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TECHNOLOGY, INNOVATION AND NATIONAL INDUSTRIAL DEVELOPMENT

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TECHNOLOGY, INNOVATION AND NATIONAL INDUSTRIAL DEVELOPMENT

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Technology, Innovation and National Industrial Development

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Jump to first page

The issues for industry

- What are the main changes caused by globalisation?
- Do they lead to economic convergence or to divergence?
- Do globalisation (and liberalisation) *per se* promote convergence?
- What is the role of the nation state in industrial development in this setting?

MAIN CHANGES TO THE INDUSTRIAL SETTING

Industrial development now demands *international competitiveness* across the board, in manufacturing and in related services and institutions. This applies to *all* countries at all levels of development. Failure to compete implies marginalisation and stagnation at the low end of the technological and income ladder.

THREE IMPORTANT FEATURES:

1. Technical change

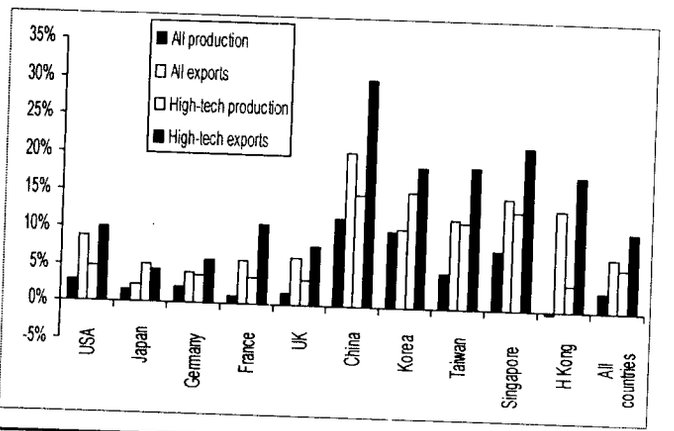
2. Spread of TNCs and globalised production systems

3. Policy liberalisation

1. Pervasive, rapid and accelerating technical change

- Shrinking economic space: falling communication and transport costs, spreading information spheres
- Provides access to larger markets export opportunity, but also poses intense & immediate competitive threats
- New technologies affect all industries, but change trade & industrial structures towards *technology-intensity*
- Tech-intensive activities grow faster -- they also offer other benefits: learning, productivity, spillovers, flexibility
- New technologies require new skills, management, institutions & infrastructure
- Using them efficiently also needs greater domestic technological effort, specialisation, alliances, networking

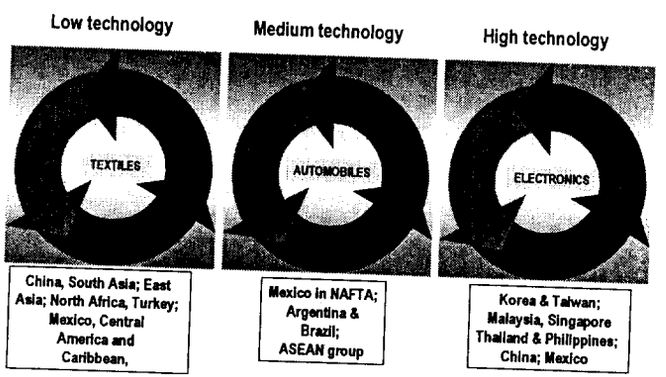
Technology intensive activities grow faster
% growth rates (1985-97)



2. Globalisation: some aspects

- FDI is rising faster than other economic aggregates: production, trade, domestic investment, licensing
- TNCs now account for about 2/3 of world trade. About 40% of this is *within* companies
- Most dynamic trade is IIPS (international integrated production systems): functions spread globally based on differences in wages, skills, technology, logistics
- Local capabilities and strong firms & clusters matter increasingly for attracting FDI: globalisation relies on efficient localisation to be sustainable
- FDI and IIPS remain highly concentrated by host country, particularly in sophisticated activities

Three major TNC export systems... and their narrow scope



3. Policy liberalization

- Widespread opening up in trade, investment, finance, skill and information flows: often sweeping & rapid, with little strategy to cope with sudden competition.
- Few tools of industrial policy remain, including many used effectively in East Asia
- Remaining tools, e.g. skill creation, R&D and FDI promotion, ICT infrastructure, are intensively used by all advanced countries
- These are necessary but not sufficient for catalysing development in 'catch-up' phase of most developing countries

CONVERGENCE OR DIVERGENCE IN COMPETITIVE INDUSTRIAL PERFORMANCE ?

