

## **Course 2.4**

### **Fostering Technology Transfer: Role, Absorption Capacity, Channels**

**and Promotion Instruments** UN-Wide Capacity Building Workshop on

Technology for Development:

Innovation Policies for SDGS in the Arab Region

*17 April 2018, Amman, Jordan*



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# 1. Introduction

- **What is technology transfer?**
- **International policy debate**
- **Transfer or diffusion?**
- **Is it necessarily international?**
- **A question of incentives**
- **A need for STI policy: National Innovation Systems**



## 2. Technology and knowledge gaps

- **Development and technological convergence**
- **Measuring the gap**
- **Two dimensions of the developed-developing gap:**
  - ✓ **innovative capabilities, and**
  - ✓ **absorptive capacities**
- **Technology gaps and poverty**



### 3. Technology gaps and poverty

- Inadequate incentive structures
- Institutional and policy weaknesses
- Causes or effects?:
  - ✓ improving education, gender equality
  - ✓ health, infant and maternal
  - ✓ climate change
- Knowledge is scientific and technological, *but*
- ... development and technology transfer is policy



## 4.1 Channels of technology transfer

- **Trade**
- **Licensing**
- **Foreign Direct Investment**
- **Movement of people (migration)**
- **Channels are inter-related**
- **Policy has a primary effect**



## 4.2 Channels of technology transfer

- **Trade**

- **Is embedded technology transferred?**

*... but tacit knowledge may not follow*

- **Does trade openness ensure transfer?**

*... but IPRs can assist or counteract openness*

- **TRIPS Article 66.2**

- **Technology imports require matching human capacities and business environment**

- **Exporting incentivizes technology transfer**



## 4.3 Channels of technology transfer

- **Licensing**

- Partners are well matched in
  - ✓ technological ability
  - ✓ negotiating power
- Risk for licensor: *repatriating royalties, grey exports, reverse engineering...*
- Requirements for licensee: *national innovation system, absorptive capacities at firm level...*





## 4.4 Channels of technology transfer

- **Foreign direct investment**
  - Capital, employment, global value chains, technology, **soft technology**
  - Demonstration effects, labor, vertical linkages
  - (a) Receptiveness to FDI, (b) Able human capacity
  - Potential **benefits are not automatic** – need NIS
  - If **low absorptive capacities** (LDCs), then **limited impact**
  - Incentives and stipulations, requirements



## 4.5 Channels of technology transfer

- **Movement of people**
  - **Key component of technology transfer**
  - **Brain drain = loss of technological capability**
  - **Turning brain drain into **brain gain****
    - ... lacking immediate employment, effort to develop international linkages*
  - **Long **delay** between policy and effect**
    - ✓ Developing absorptive capacity through NIS
    - ✓ Immigration authorities, managing diaspora, expatriates, dual culture
    - ✓ Importing academics, experts, teachers
    - ✓ Donor finance: local participation in tech, R&D, as reporting element

## 5. Technology transfer and National systems of innovation

- ✓ **Policy framework for developing absorptive capacity**  
*... because technology transfer cannot make up for a lack of absorptive capacities*
- ✓ **Science became policy issue in developed countries, mid 20th century**
- ✓ **Goal: increase investment in science, technology**
- ✓ **Old assumption: market failure**  
**Framework: linear innovation**
- ✓ **New Assumption: Systemic, institutional failure**  
**Framework: National systems of innovation**



## 6.1 Absorptive capacities

- **NIS** > Response to system failure in addition to market failure
  - Use of technology and innovation outcomes are below potential of national economy
    - ... *ability of firms to learn, incentives, linkages , institutions, regulations*
  - Human capacity, finance, infrastructure (ICTs)
  - Interaction: *Academia-Firms-Government*
  - **Tacit knowledge**: informal, implied, habitual, experiential, **not easily transferable**
  - NIS purpose: Incentivize learning interactions
  - Enable, among others, technology transfer
    - ... *identification, adaptation, absorption, commercialization as innovation*

