

# **Innovation Policy for Development: an Overview**

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# Plan of talk

- Introduction: broadening the notion of innovation; innovation and growth in historical perspective
- The economic rationale for Government support of innovation and R&D
- Expanding on spillovers in development economies
- Key Issues: Outward- vs. locally oriented innovations; General Purpose Technologies (GPTs)
- Promise and limitations of innovation policies: The case of Israel
- Drawing guiding principles for innovation policies; main levers: skills, incentives, information, finance.

# Introduction

## *the view of R&D/Innovation policy as panacea*

Riding the wave of The “Knowledge Economy”:

- In the EU the Lisbon agenda: **3% R&D/GDP**
- Race in *emerging economies* to develop innovation policies, set up Gov support to R&D (e.g. eastern Europe, Central Asia, etc)
- Presumed success stories turned into “role models”: Finland, Israel, Taiwan, Bangalore (India).
- Bandwagon effect in the globalization of R&D; rush to attract and set up Venture Capital funds.

*Is all this really relevant for development?*

*Constructive skepticism...*

## *Intro 2:*

# **Broadening the notion of innovation**

- Typically associate innovations with new/better products (e.g. CDs vs. magnetic tapes, GPS, cardiac stents), nowadays particularly with improvements in Information & Communications Technologies (ICT).
- But in fact much broader notion, including all sorts of “process innovations” and organizational changes, e.g.
  - *Rearranging the sequence/timing of tasks,*
  - *Better transportation modes,*
  - *Altering the composition of inputs & skills,*

## *Intro 3:*

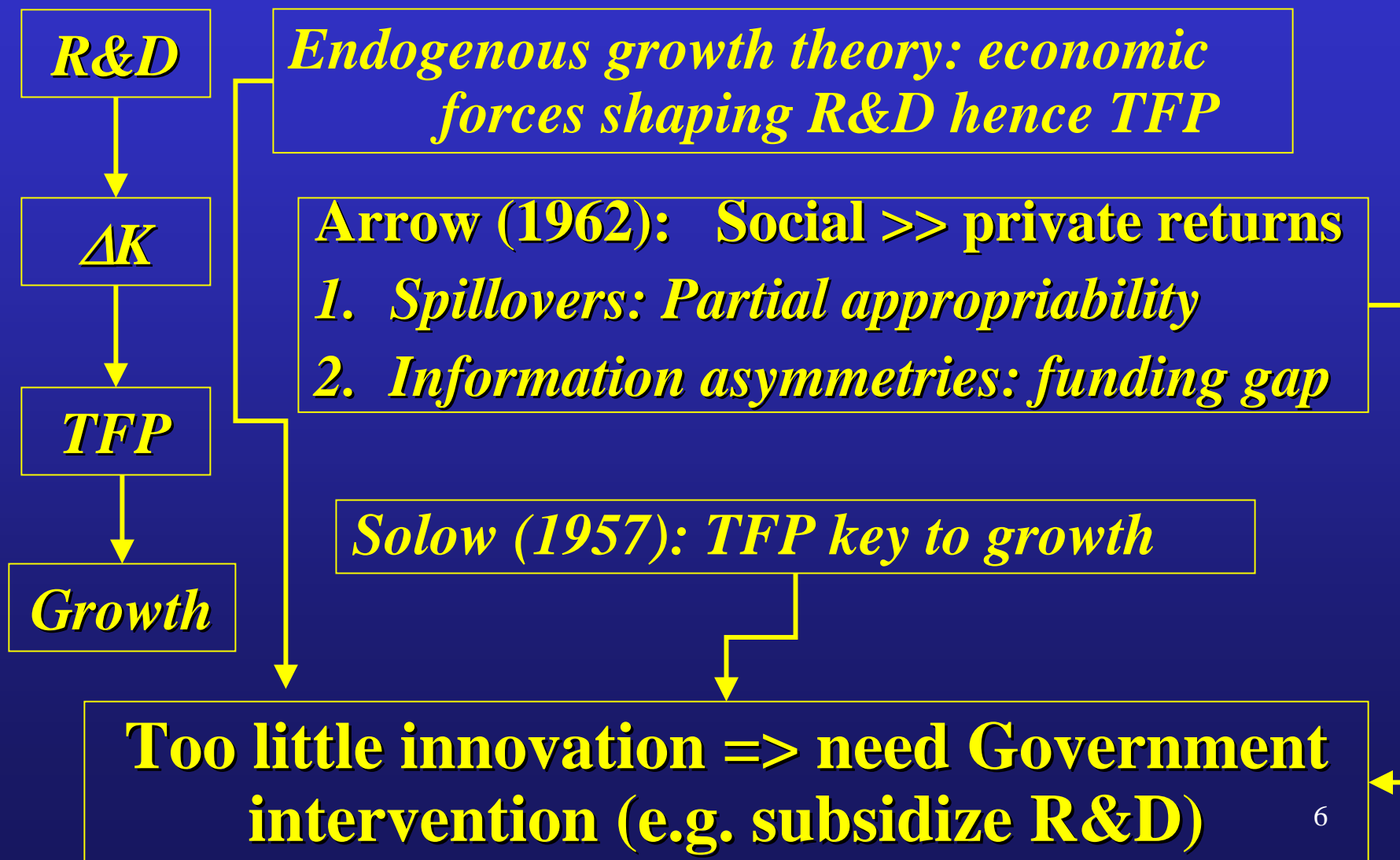
# **Innovation and growth in historical perspective**