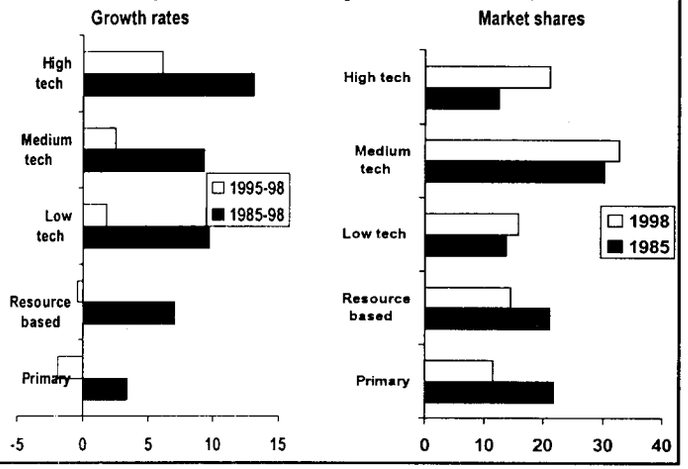
One good way to analyse industrial competitiveness is via export patterns in manufactures

Trade patterns are changing, reflecting pace and nature of technical change. Products can be divided by technological categories...

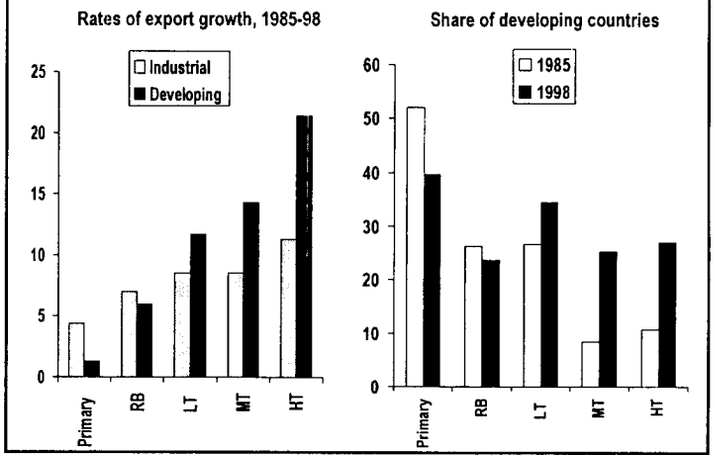
Export structures

- **Primary products**
- **Manufactured products**
  - **Resource based (RB)**: e.g. food, wood, forest products, processed minerals, petroleum products
  - **Low technology (LT)**: e.g. textiles, clothing, toys, footwear, simple metal products
  - **Medium technology (MT)**: e.g. automotive products, TVs, machinery, chemicals, steel
  - **High technology (HT)**: Advanced electronics and electricals, pharmaceuticals, aerospace, precision instruments

Global exports driven by innovation (1985-98)