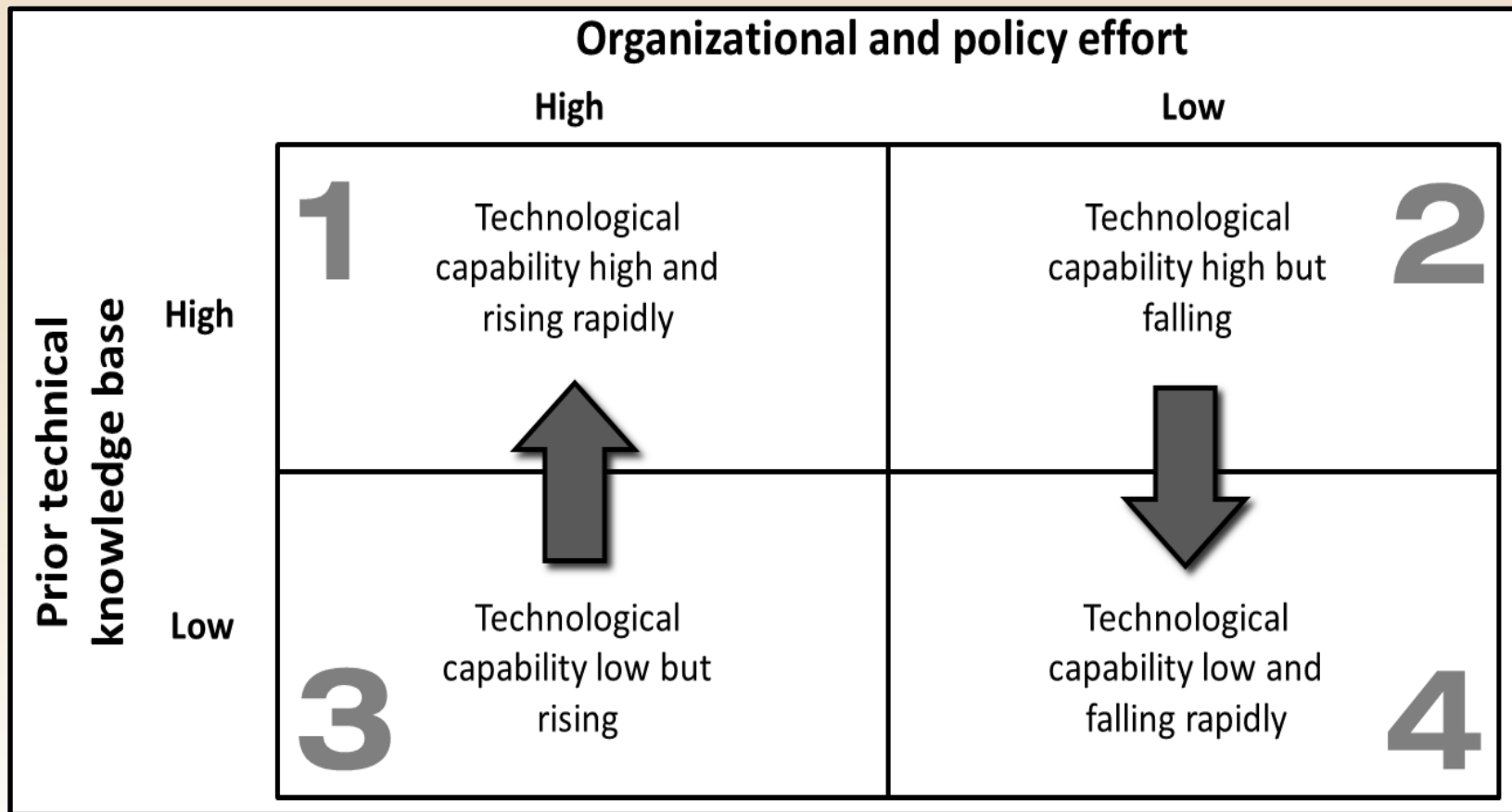


## 6.2 Absorptive capacities

- Ability of entrepreneurs and firms to identify, transfer and imbed technology in process, product or service
- Improving technology transfer means increasing absorptive capacity
- Policy, but also historical development path
- Knowledge base: slow to develop, quick deterioration
- Human capital: aggregate education and skills  
... scientific, industrial and entrepreneurial
- Aggregate  $\neq$  actual; depends on effectiveness of NIS
- DCs and investment in scientific R&D capacity



## 6.3 Absorptive capacities



## 7. Intellectual property rights (IPR)

- **IPR environment: Positive or negative effect**
  - ... in theory IPR is a condition for FDI, but also gives incentives to local firms to transfer, develop or adapt technology and innovate
- **Creative imitation: public domain, expired IPR, GPL**
- **With development, role of IPR increases**
- **But for LDCs, questionable policy investment**
  - ... legislation can be upgraded but will see little use
- **A question of cost: regime, flexibilities, firms**



## 8.1 Technology transfer: A discovery process

- **Discovering what works economically**
- **Centrality of the transfer or generation of the business idea**  
*...which in turn seeks out technological solutions and technology transfers*
- **Importance of economic experimentation (and failure)**
- **“Discovery” should replace “Knowledge” at the start**  
*... seek economic knowledge early, curtail uncertainty over investment in technology*
- **Demand driven transfers replace technology-push**
- **Three problems requiring institutional support:**
  - **Information, coordination**
  - **Finance under uncertainty**
  - **Time gap between economic discovery and technology transfer**





## 8.2 Technology transfer: A discovery process

- **Transfer and economic knowledge**

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# Conclusions

- **Central to economic development**
- **Technology gaps explain development gaps**
- **Diverse policy measures, evidence-based policy**
- **Development history, path, requires unique policy mix**
- **Technology channels depend on absorptive capacity**
- **NIS as central policy framework**
- **Transfer is only as successful as its economic success**



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