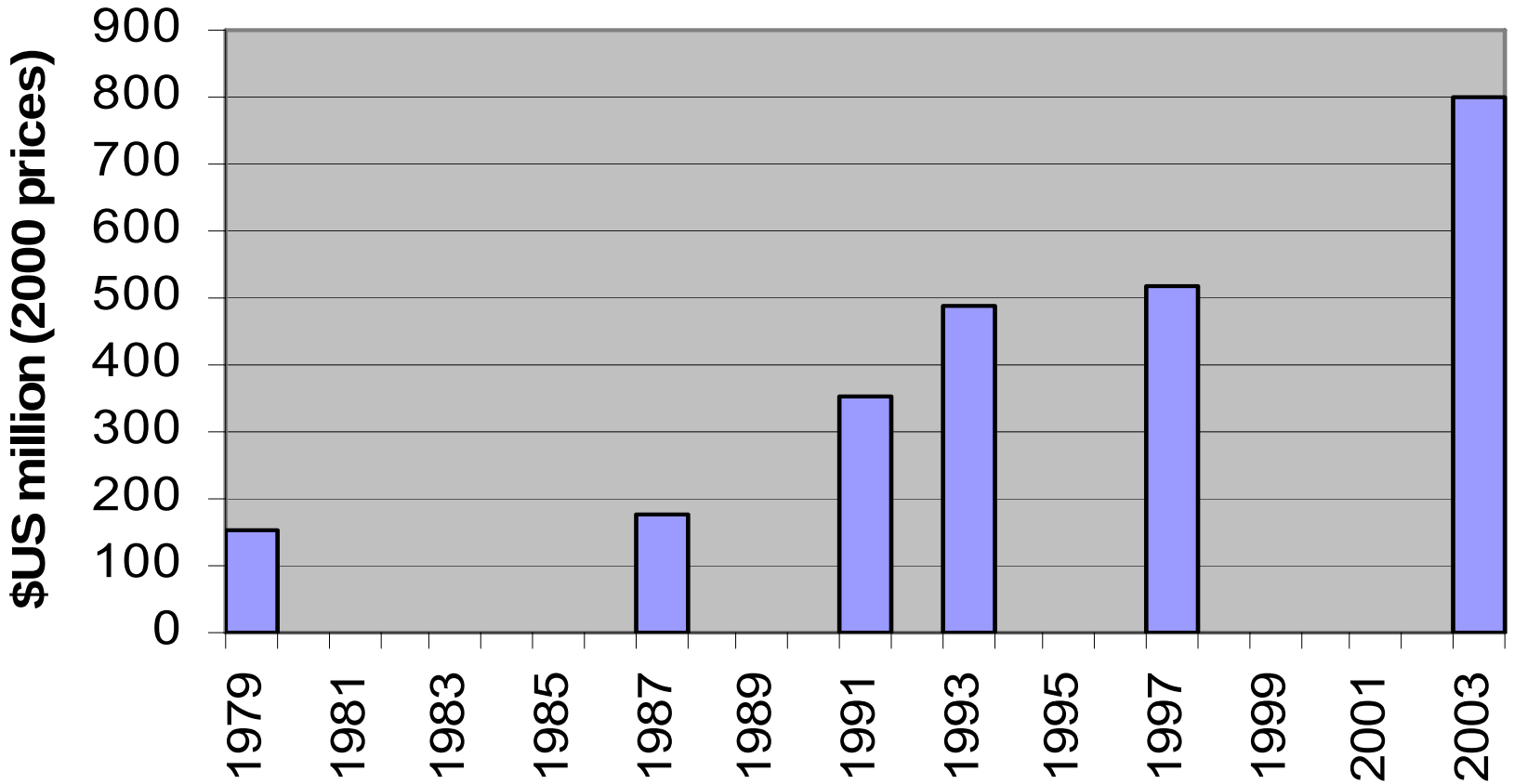
Discovery & Development of a New Medicine

Figure 1 Life cycle of a NCE from synthesis to market



Sources: Row 1 – Myers and Howe, 1997, Figure 2; Row 2 – DiMasi et al., 1991; Lehman Brothers, 1997b; PhRMA, 1997; Row 3 – Lehman Brothers, 1997b, 4.
Notes: IND= Investigational new drug. In the UK companies must fill out a Clinical Exemption Certificate (CTX), but there are currently fewer hurdles to initiating clinical trials in the UK than in the US (CMR International).
The duration and success rate figures represent typical performance in US companies rather than averages of a specific sample of NCEs.
The diagram uses US data. Because companies in the US face the additional hurdle of filing an IND before they can start clinical trials, the total development time in the US may be longer than in other major markets. According to CMR International, the mean development time for a product to reach any global market was 10 years in 1996.

The Rising Cost of an NCE



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Understanding the R&D process: basic concepts

1. Most new medicines are developed simultaneously
2. The innovation race stimulates competition
3. Being the *first in class* does not imply being the *best in class*
4. The market (clinical practice) determines the '*winners*'
5. There exists spillovers in the R&D process
6. Alliances have an important role to play

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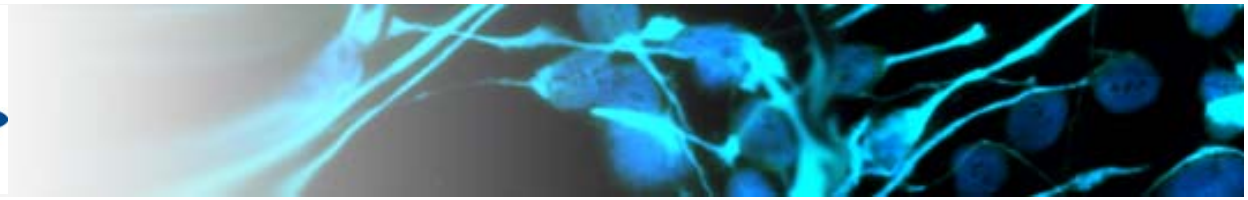
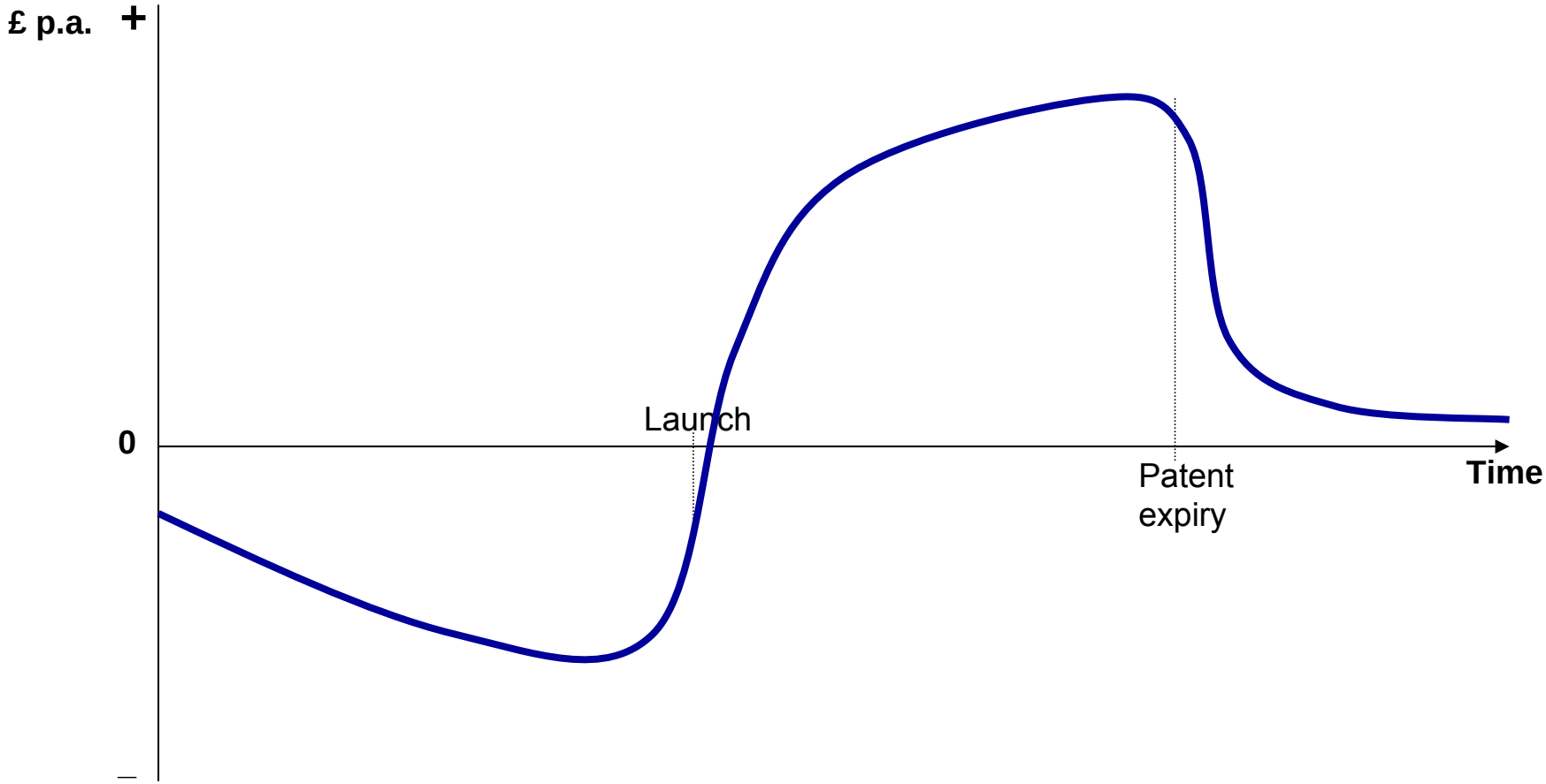