Exports of industrial vs. developing countries

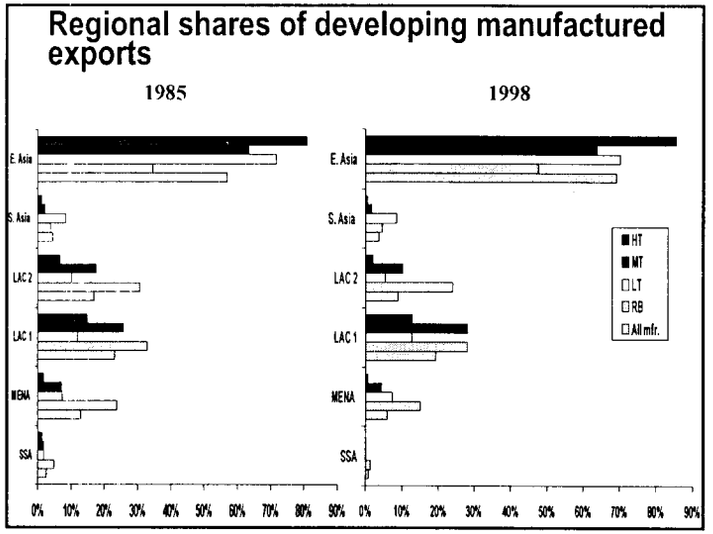


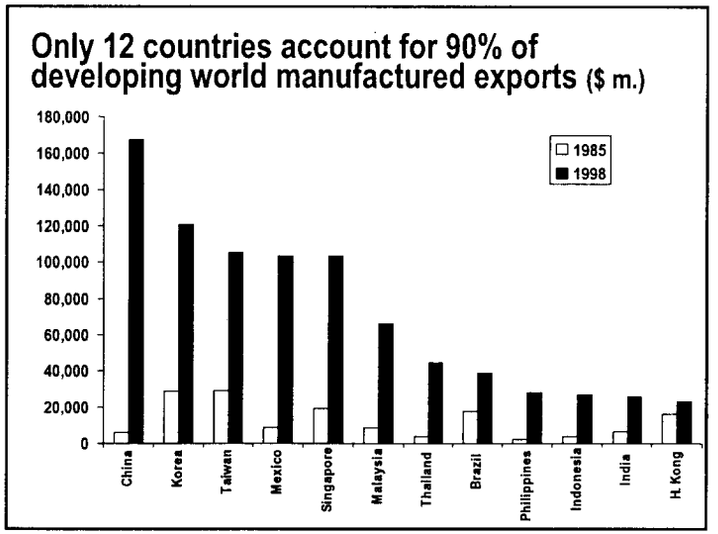
At first sight, the developing world seems to be doing well

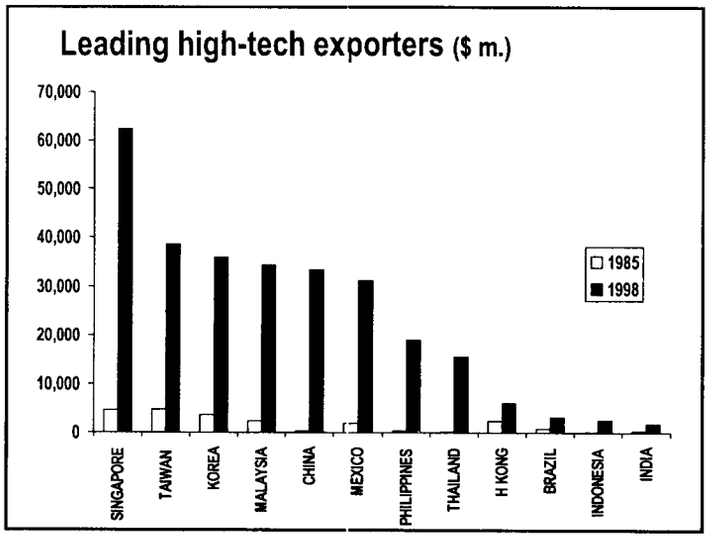
- But this is misleading...
  - Success is concentrated by region and country
  - A large part of HT exports are from simple assembly activity in high-tech industries
  - Export activity is often not be 'rooted' in economy or innovation system, and so may not be sustainable

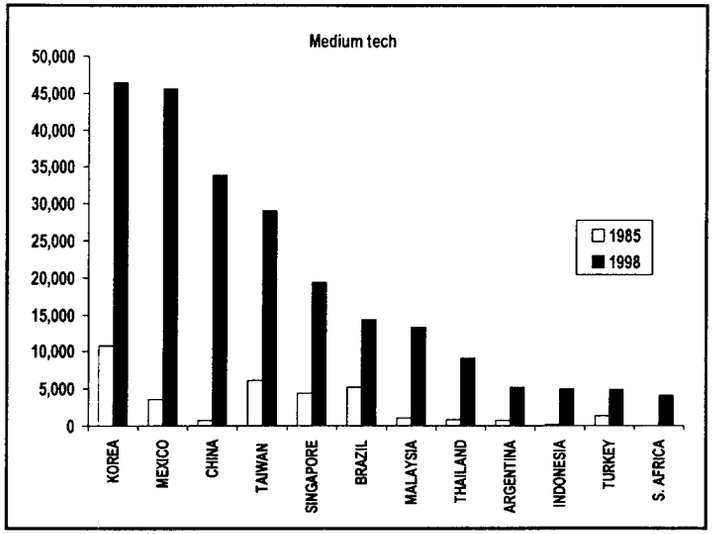
Export shares of main regions:

