Bridging the Technology Gap

Short courses for Permanent Missions in Geneva

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Outline

- Introductory remarks: Technology and the "technology gap"
- Global, national and end-user perspectives on technology
- Innovation systems and technology flows
- Discussion

11:25 – 11:40 break

- Policy implications: global and national
- Case Studies and Discussion

TECHNOLOGY

AND

THE TECHNOLOGY GAP

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Technology = Knowledge

(Knowledge about how to do something)

```
for i = 1:K
        xv = (x2(:,i)*ones(1,ns)).*v(cdid,ns*(i-1)+1:ns*i);
        temp = cumsum(xv.*shares);
        sum1 = temp(cdindex,:);
        sum1(2:size(sum1,1),:) = diff(sum1);
        f1(:,i) = mean((shares.*(xv-sum1(cdid,:)))')';
        clear xv temp sum1
end
for j = 1:J
i = demogr(cdid,ns*(j-1)+1:ns*j);
        temp1 = zeros(size(cdid,1),K);
        for i = 1:K
                xd=(x2(:,i)*ones(1,ns)).*d;
                temp = cumsum(xd.*shares);
                sum1 = temp(cdindex,:);
                sum1(2:size(sum1,1),:) = diff(sum1);
                temp1(:,i) = mean((shares.*(xd-sum1(cdid,:)))')';
                clear xd temp sum1
        end
        f1(:,K*j+1:K*(j+1)) = temp1;
        clear temp1
end
```

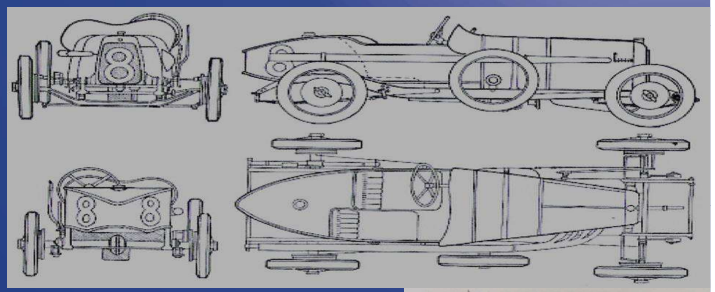
“Hardware”

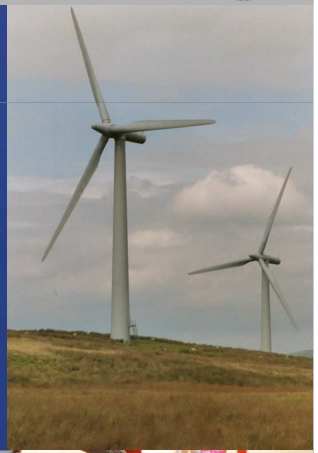
Processes

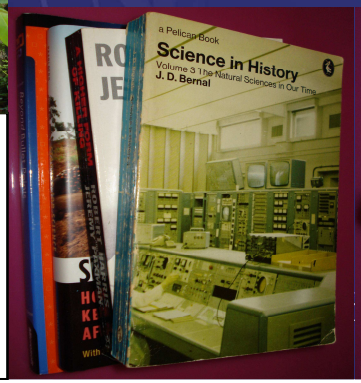
Codified knowledge

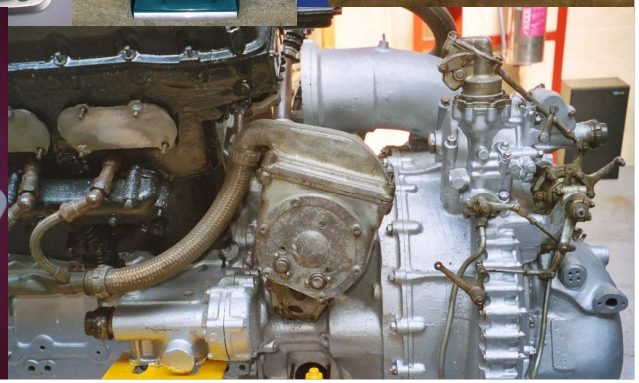
Biological material

Human skills, knowledge and experience









The "Technology Gap"

What is it, and why is it important?

Is it getting smaller or bigger?

How is it measured?

Measuring technological development

- Total Factor Productivity
- UNESCO's Science & Technology statistics
- UNDP's Technology Achievement Index
- World Economic Forum's Competitiveness Index
- UNCTAD's Innovation Capability Index
- OECD's Science, Technology and Industry Scoreboard
- ITU's ICT Indicators