Cash Flow for a Successful Medicine



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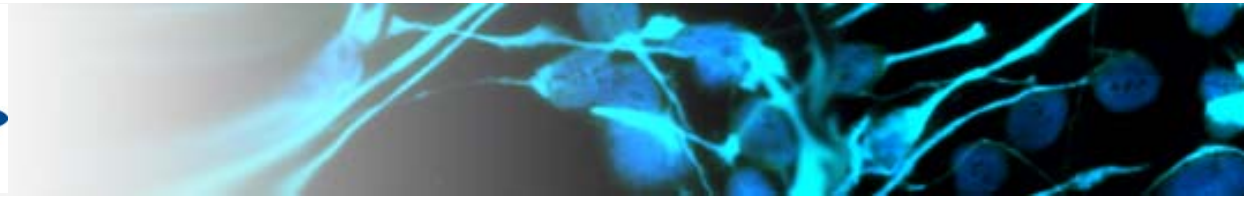
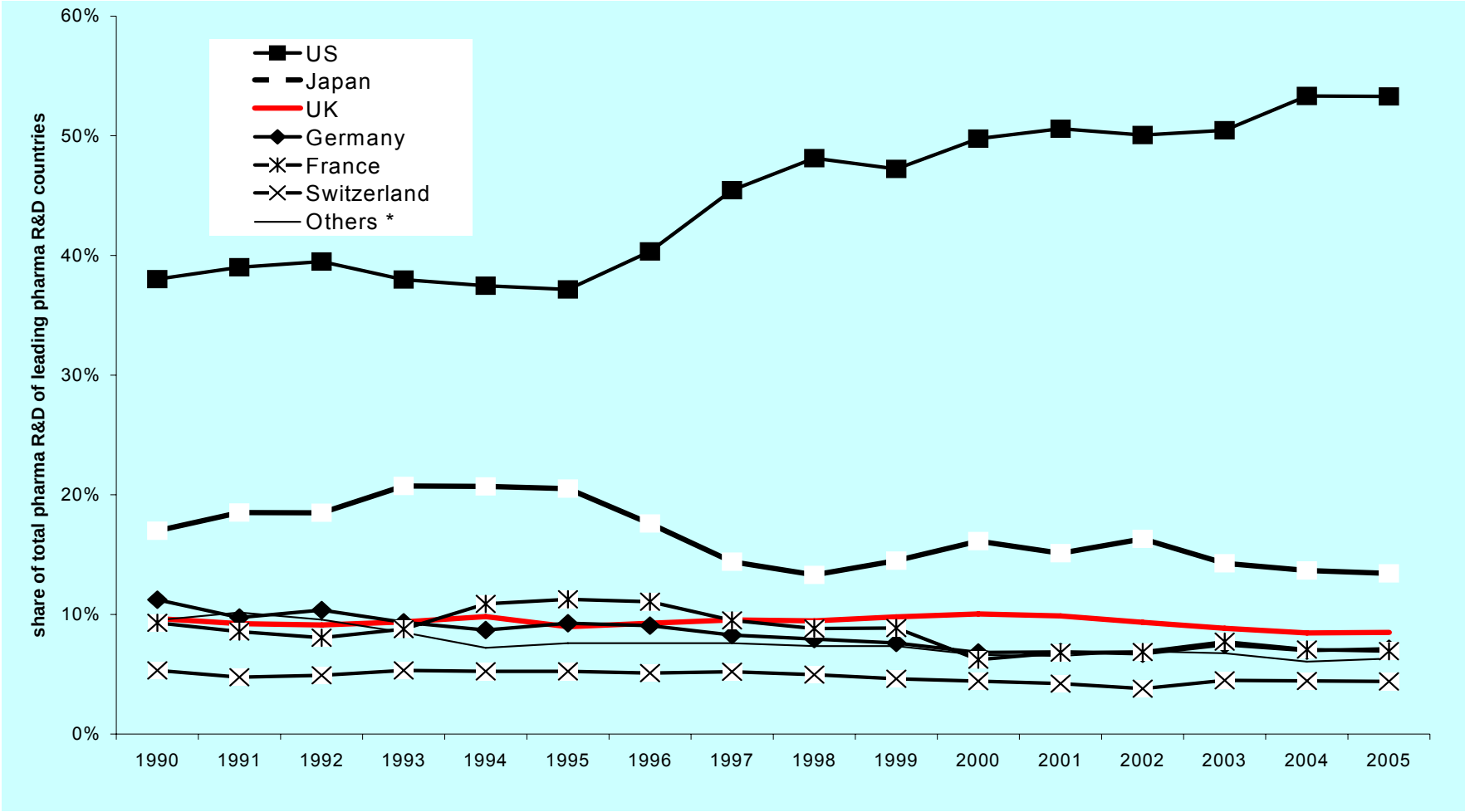
Supply Side – Main Characteristics (3)

- R&D costs are sunk (global) joint costs
- R&D costs ≈ 17% of pharmaceutical sales p.a.
  But ≈ 31% of costs on net present value basis
- => (even long-run) marginal cost << average cost
- => Price discrimination (based on Ramsey rule?) if non-linear pricing is impractical
- → Parallel trade



% of ‘World’ Pharmaceutical Industry R&D Spend



Sources: National pharmaceutical industry trade associations

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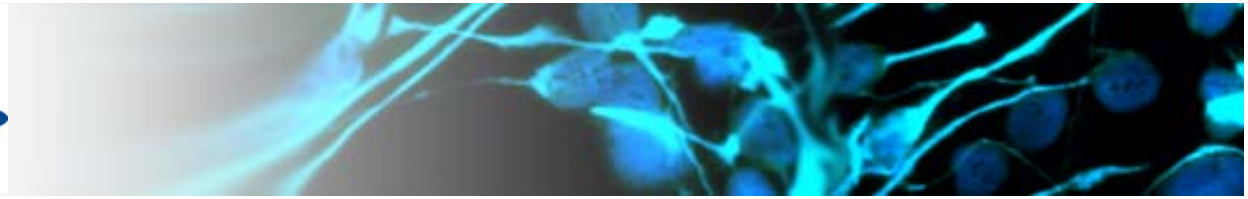


Types of Prescription Medicines

	Original brand		Branded generics	Unbranded generics	OTCs
	On-patent	Off-patent			
NHS					
Private					