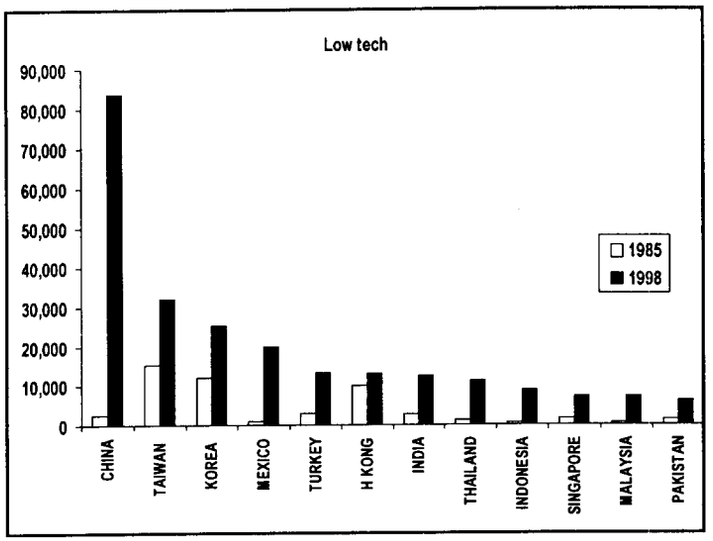
>East Asia, including China (EA1) and excluding China (EA2)
>South Asia
>Latin America including Mexico (LAC1) and excluding it (LAC2)
>Middle East & North Africa (MENA) including Turkey
>Sub-Saharan Africa (SSA)

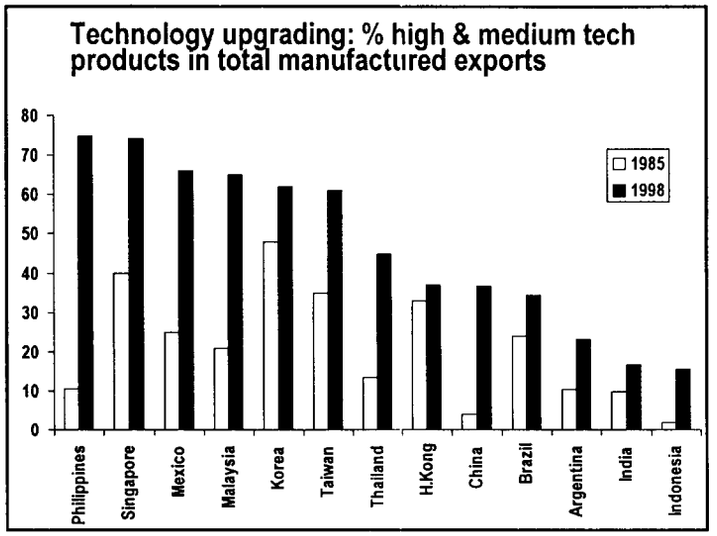

Regional shares of developing manufactured exports
1985
1998
E. Asia
S. Asia
LAC 2
LAC 1
MENA
SSA
HT
MT
LT
RB
All mfr.
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%

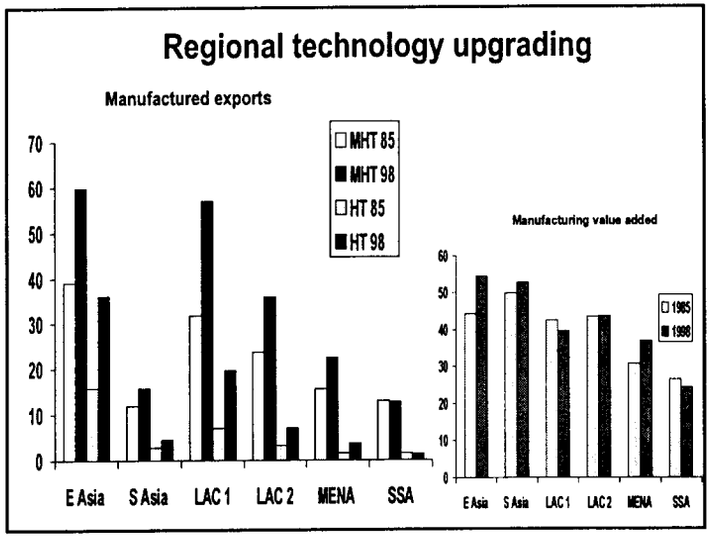

Only 12 countries account for 90% of developing world manufactured exports ($ m.)
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
1985
1998
China
Korea
Taiwan
Mexico
Singapore
Malaysia
Thailand
Brazil
Philippines
Indonesia
India
H. Kong


Leading high-tech exporters ($ m.)
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
1985
1998
SINGAPORE
TAIWAN
KOREA
MALAYSIA
CHINA
MEXICO
PHILIPPINES
THAILAND
H KONG
BRAZIL
INDONESIA
INDIA


Medium tech
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
1985
1998
KOREA
MEXICO
CHINA
TAIWAN
SINGAPORE
BRAZIL
MALAYSIA
THAILAND
ARGENTINA
INDONESIA
TURKEY
S. AFRICA







Industrial performance is diverging.