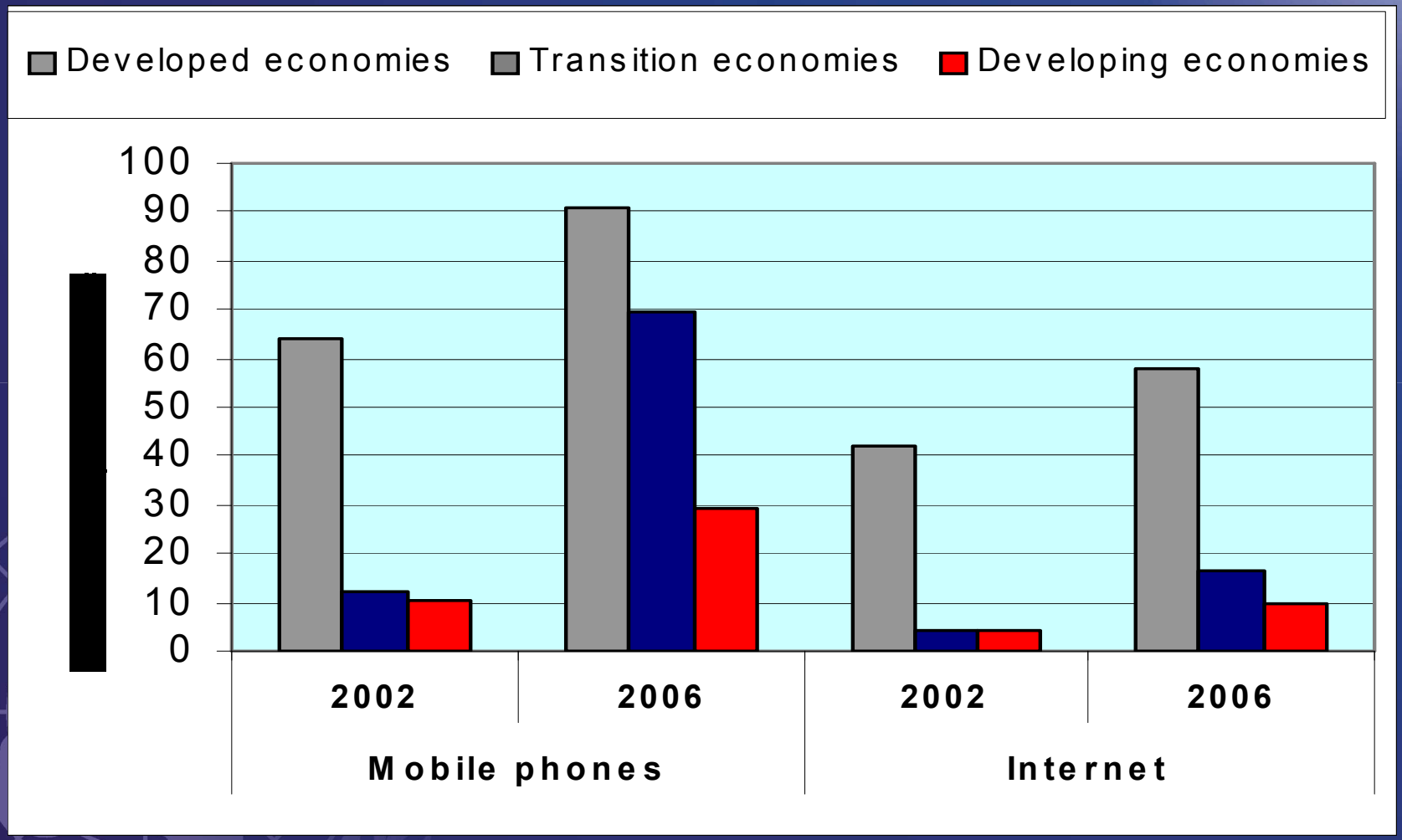
UNCTAD's Innovation Capability Index

(unweighted averages for the regions)		
Region	**1995**	**2001**
Developed countries (excl. new EU members)	0.876	0.869
New EU members	0.655	0.707
South-East Europe and CIS	0.602	0.584
South-East and East Asia	0.492	0.518
West Asia and North Africa	0.348	0.361
Latin America and the Caribbean	0.375	0.360
South Asia	0.223	0.215
Sub-Saharan Africa	0.157	0.160

Factors reflected in the UNCTAD Index:

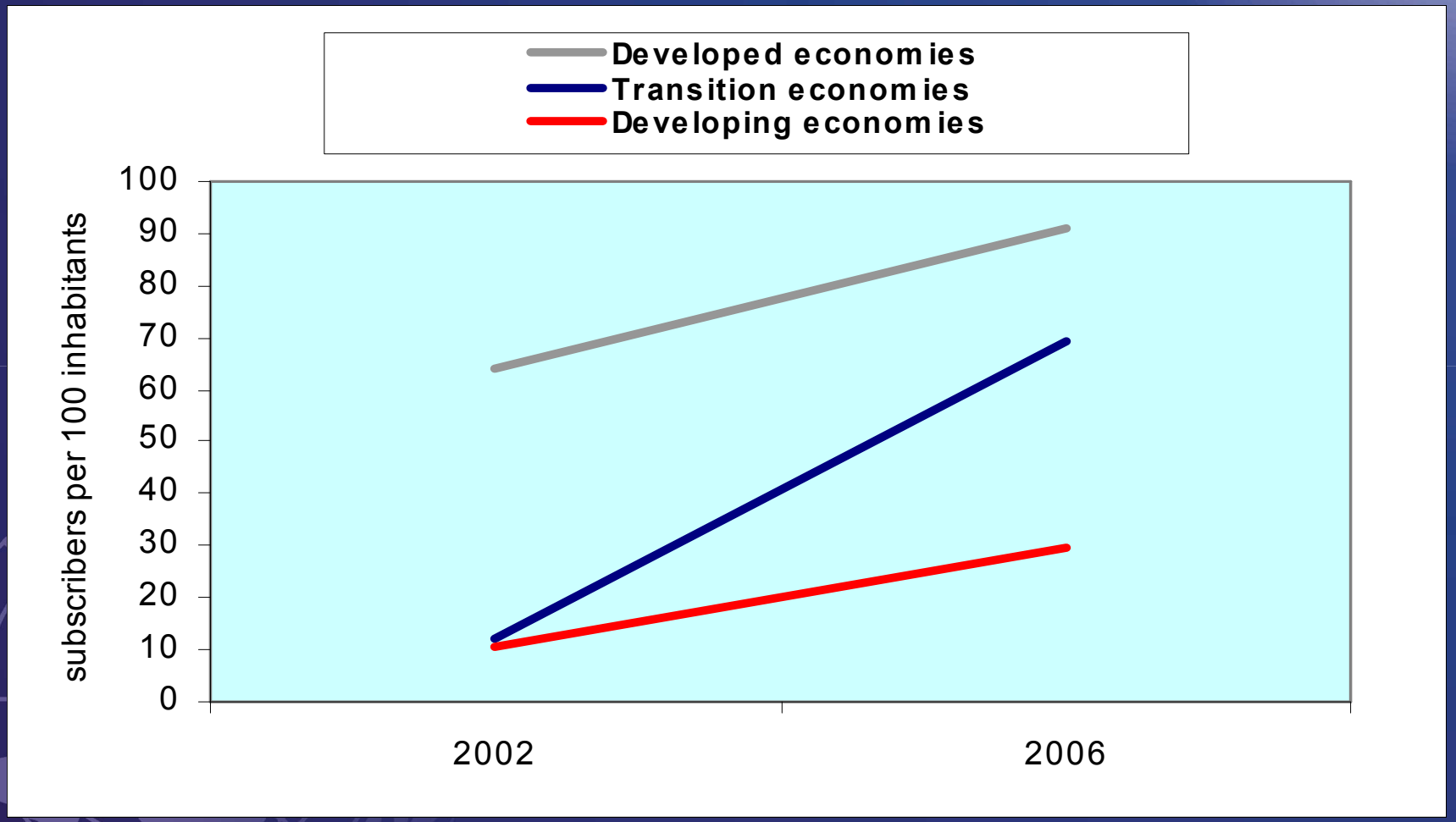
- ✓ R&D personnel/million population;
- ✓ U.S. patents granted per million population;
- ✓ Scientific publications/million population;
- ✓ Literacy rate as % of population;
- ✓ Secondary enrolment as % of age group
- ✓ Tertiary enrolment as % of age group