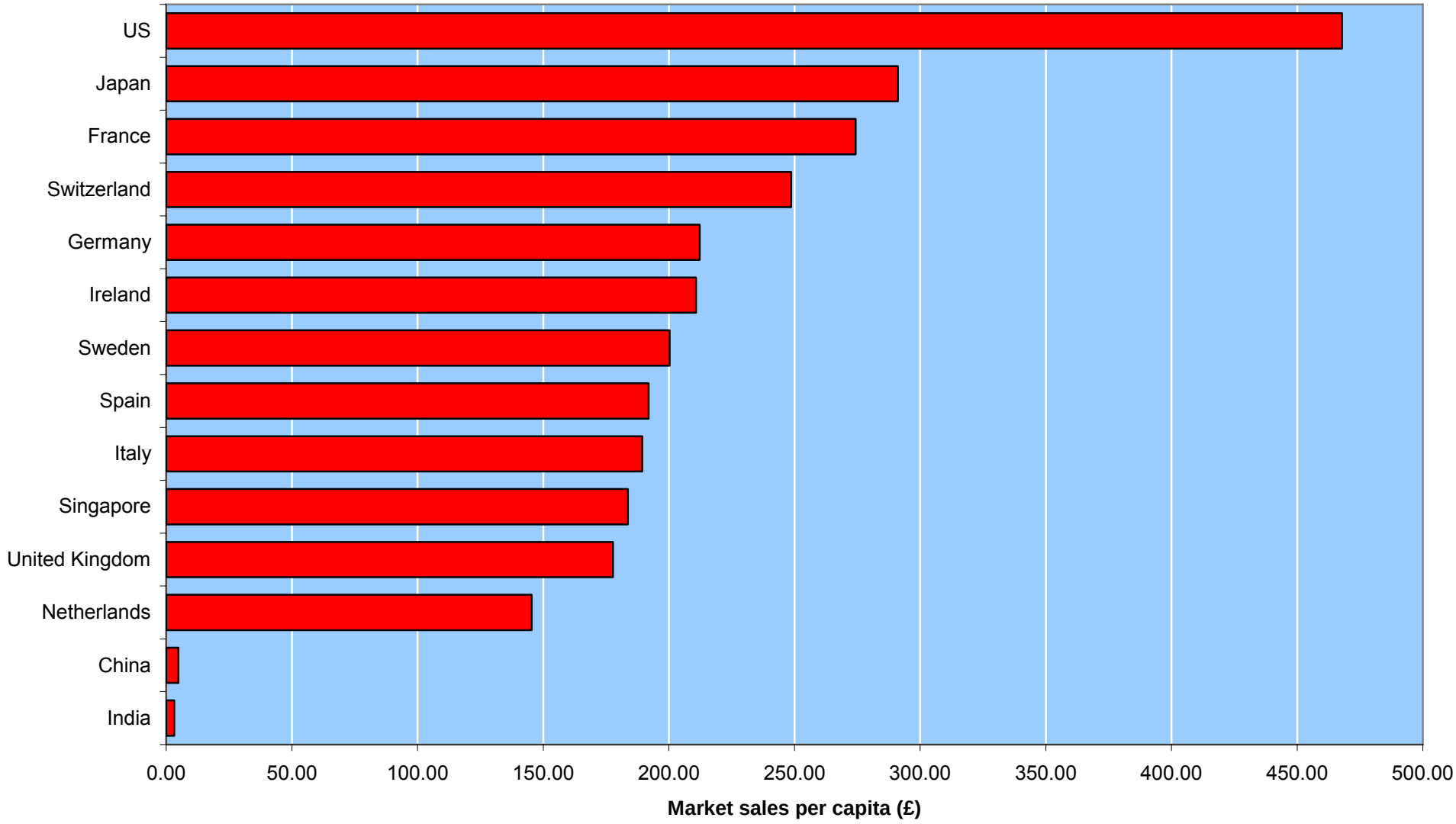
UK:

- Generic prescriptions as total number of prescriptions dispensed: 58% in 2005 compared to 15% in 1975
- Proportion of prescriptions written generically: >80% in 2005 vs. 35% in 1985

Source: OHE Compendium (2007)

OTCs = over the counter medicines

Pharmaceutical Expenditure per head – 2005



Sources: OECD.
World Bank.

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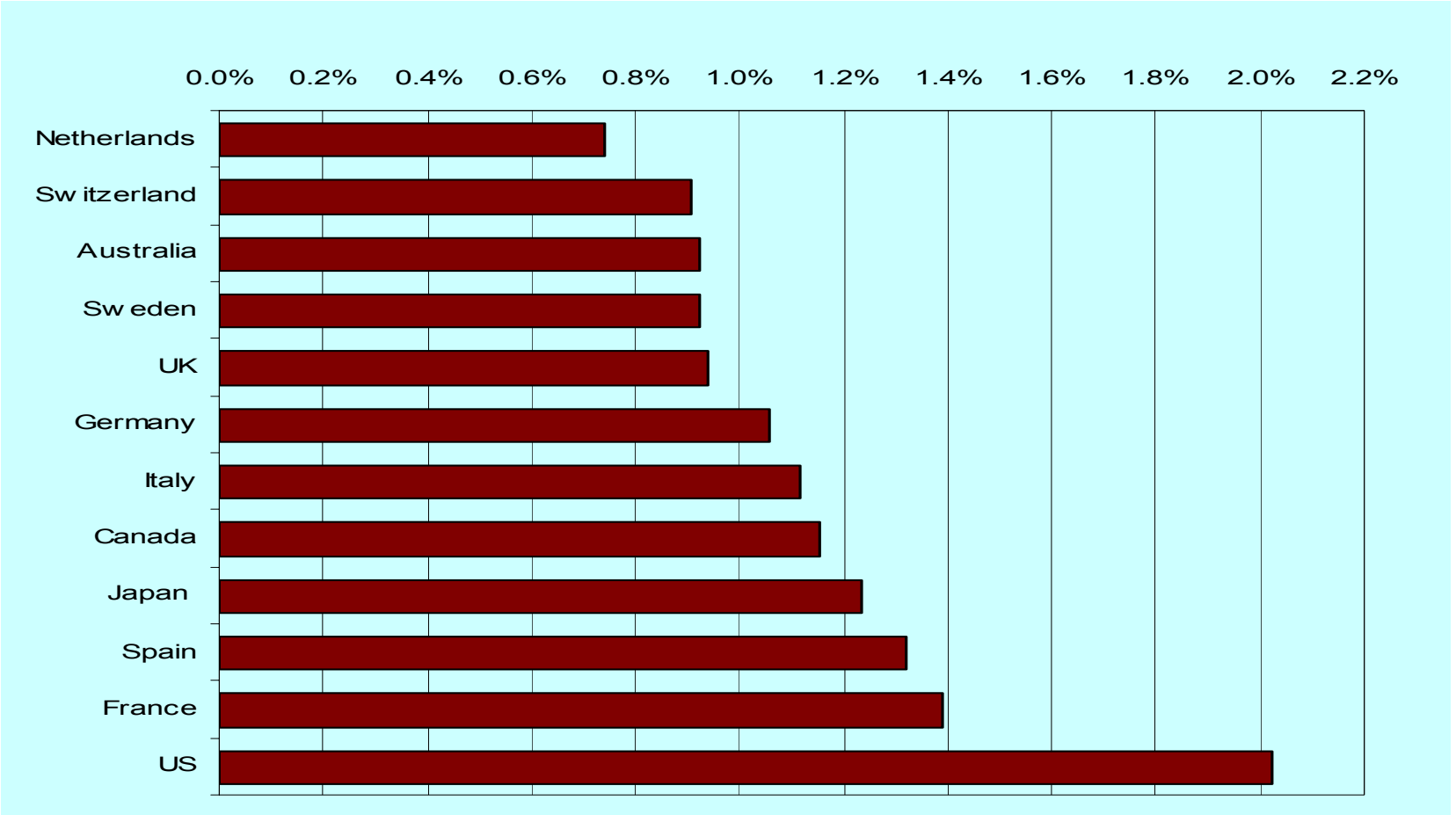
Pharmaceutical Sales as % of GDP (2004)



Sources: OHE calculations using IMS World Review 2004 market data and OECD data for GDP