This is not, however, a temporary adjustment (to liberalisation) that will correct itself over time.

It reflects growing differences in the structural drivers of competitiveness, which determine ability to attract, master and improve on new technologies.

Drivers interact in competitive performance. Take some indicators...

- Skills: measured by tertiary enrolments in technical subjects
- Technological effort: R&D financed by productive enterprises

Domestic capabilities

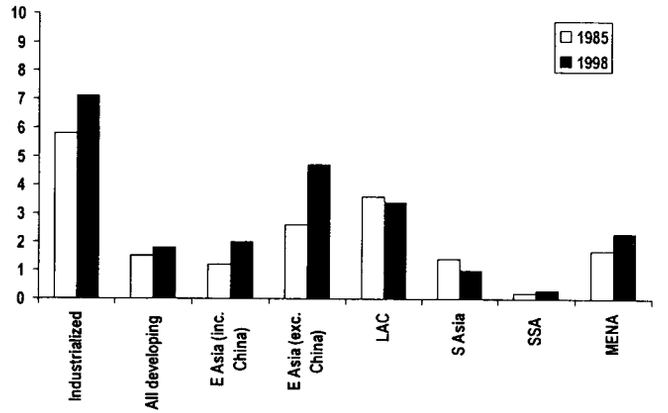
- FDI: 3-year averages (1981-84 & 1994-97)
- Other technology imports: royalty and licence payments overseas

Imported capabilities

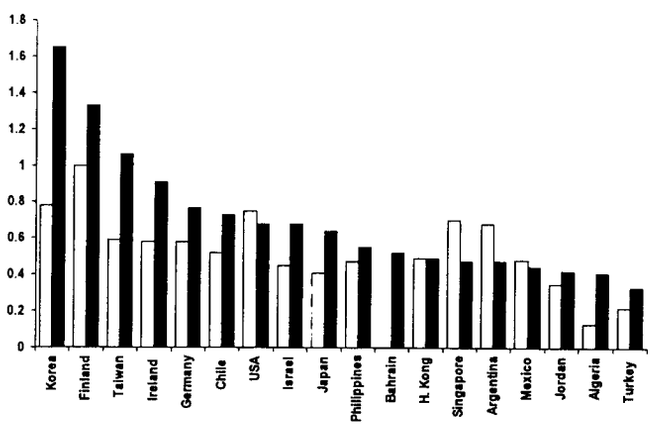
- ICT infrastructure: telephone mainlines, mobiles and PCs

Infrastructure

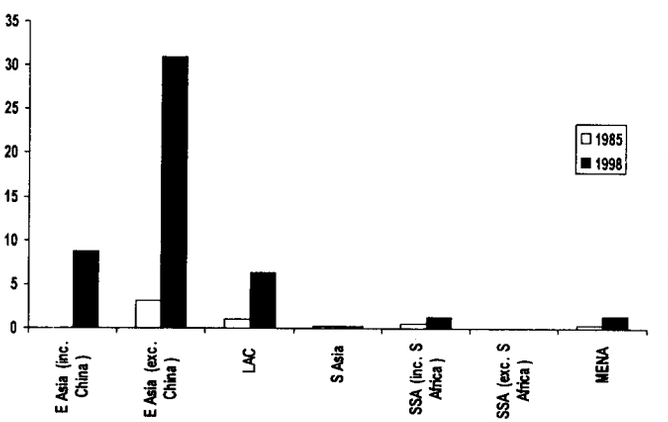
Skill base: regional tertiary technical enrolments (per 1000 people)