Key ICT indicators



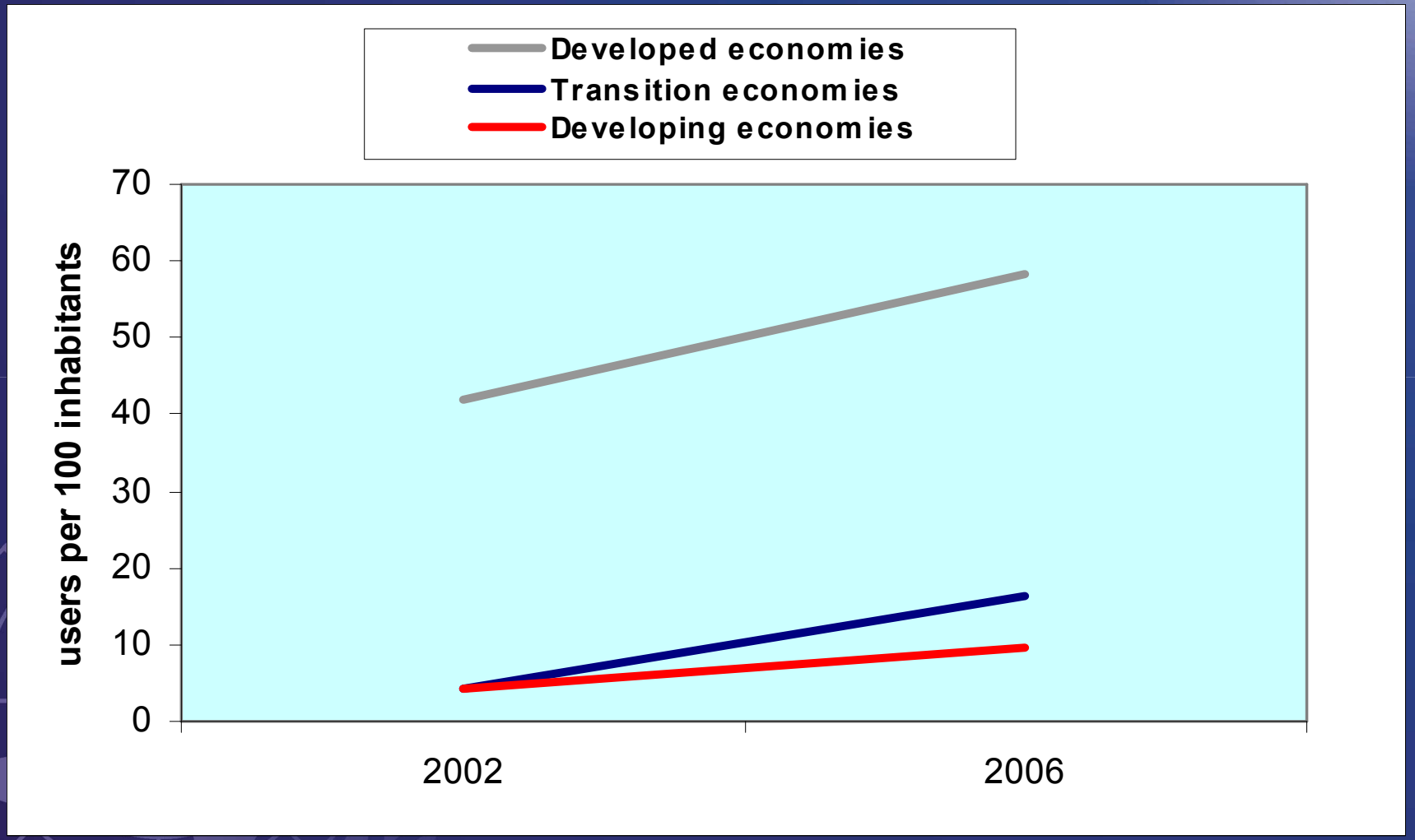
Adapted from UNCTAD 2007 Information Economy Report 2007-2008

Mobile phone subscribers



Adapted from UNCTAD 2007 Information Economy Report 2007-2008

Internet use



Adapted from UNCTAD 2007 Information Economy Report 2007-2008

PERSPECTIVES ON TECHNOLOGY

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International Perspective

Aim: to facilitate and regulate technology flows

Perspective: International Technology Transfer

- **Trade (technology markets)**
- **Investment (FDI, ODA)**
- **Intellectual Property Rights (IPR)**
- **International Standards**
- **Regulation (safety, security and sustainability)**

"End user" perspective

Aim: maintain or improve efficiency and/or effectivenes

Perspective: Technology selection, acquisition and absorption

- **Technology selection and acquisition**
  - **Access to information**
  - **Existing knowledge needed to select best-fit technology**
  - **Access to capital**
- **Absorptive capacity**
  - **Knowledge, skills and experience to use, maintain, adapt and manage change**
  - **Linkages: within organizations, with other organizations/institutions**
- **Innovative capacity (for *some* end-users)**
  - **Incremental improvement to acquired technology**
  - **Imitation: reverse engineering / licensing**
  - **"Radical" innovation: new product/process development**

National Perspectives

Aim: Increase economic growth and improve social welfare

Perspectives:

1. **Technology acquisition (international)**
2. **Technology development and diffusion (national)**

National Perspectives

Aim: to promote economic growth and improve social welfare

International:

Technology Acquisition

- FDI
- Licensing
- Trade
- Skills migration
- R&D collaboration

Domestic:

Technology development and diffusion

- Human resource capacity
- Stimulate/support innovative capacity of enterprises
- IPR protection
- Competition policy
- Public sector R&D
- Extension services

etc.