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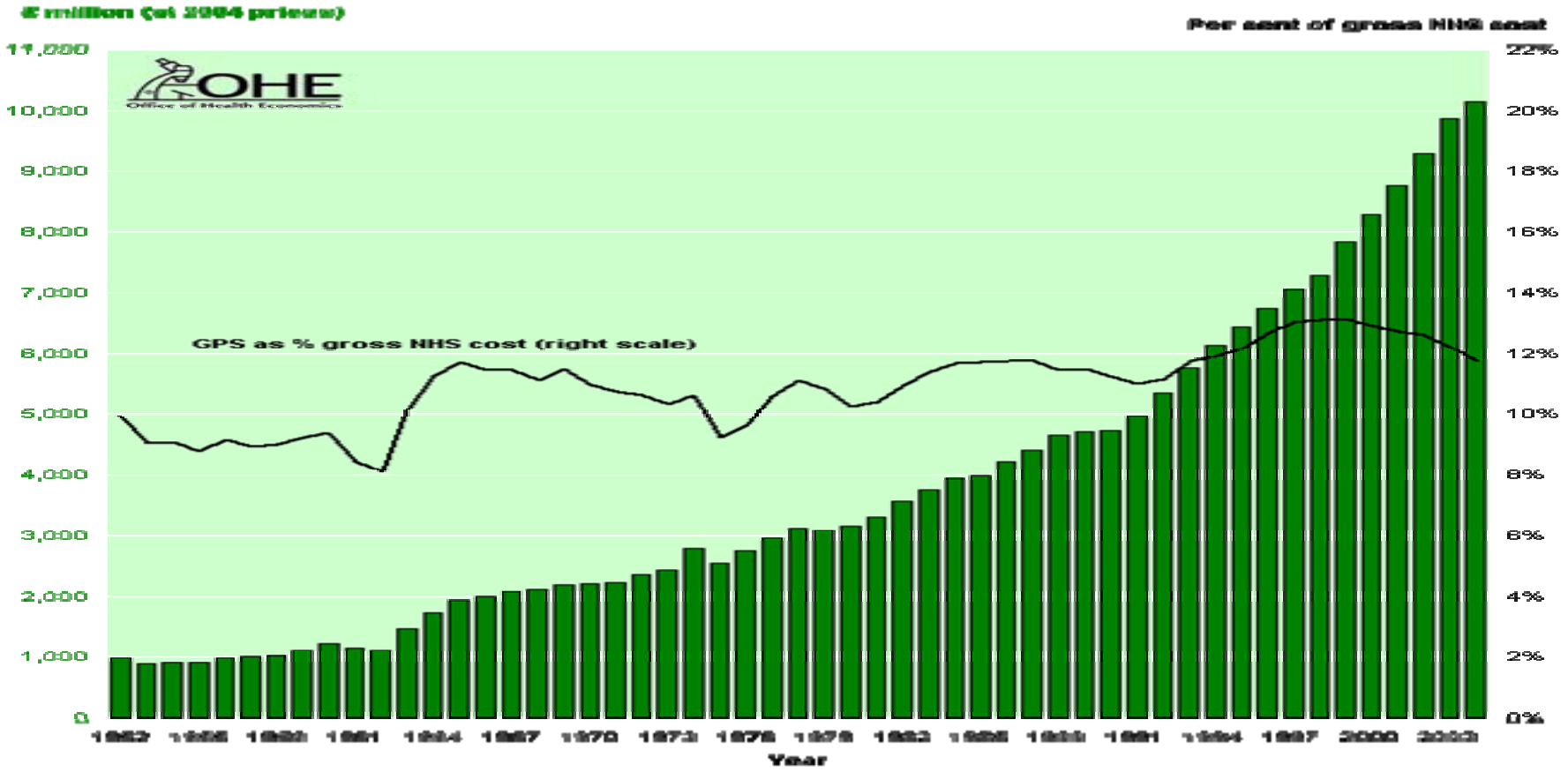
Figure 4.14 Gross* cost of General Pharmaceutical Services (GPS), UK, 1952 - 2004

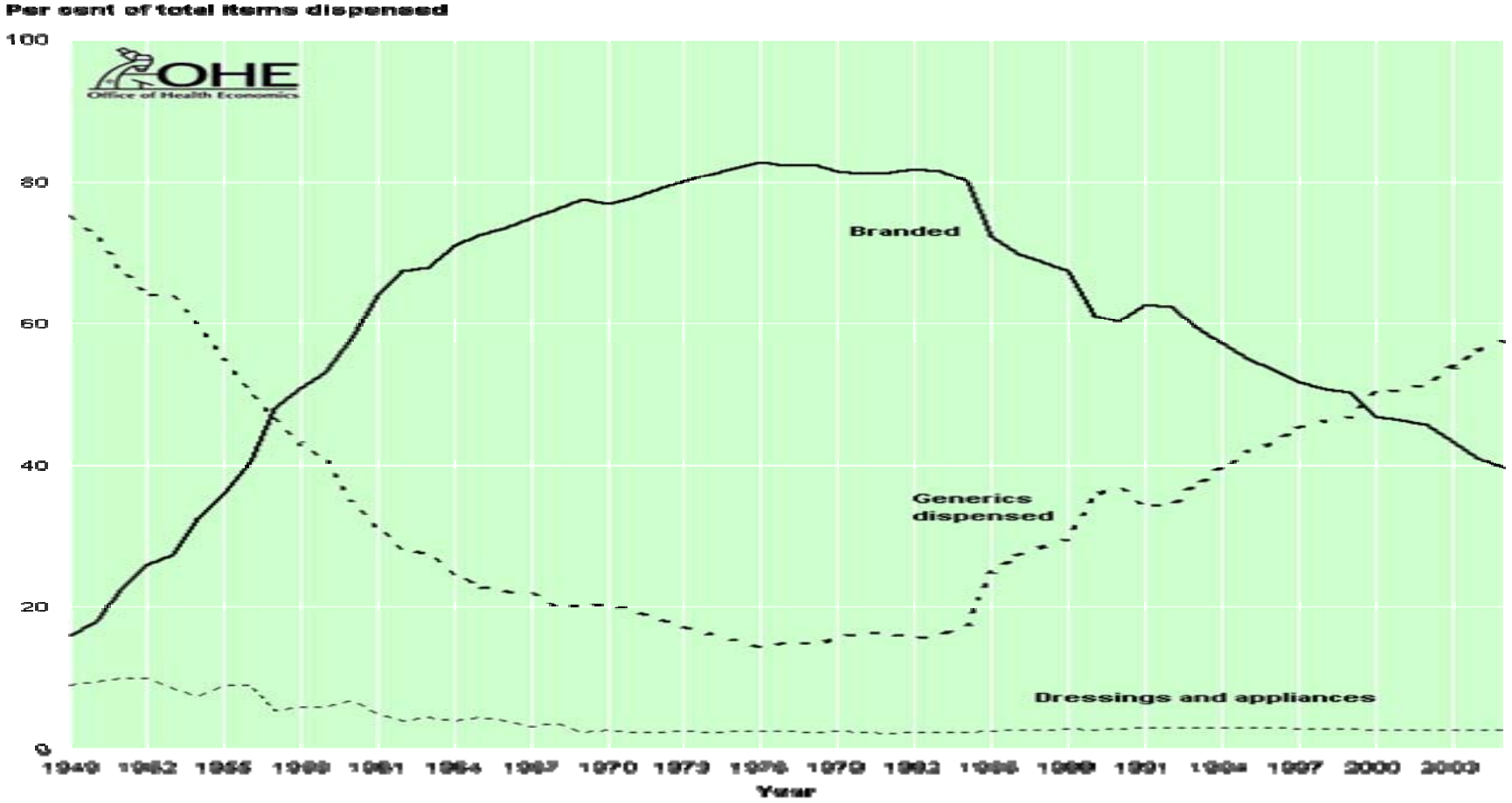


Notes: * Figures include dispensing fees, allowances and prescription charges, at 2004 prices, as adjusted by the GDP* deflator at market prices.

Sources: The Government's Expenditure Plans [DH]
Health and Personal Social Services Statistics for England [DH].
Scottish Health Statistics (ISD)
Health Statistics Wales (NAW)
Annual Statistical Report [Northern Ireland CSA].
Annual Abstract of Statistics [ONS].