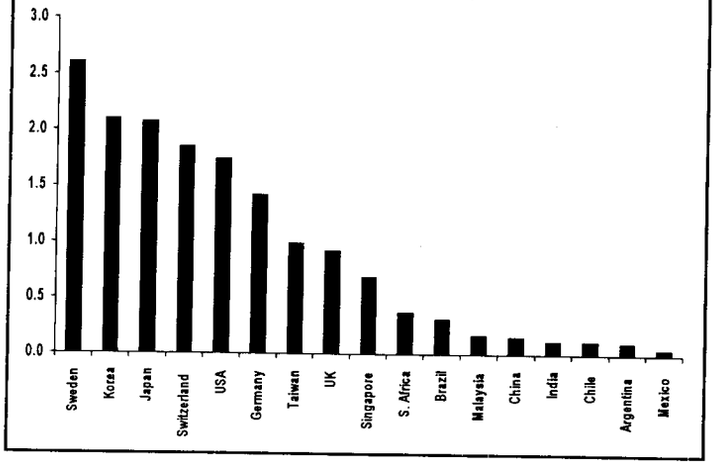
Technical enrolments by country, 1985-98 (% population)



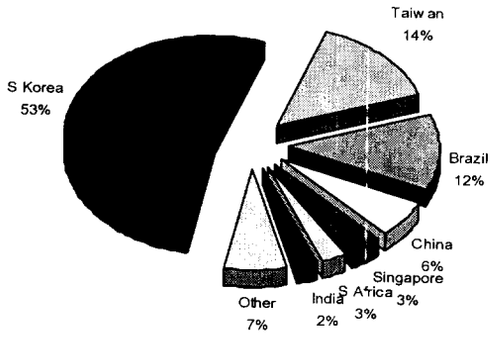
R&D by productive enterprises, per capita ($)



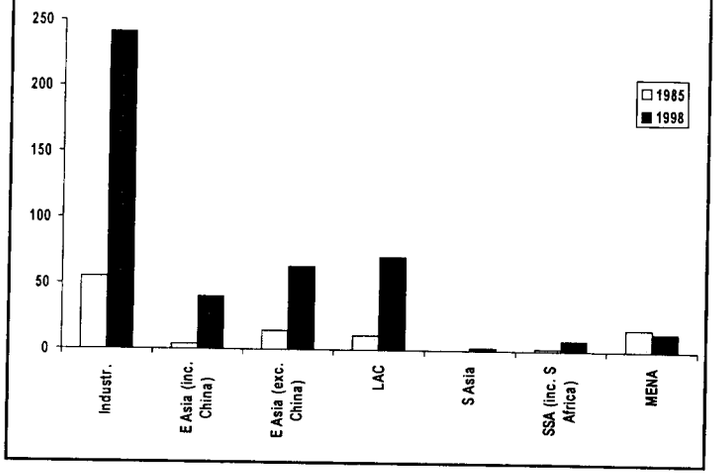
Technological leaders: R&D by productive enterprises as % GDP (1997-8)



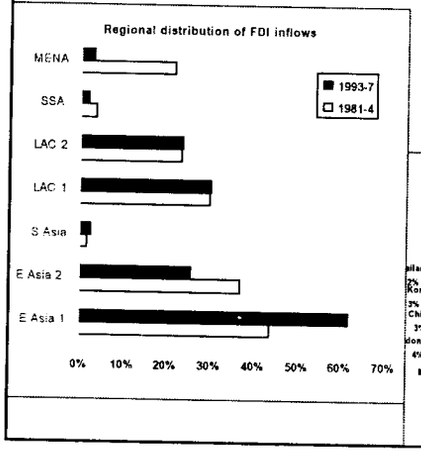
R&D distribution by developing country



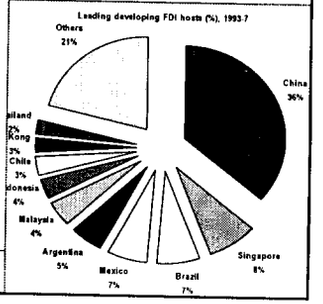
Annual inward FDI (US$ per capita)