INNOVATION SYSTEMS AND TECHNOLOGY FLOWS

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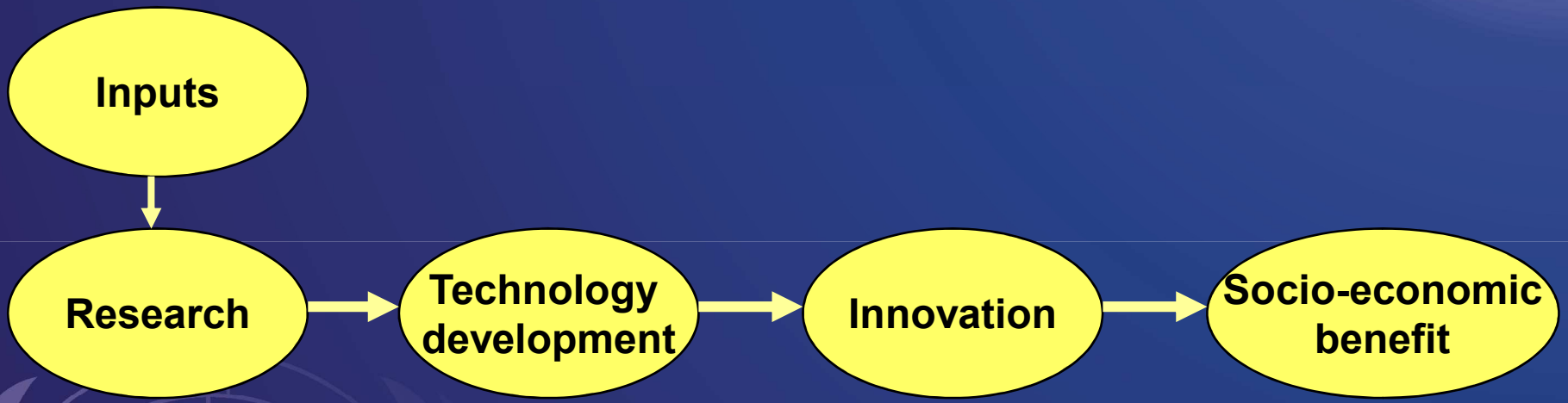
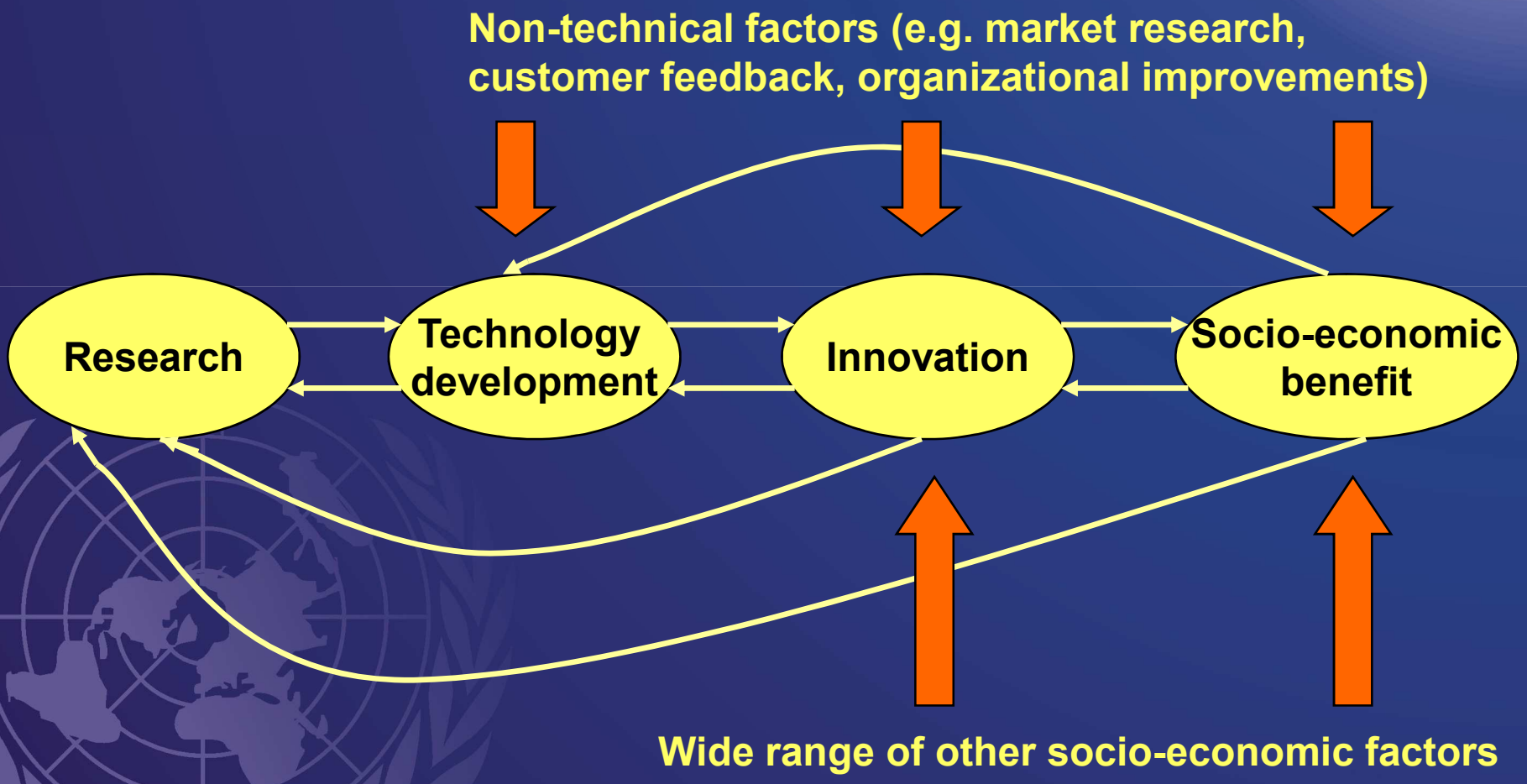
Linear ("science push") model



"Chain link" model



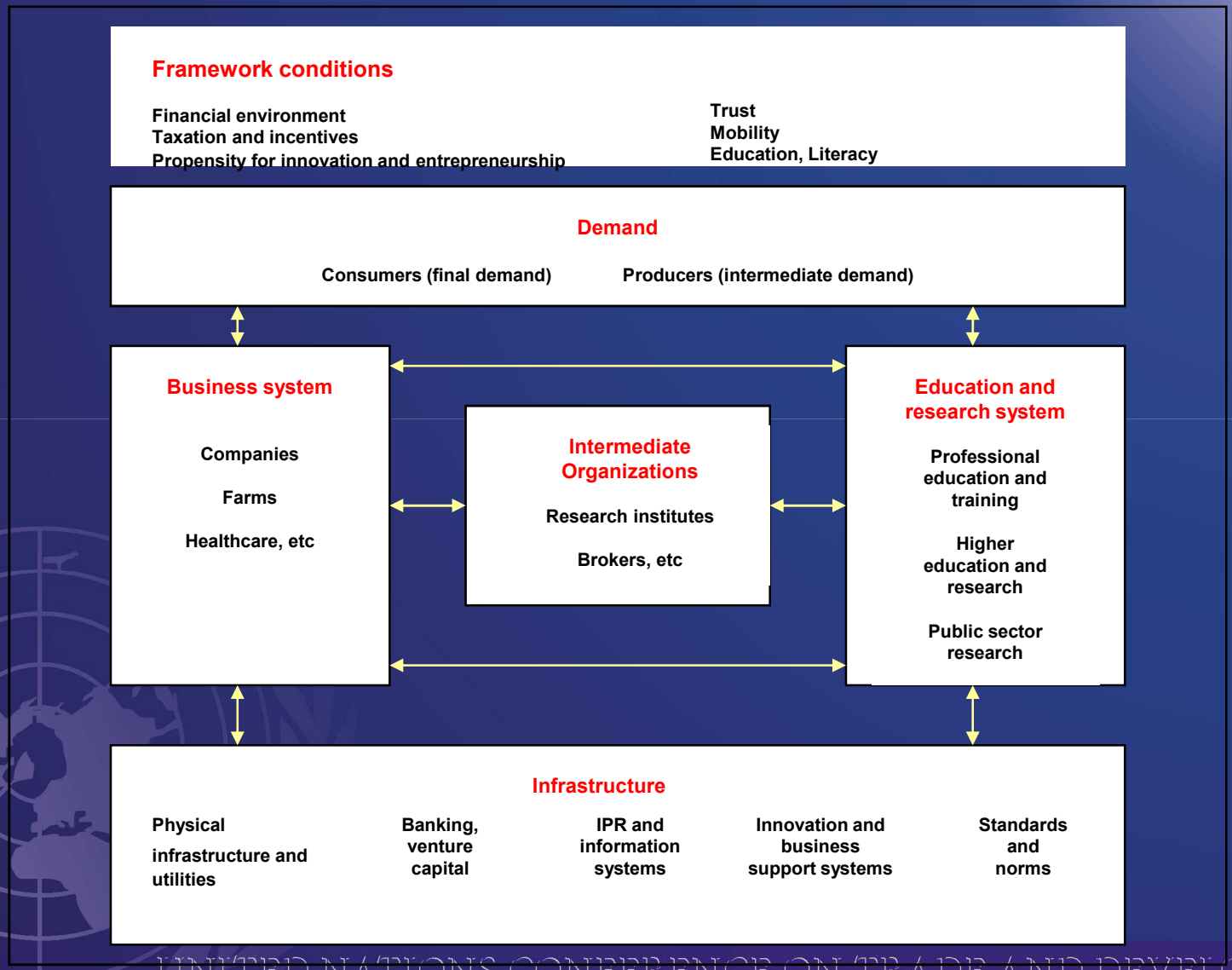
Adapted from Martin & Tang 2007

National Innovation Systems (NIS)