OHE Compendium of Health Statistics, 2007

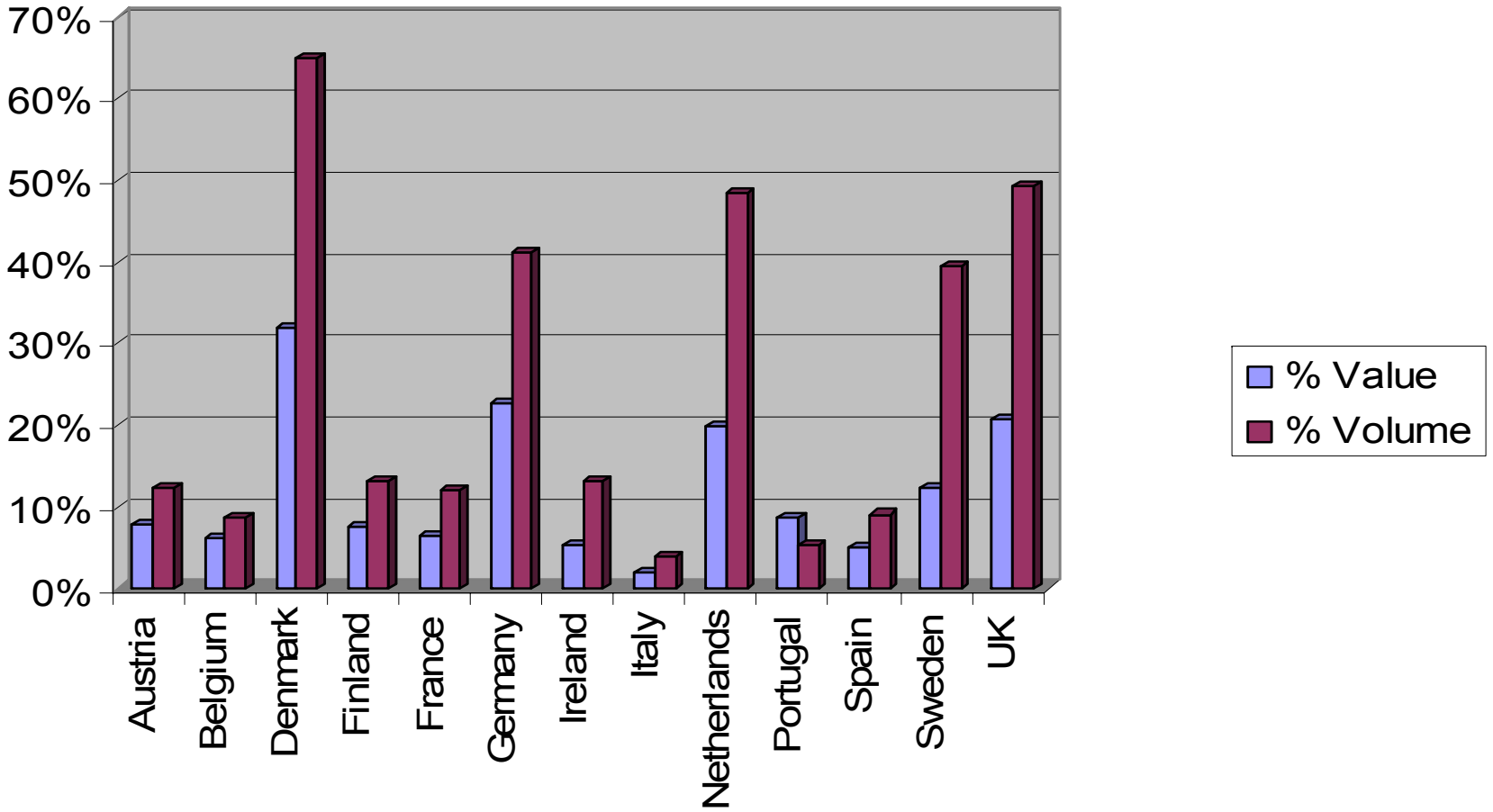
Figure 4.20 **Market share of branded and generic prescription items dispensed by chemists*, England, 1949 - 2006**



Notes: *Including appliance contractors.
Data from 1999 have been revised, see OHE Statistical Bulletin 2000/20.
Source: Prescriptions Dispensed in the Community Statistics England (OHE Statistical Bulletin).

OHE Compendium of Health Statistics, 2007

Generic Market Shares across Europe (2004)

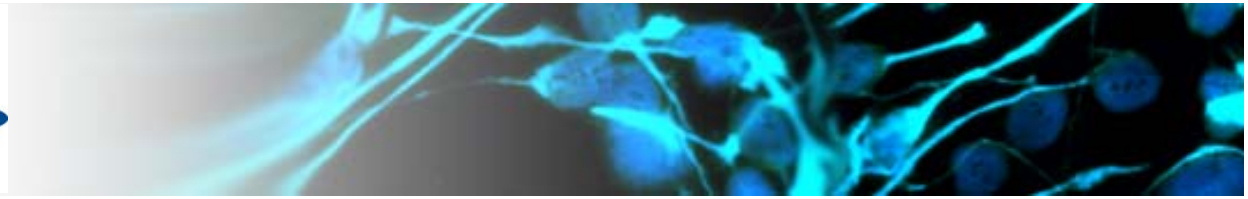


Demand Side Characteristics

	Chooses	Pays	Consumes
Normal market	Consumer	Consumer	Consumer
Prescription medicines market	Prescriber	Government / insurer	Patient

Measures Affecting Prescriber Price Sensitivity (UK)

- Primary Care Trust budgets
- Practice budgets and prescribing incentive schemes
- Provision of information (PRODIGY, PACT, NICE guidance, pharmaceutical advisers, etc.)



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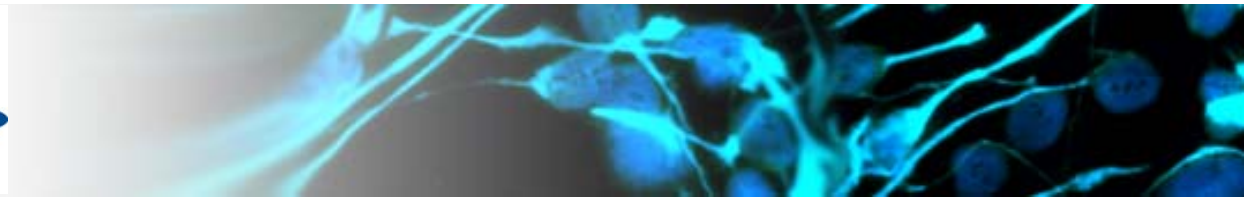
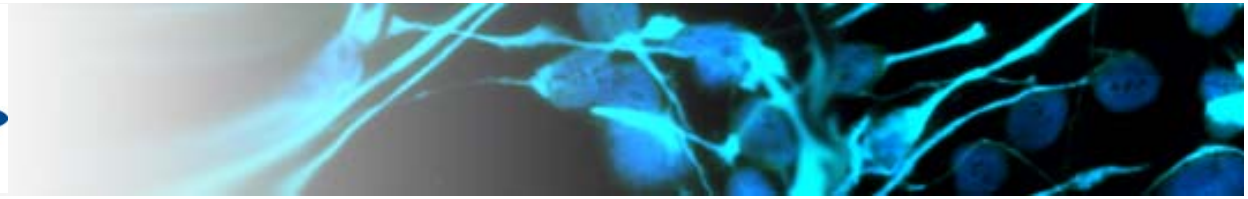


National Institute for Health and Clinical Excellence

- Covers England & Wales
- Two main outputs:
  1. Technology appraisals
  2. Clinical guidelines

Technology Appraisal Criteria April 2004

- The Institute and Appraisal Committee take into account:
  - the broad clinical priorities of the Secretary of State for Health and the Welsh Assembly Government
  - the degree of clinical need of the patients with the condition under consideration
  - the broad balance of benefits and costs
  - any guidance from the Secretary of State for Health and the Welsh Assembly Government on the resources likely to be available and on such other matters as they think fit
  - the effective use of available resources