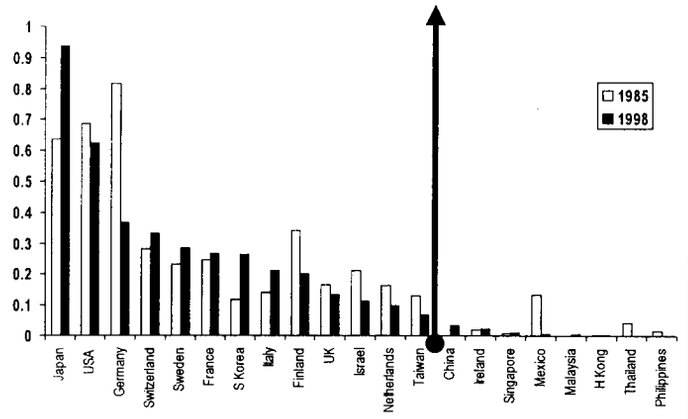
FDI distribution



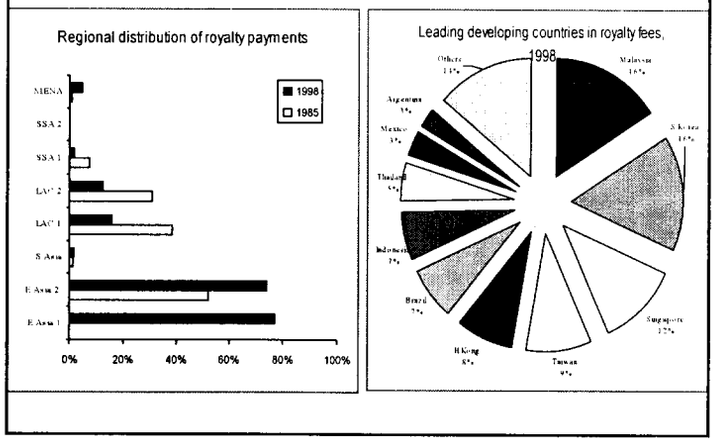
10 COUNTRIES GET 80% OF FDI IN THE DEVELOPING WORLD: AND THEIR SHARE IS RISING OVER TIME



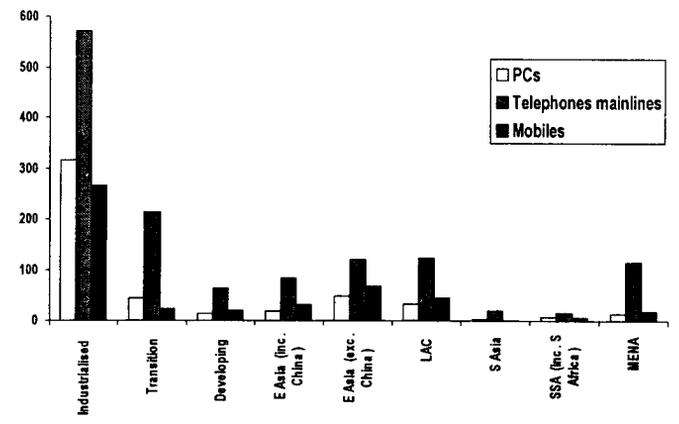
Indicator of integration into foreign-owned production systems: R&D per unit of high-tech exports



Technology licence payments abroad



ICT Infrastructure (1998, per 1000 people)



Main findings in developing world

- East Asia: leads in performance, with fastest growth, highest exports & technology intensity. Strong divergence between countries with and without targeted industrial policy, latter are vulnerable
- LAC: strong industrial, skills and ICT base, but tech structure & R&D weak. FDI high but not dynamic. Mexico excepted, industrial prospects are poor
- S Asia: lagging and weak, with stagnant export structure, low FDI/technology inflows, poor skills and deficient infrastructure
- SSA: weakest in all respects and falling further behind - increasingly marginalised, structurally unable to cope
- MENA: between S Asia & LAC -- not using its skill or ICT base, with stagnant structure, low R&D and FDI

Globalisation and liberalisation *per se* lead to...

- Increasing divergence based on differences in ability to compete industrially
- There are no in-built forces for reversing these structural competitive lags
- Rationalisation of global industry will lead to few major production sites in first movers with strong capabilities and agglomerations
- For few countries that enter IIPS, sustained growth depends on upgrading skills and local capabilities -- not guaranteed by past success

Role of the state today

- To enhance competitiveness in presence of pervasive market & institutional failures
- Strategies have to be very different from past
  - Death of distance, rapid technical change and rise of IIPS changes policy options
  - Rules of game and political/market pressures
- But freer markets and more mobile resources do not mean 'no role for industrial policy': both call for greater local capabilities, and this is not provided by free markets

- Some mixture of autonomous & FDI dependent strategies is necessary, balance depending on the national context
- Both strategies require selective interventions, co-ordinated between firms, clusters and factor markets, and consistent with clear 'vision'
- Driving force in industrial policy must be building technological capabilities, in existing activities and in new, more complex activities that enjoy higher growth rates and greater spill-overs
- Many useful lessons from the different models of the mature Asian NIEs and, increasingly, China

Thank you...