various definitions

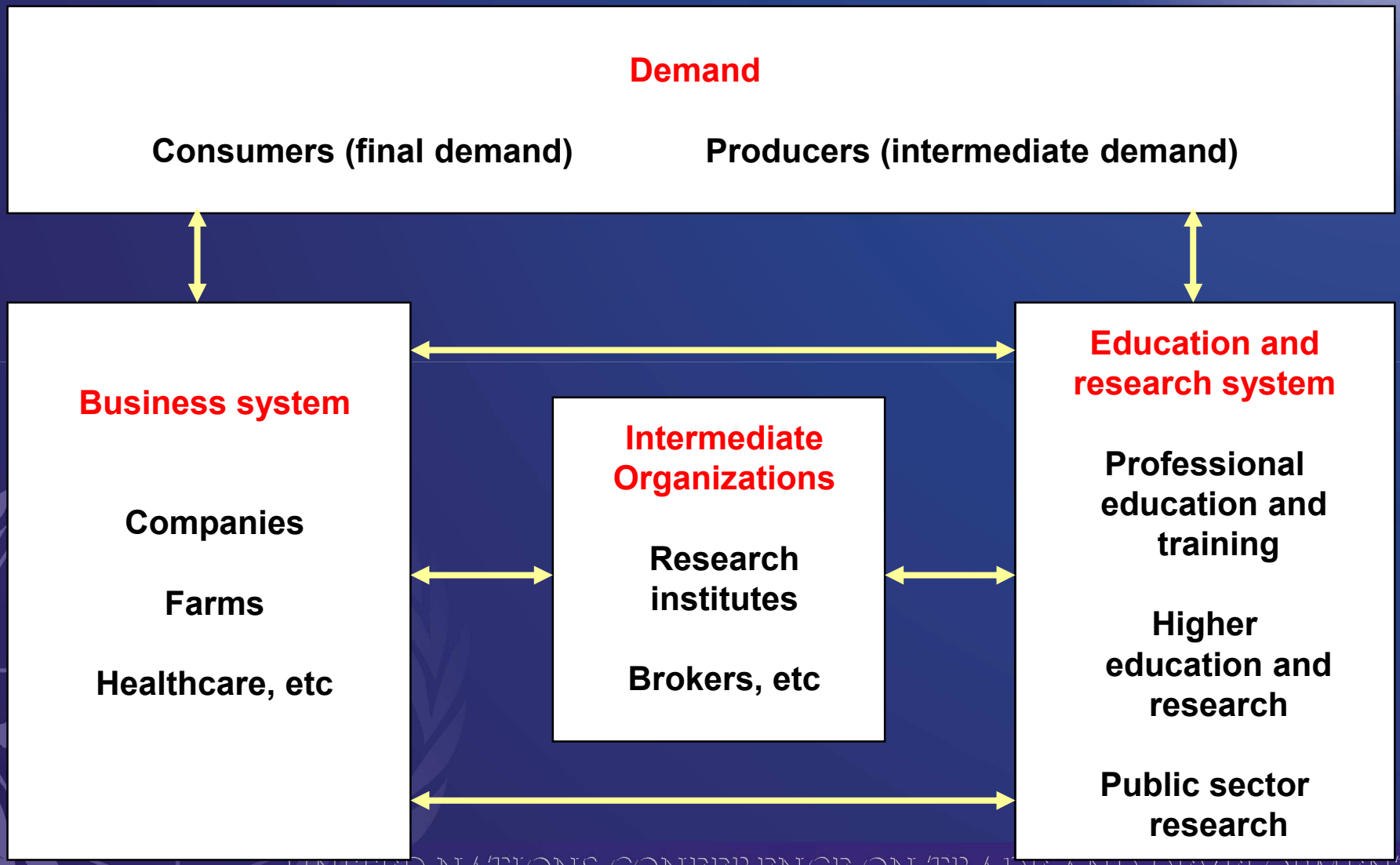
- Network of public and private institutions whose activities and interactions initiate, import, modify and diffuse new technologies. (Freeman, 1987)
- Elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge ... and are either located within or rooted inside the borders of a nation state. (Lundvall, 1992)
- Set of institutions whose interactions determine the innovative performance ... of national firms. (Nelson, 1993)
- National institutions, their incentive structures and their competencies, that determine the rate and direction of technological learning in a country. (Patel and Pavitt, 1994)

National Innovation System: schematic

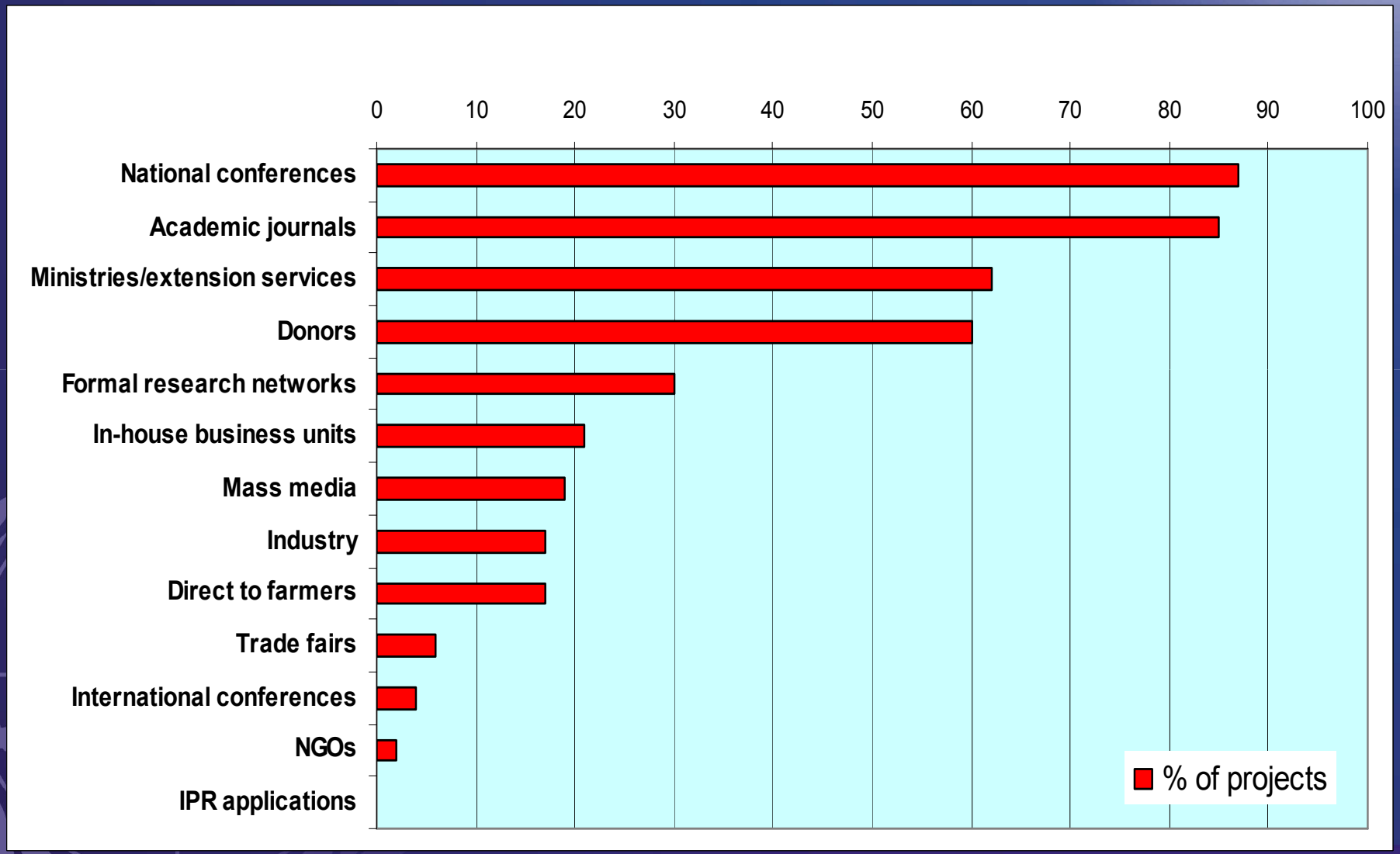


Adapted from Arnold & Bell (2001), cited in UNCTAD (2007)