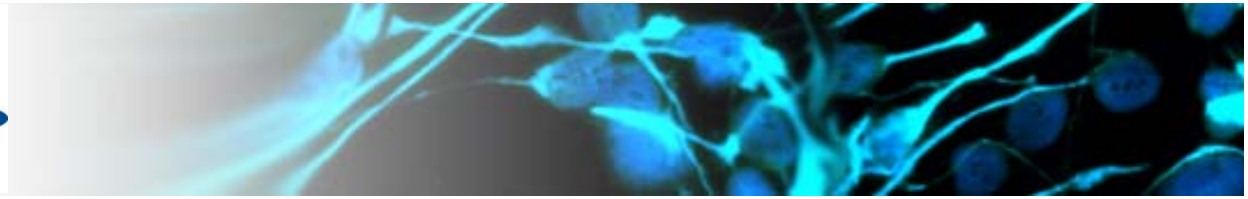


NICE's Guide to Methods of Technology Appraisal, April 2004

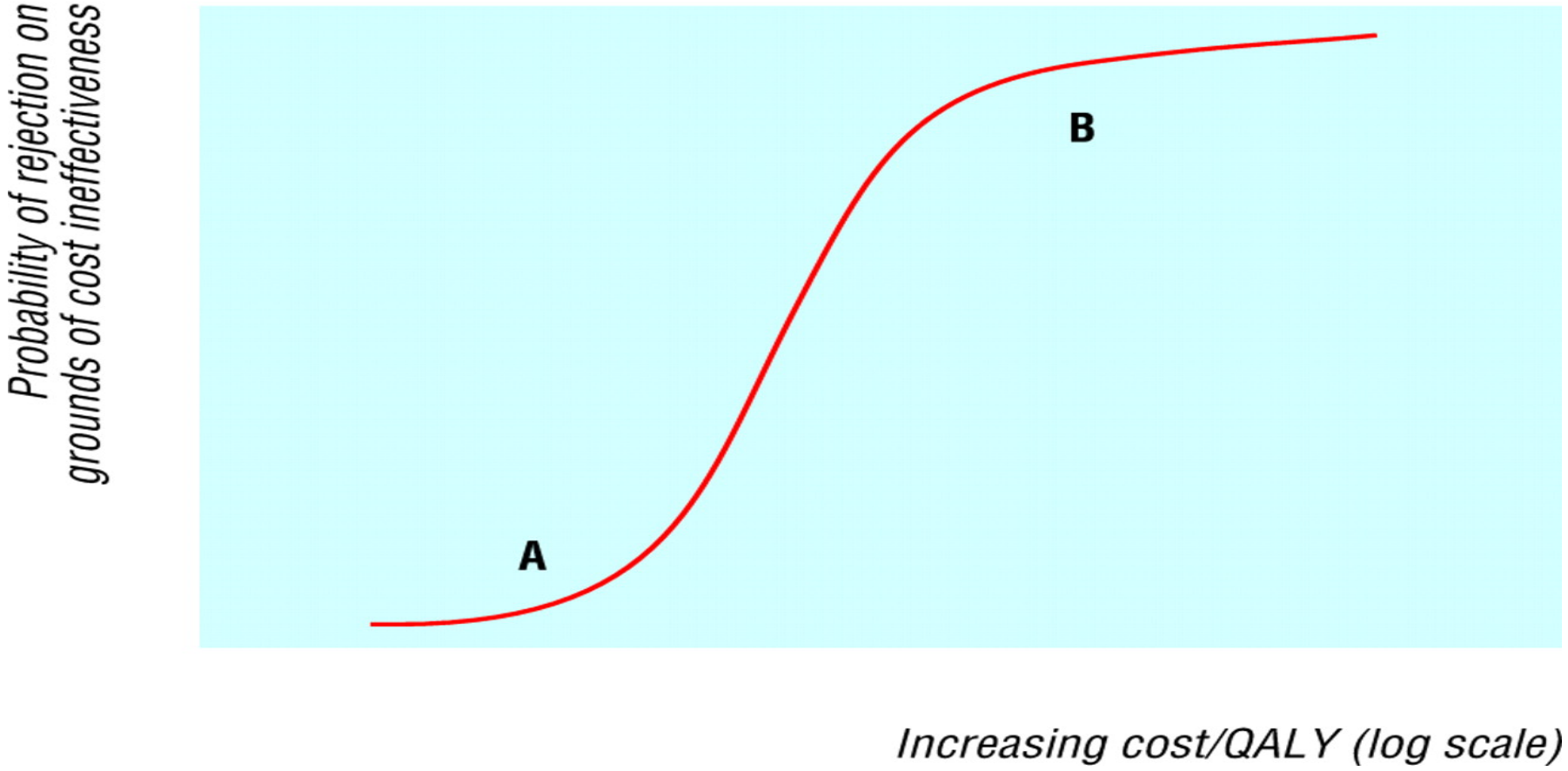
- Below a most plausible incremental cost-effectiveness ratio (ICER) of £20,000/QALY, judgments about the acceptability of a technology as an effective use of NHS resources are based primarily on the cost-effectiveness estimate.

- Above a most plausible ICER of £20,000/QALY, judgments about the acceptability of the technology as an effective use of NHS resources are more likely to make more explicit reference to factors including:
  - the degree of uncertainty surrounding the calculation of ICERs
  - the innovative nature of the technology
  - the particular features of the condition and population receiving the technology
  - where appropriate, the wider societal costs and benefits

- Above an ICER of £30,000/QALY, the case for supporting the technology on these factors has to be increasingly strong



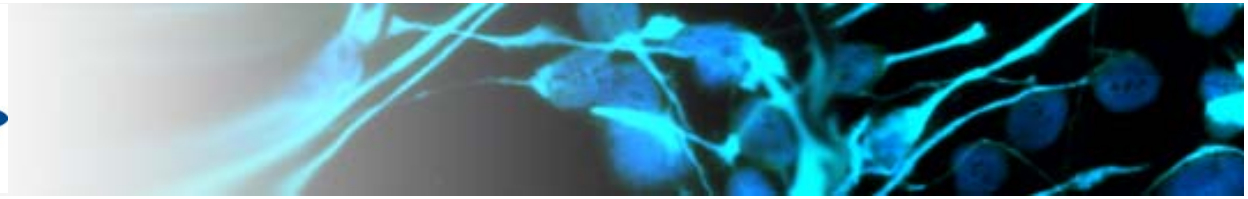
Use of thresholds?



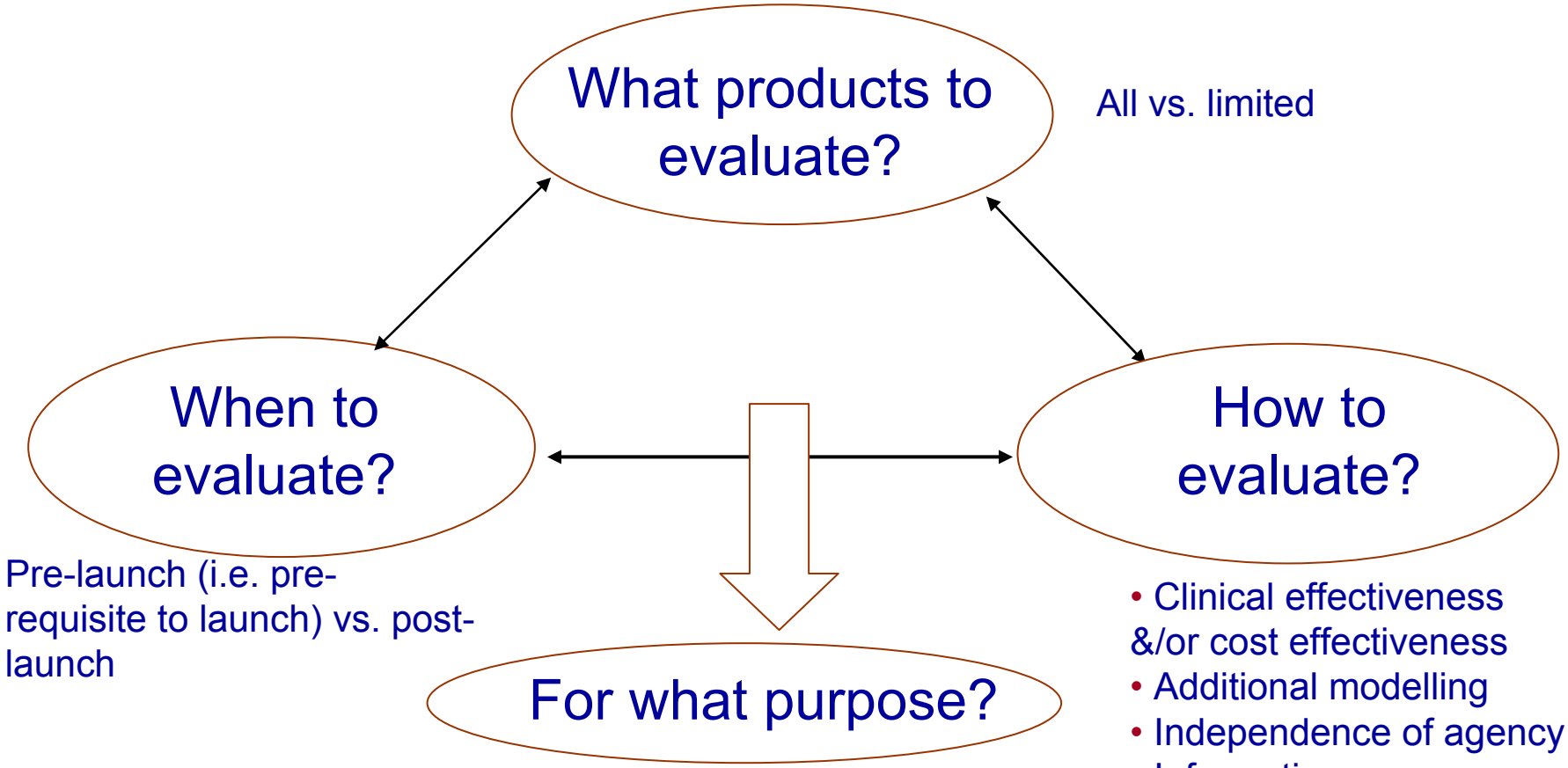
Source: Rawlins and Culyer, 2004

Economic Evaluation Elsewhere

- Focused on pharmaceuticals
- Fourth hurdle i.e. **reimbursement** decisions:
  - Public reimbursement: Australia, Baltic countries, Belgium, Canada (British Columbia, Ontario), Czech Republic, Denmark, Finland, France, Hungary, Netherlands, New Zealand, Norway, Portugal, Russia, Slovenia, Sweden
  - US managed care formularies
- **Pricing** negotiations
  - Australia, France, Italy, New Zealand
- **Advice** to health service
  - England and Wales (NICE), Scotland (SMC)
- **Risk sharing** arrangements
  - Australia, New Zealand, UK (only MS drugs to date)