The "core" of an innovation system

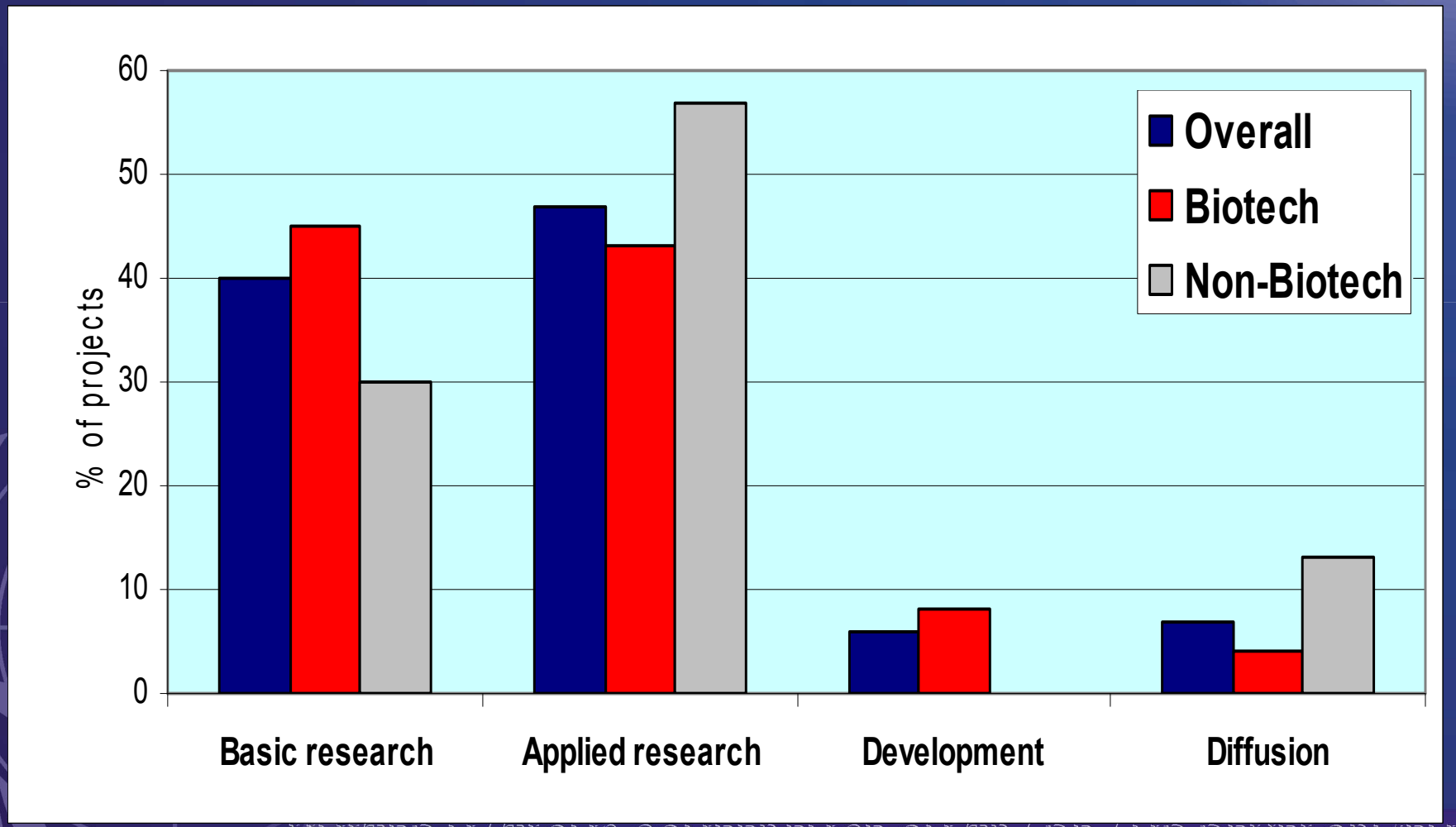


Data from country study: Diffusion of results from public sector R&D



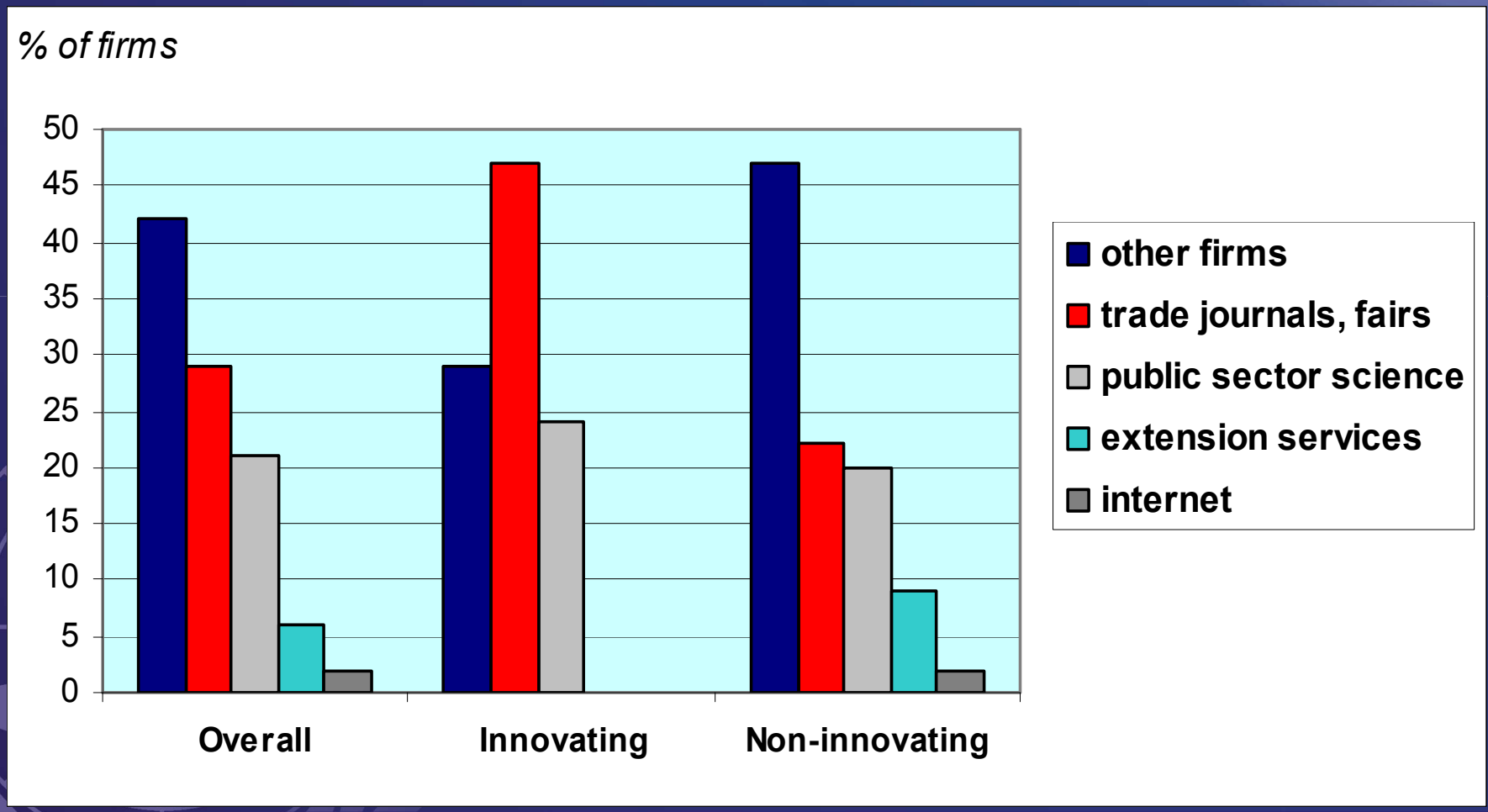
BDP database 2003

Data from country study: R&D projects in agriculture & health by type/objective



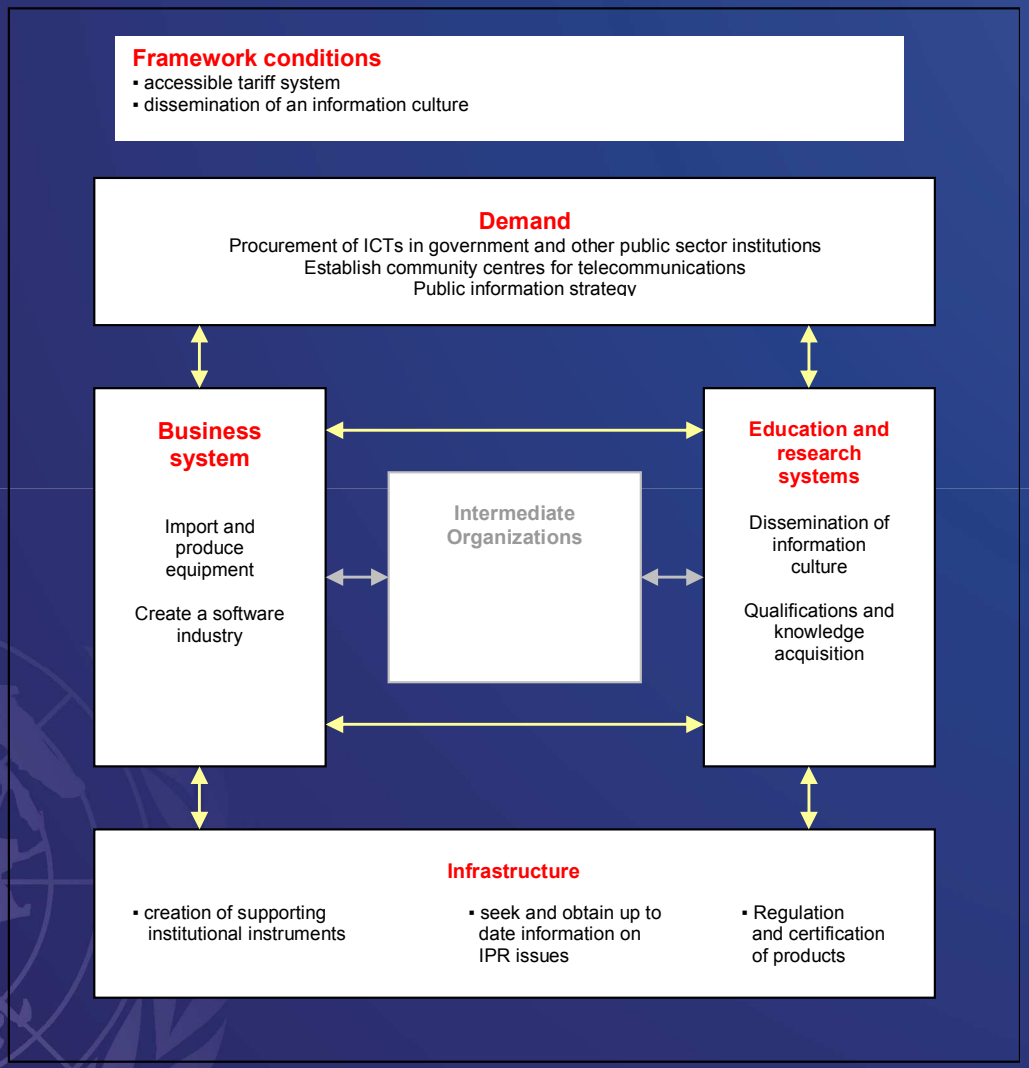
BDP database 2003

Data from country study: Firms' sources of new knowledge



BDP database 2003

Policy example: a national ICT strategy



POLICY IMPLICATIONS

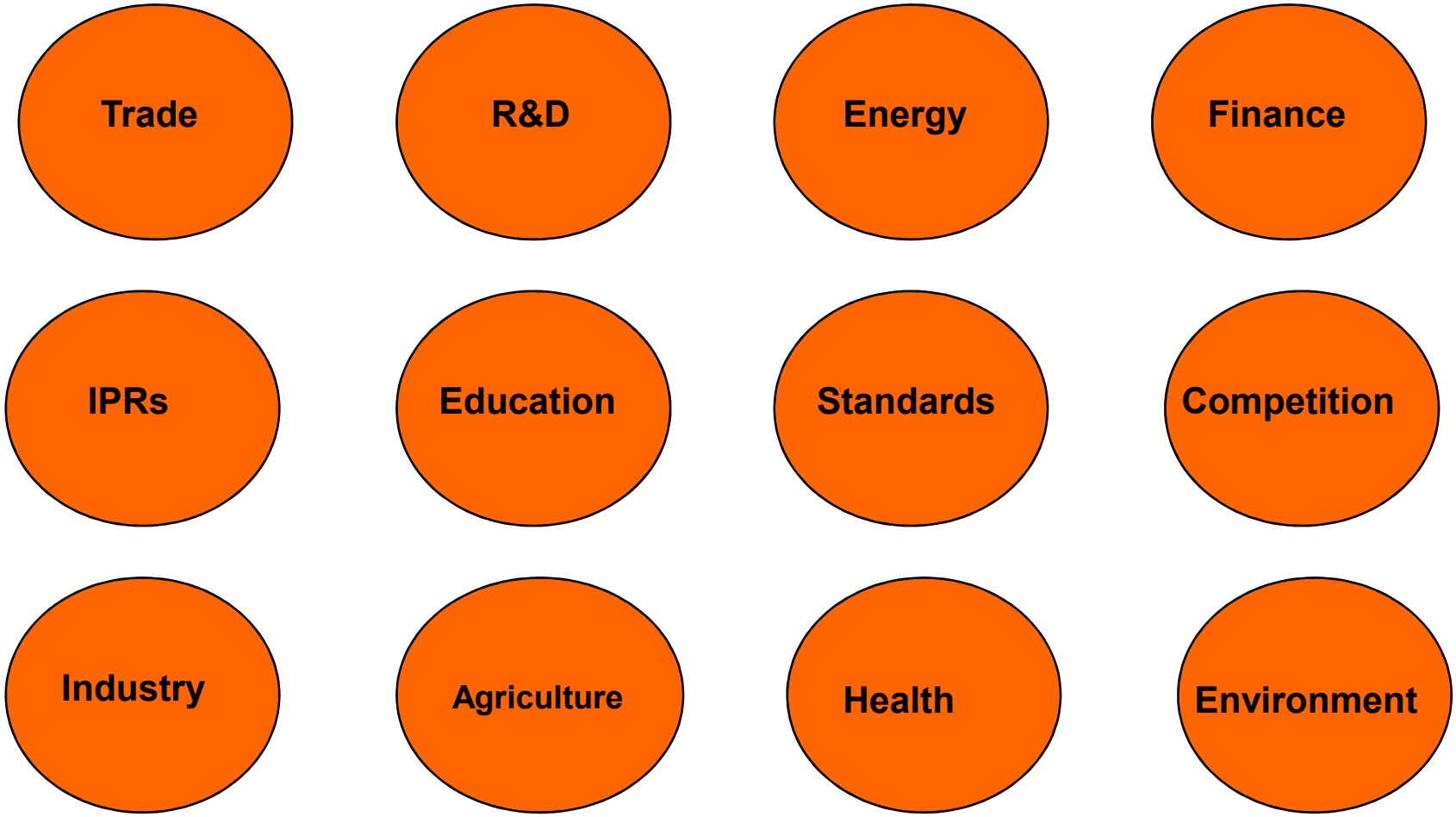
Implications for international policy

- Need to understand 'cause and effect' in technology flows
- Complex and differentiated systems of innovation
- On-going efforts include:
  - CSTD
    - WSIS follow-up and an on-going forum for debate and exchange of experiences
  - UNCTAD
    - Science, Technology and Innovation Policy (STIP) Reviews
    - ICT Policy Reviews
  - UNESCO
    - Science & Technology Policy Reviews for Africa
  - OECD
    - Innovation Policy Reviews

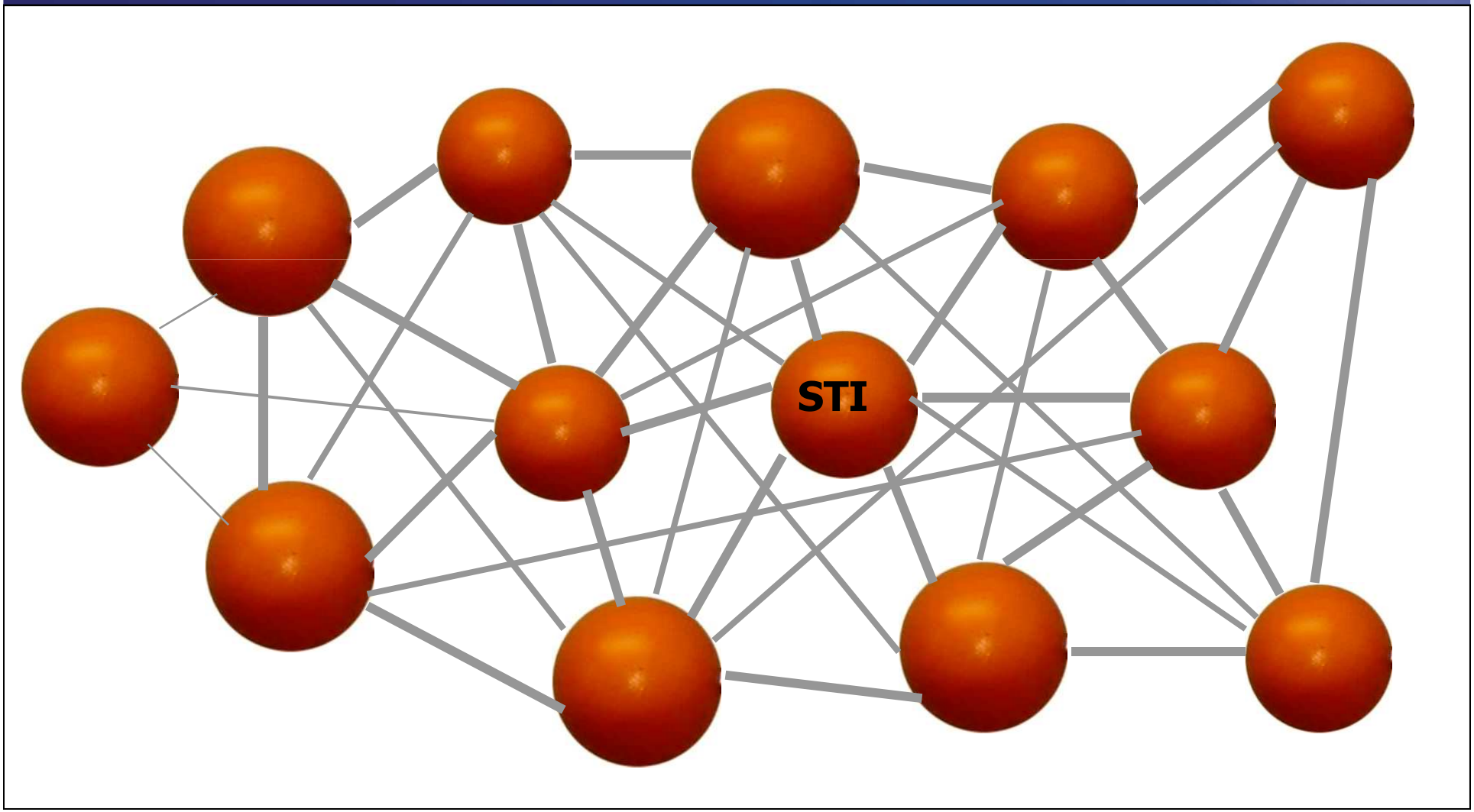
Implications for national policy

- Range of policies to facilitate inward technology transfer
- Policies to build an enabling environment for both absorption and development of technology
- Develop policy mechanisms to support and stimulate innovation at the domestic level
  - Procurement
  - Regulation
  - Direct support for R&D (e.g. grant funding)
  - Indirect support for R&D (e.g. tax credits)

Key policy areas in an innovation system



Science, technology & innovation policy at the heart of development strategy



Case Studies and Discussion

- What can be learnt from the development of ICT policies for other technology policies?
- What is the role of public sector R&D?
- What policy mechanisms have been successful in stimulating innovative activities in more and less developed countries?
- AND ANY OTHER TOPICS OF COMMON INTEREST

Thank you for your participation.