Health Technology Assessments – some issues



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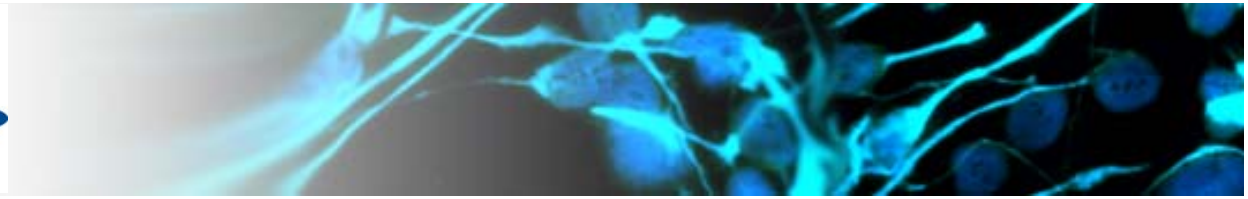
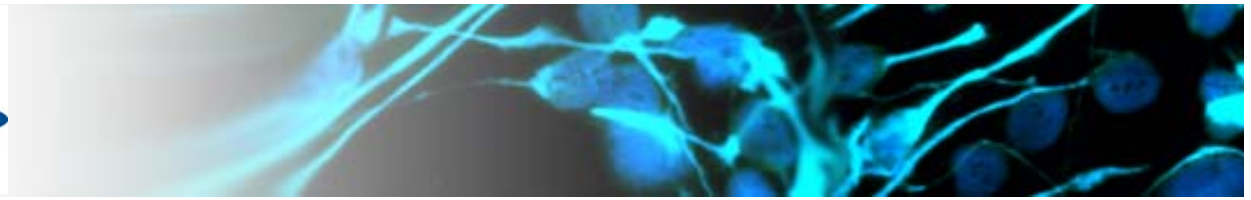
Why Regulate? - Market Failure

- **Public goods** and the **free-rider** problem (e.g. research)
- **Externalities**
  - E.g. your vaccination reduces my risk of catching an infection
  - E.g. the caring externality: I'm happy if you're cared for
- **Incomplete** or **asymmetric information**
  - Moral hazard (= 'hidden action')
  - Selection problem (= 'hidden information')
  - Principal/agent problems
- **Government procurement**



Monopoly Power

- Economies of scale and/or scope
- Natural (local) monopoly
- Input constraints
- Patents: dynamic efficiency vs. static monopoly



Net Value of the Pharmaceutical Industry – Economic Rent (I)

- Measuring the contribution to the UK economy made by pharmaceutical companies
- How sorry would the UK be if the industry/some companies moved out?
- Economic rent concept: *Payment to a factor of production or input (labour and capital) in excess of the amount it would receive in its best alternative use*

Net Value of the Pharmaceutical Industry – Economic Rent (II)

Garau and Sussex (2007)

- Key assumptions:
  - UK-based activities of AZ and GSK (two members of BPG) were undertaken somewhere else in the world
  - Resources freed up would be fully and immediately re-employed within the country

Net Value of the Pharmaceutical Industry – Economic Rent (III)

Total economic rent generated by BPG companies, 2005

£ million p.a.	**BPG companies –all activities**	**BPG companies - manufacturing only**
Producer rents	164 – 766	24 – 115
Labour rents	115 – 137	39 – 48
R&D spillovers	120 – 360	0
Sub-total	**399 – 1,263**	**63 – 163**
Possible terms of trade effect	Highly uncertain but possibly in the range 600-2,900	Highly uncertain but possibly in the range 600-2,900

Source: Garau and Sussex, 2007

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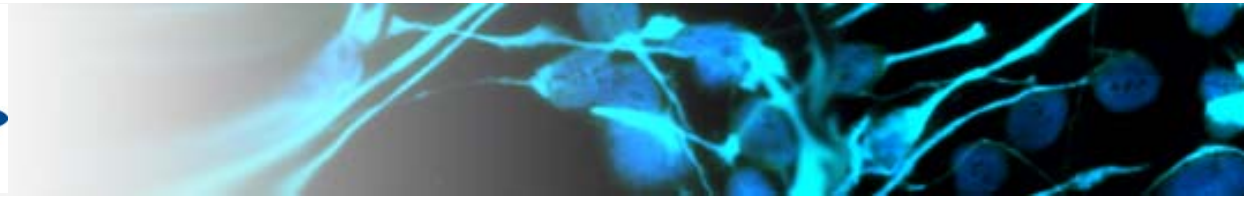
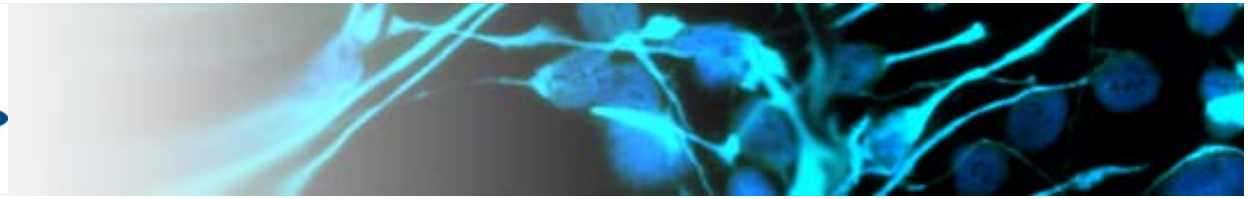


Options: Types of Regulation

- 'No regulation' = 1998 Competition Act only

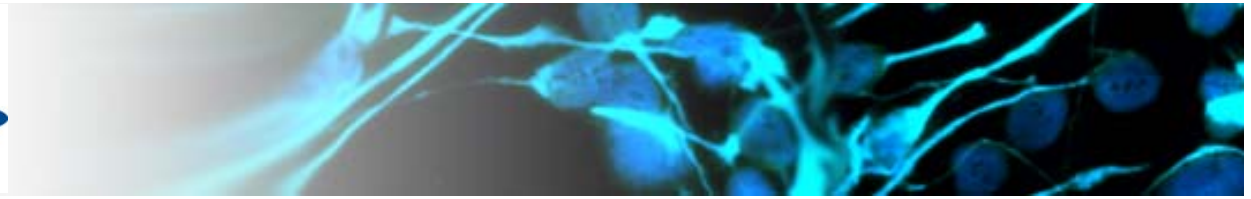
- Profit, i.e. rate of return, control:
  - Unbanded
  - Banded

- Price control:
  - Baskets of products, as with 'RPI-X' control of utilities' prices
  - Individual products, e.g. via reference prices, or 'cost-plus', or related to therapeutic benefit

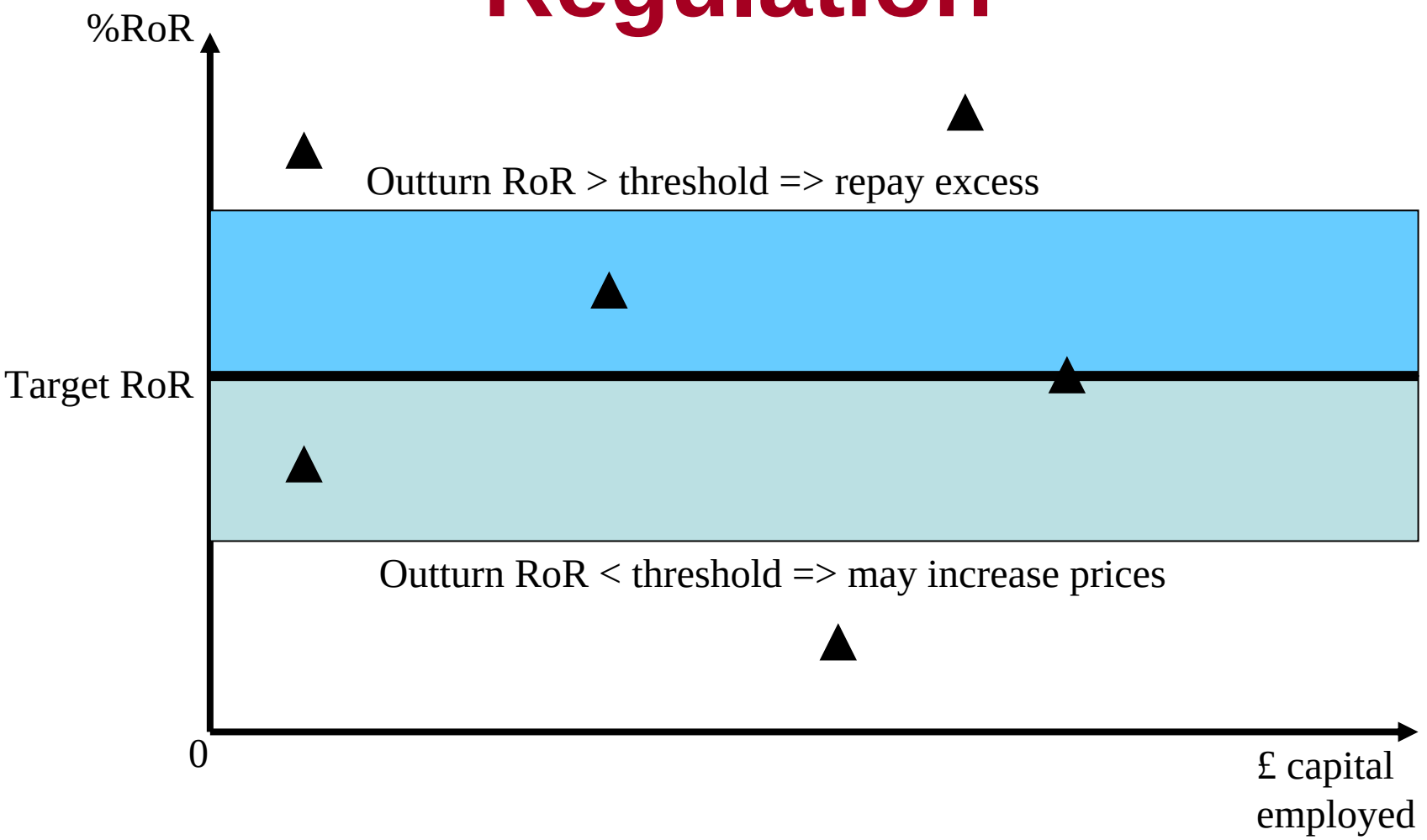


1998 Competition Act

- Came into force March 2000
- Based on EU Treaty - Articles 81 & 82
- Prohibitions:
  - Chapter 1 – Agreements preventing, restricting or distorting competition
  - Chapter 2 – *Abuse* of a dominant market position
- Fines up to 10% of turnover; 3rd parties may sue for damages



Banded Rate of Return Regulation



RPI-X Regulation of a Basket of 'n' Products

$$\left\{ \frac{w_1 p^1_1 + w_2 p^1_2 + w_3 p^1_3 + \ldots\ldots + w_n p^1_n}{w_1 p^0_1 + w_2 p^0_2 + w_3 p^0_3 + \ldots\ldots + w_n p^0_n} - 1 \right\} \times 100 \leq \Delta RPI - X$$

Where:

w_i = weight for product 'i' (e.g. quantity sold in period 0)

p^t_i = price of product 'i' in period t = 0,1

ΔRPI = % change in retail price index between period 0 and period 1

X = efficiency factor

Regulation Criteria

- Static efficiency:
  - Productive efficiency
  - Allocative efficiency
- Dynamic efficiency
- Benefit to UK plc – economic rent
- Regulatory (administrative) burden
- Equity/other social policy objectives

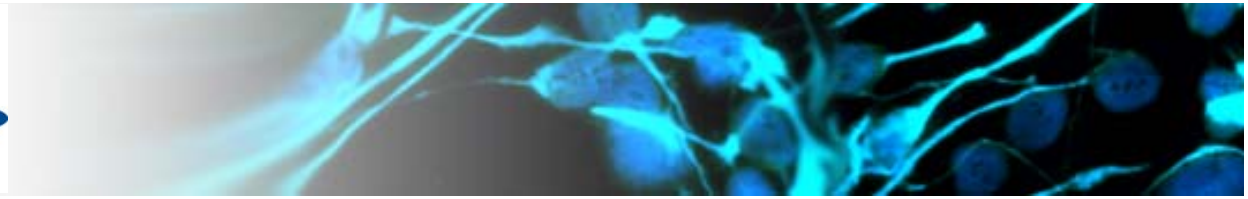
2 Forms of Price Regulation in UK

- **Pharmaceutical Price Regulation Scheme (PPRS)** regulates manufacturers' profits earned on sales to the National Health Service of **branded medicines (on- and off-patent)**

- **Schemes M ands W** control the reimbursed price of **generic medicines** paid to dispensing pharmacists and doctors

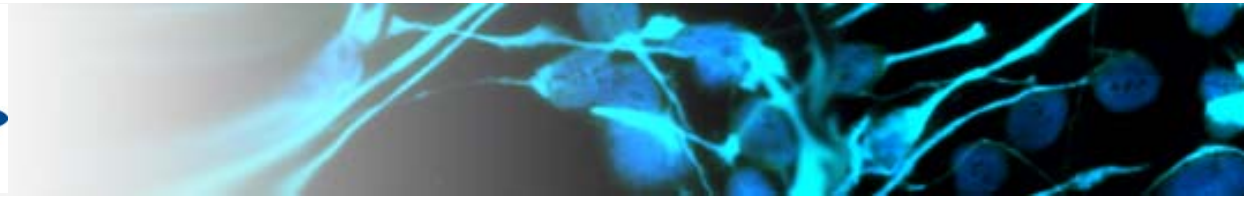
The PPRS (2005)

- Have been variants of PPRS since 1960s
- Department of Health acts as regulator for whole UK
- Objectives of 2005 PPRS:
  - Secure the provision of safe and effective medicines for the NHS at reasonable prices
  - Promote a strong and profitable R&D-based pharmaceutical industry
  - Encourage efficient and competitive development and supply of medicines
- Voluntary – but (unspecified) statutory alternative scheme for firms that opt out



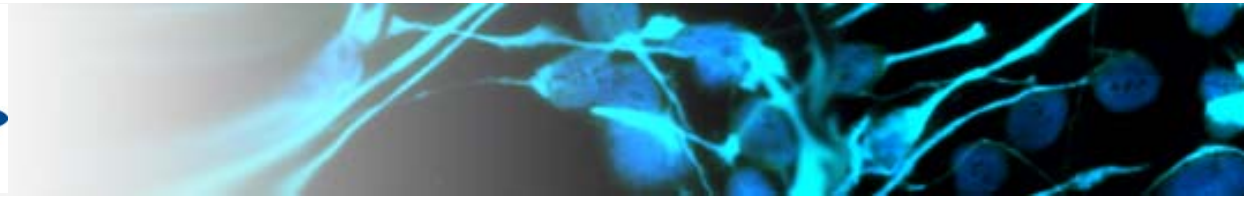
The PPRS (2005)

- Covers branded pharmaceuticals sold to the NHS
- Negotiated every 5 years or so between the ABPI and the Department of Health
- Current scheme commenced 1/1/05
- Scheme applies to all companies supplying BRANDED medicines to the NHS ≈ 80% by value of pharma sales to NHS
- Indirectly controls price by regulating profits earned by these firms



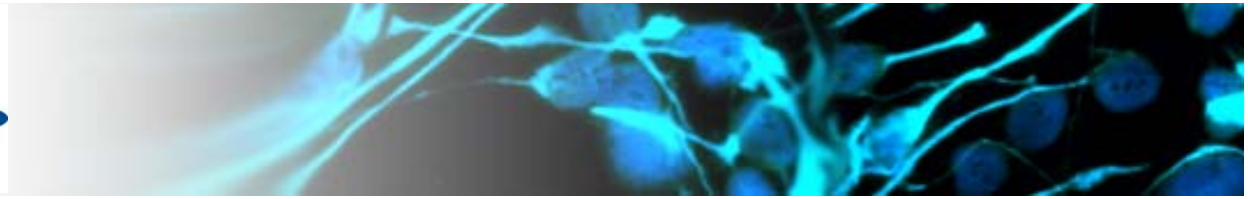
The PPRS (2005)

- Freedom of pricing at launch, subject to constraints
- 21% target return on capital (ROC)
- Margin of tolerance:
  - If ROC > 29.4% => repay excess profits
  - If ROC < 8.4% => may apply for price increases
- Limits on ‘allowed’ marketing and information expenses and R&D expenses
- 7% cut on all list prices at 1/1/05



Generics: M and W Schemes (2005)

- The reimbursed price (the Drug Tariff price) is the volume-weighted average price charged by manufacturers
- Manufacturers and wholesalers are required to submit quarterly data to the Department of Health on, among other things, net sales values and net acquisition costs, on a product by product basis i.e. including discounts
- Greater reliance on competition to control prices, but the generics market is more closely monitored than ever before



Useful Reading

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