1. The cumulative effect of *widely distributed* small improvements has been as significant for growth as the impact of discrete, “higher order” innovations.
2. Innovations entail *interdependencies*, necessitating and triggering further complementary investments and innovations in order to reap their full benefits.



*Innovation policies for development should include much more than just supporting formal R&D projects, more than just in “high tech” sectors.*

# The Economic Rationale for Government Support of Innovation and R&D



# Expanding on Spillovers

- Spillovers: The basics
- Broadening the Scope of Spillovers:
  - (i) Post-innovation competition
  - (ii) “Demonstration effects” in diffusion
  - (iii) “Demonstration Effects” again:  
rent-creation vs. rent-seeking norms
  - (iv) Who really benefits from spillovers  
in a global economy?

# Spillovers: the basics

1. Innovations generate positive externalities (e.g. new ideas, new  $K$ ) that benefit other would-be inventors;
2. Innovations confer benefits to purchasers of new products (consumers and producers) that often exceed sustainable increases in price;

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*social returns from innovations >> private returns*

Spillovers channels:

- local interactions, information diffusion, mobility,
- International trade, FDI

# Broadening the Scope of Spillovers

## (i) Post-innovation competition

- Markets in developing countries tend to be highly concentrated and stagnant;
- A single innovator may break the mold and trigger a process of “spiraling innovations”;
- Hence “spillovers”: initial innovation brings about further innovation.
- Policy implications: encourage *first-time* innovators in static markets; prevent dominant firms from denying foothold.

## (ii) “Demonstration effects” in diffusion

- Early adopters positively impact later adopters: network externalities, informational effects, emulation, etc.
- Thus early adopters/innovators: source of spillovers;
- Finding: diffusion of new techs *slower* in less developed countries;
- Policy implications: support early adopters, particularly of technologies that can enhance productivity in wide range of sectors.

### *(iii)* **“Demonstration Effects” again: rent-creation vs. rent-seeking norms**

- J. Mokyr: precondition for Industrial Revolution (thus for growth), the shift from rent-seeking to rent-creation behavior and institutions, encouraged by the Enlightenment.
- Shift yet to occur in many developing countries: is it more attractive for entrepreneurs to search for innovative ways to further extract rents, or to develop new technologies?
- Policy implications: change cost-benefit of rent-seeking versus rent-creation, help market pioneers. Need the local “Thomas Edison”, the local “Steven Jobs” to emulate.

## (iv) Who really benefits from spillovers in the global economy?

- *In large economies with small  $(Ex+Im)/GDP$  (e.g. USA), spillovers benefit mainly the local economy:*
  - Large: high *Prob.* that other *local* agents will benefit,
  - Low  $(Ex+Im)/GDP$ : small risk of spillovers slipping out.
- *In “small” open economies :*
  - Fewer potential local recipients (“small”: size of relevant sectors, not population or GDP);
  - spillovers may easily spill out, benefiting *foreign* firms and consumers rather than local economy;
  - But may be *recipient* of trade-mediated spillovers (e.g. Coe & Helpman) => need “absorptive capacity”

## *(iv) cont.: Local vs. Global Spillovers - some policy implications*

Just promoting local innovation may *not* result in faster growth. Innovation policies should aim *not just* at increasing R&D, but do so in a way that,

- incentivizes spillovers *inflows* rather than outflows;
- develops “*absorptive capacity*”;

*None of it can be taken for granted in small open economies, certainly not in developing countries.*

# Innovation and Development

## *zooming in*

1. Outward-oriented innovations vs. serving local markets
2. Innovation in the context of General Purpose Technologies (GPTs)

# Outward-oriented innovations vs. serving local markets

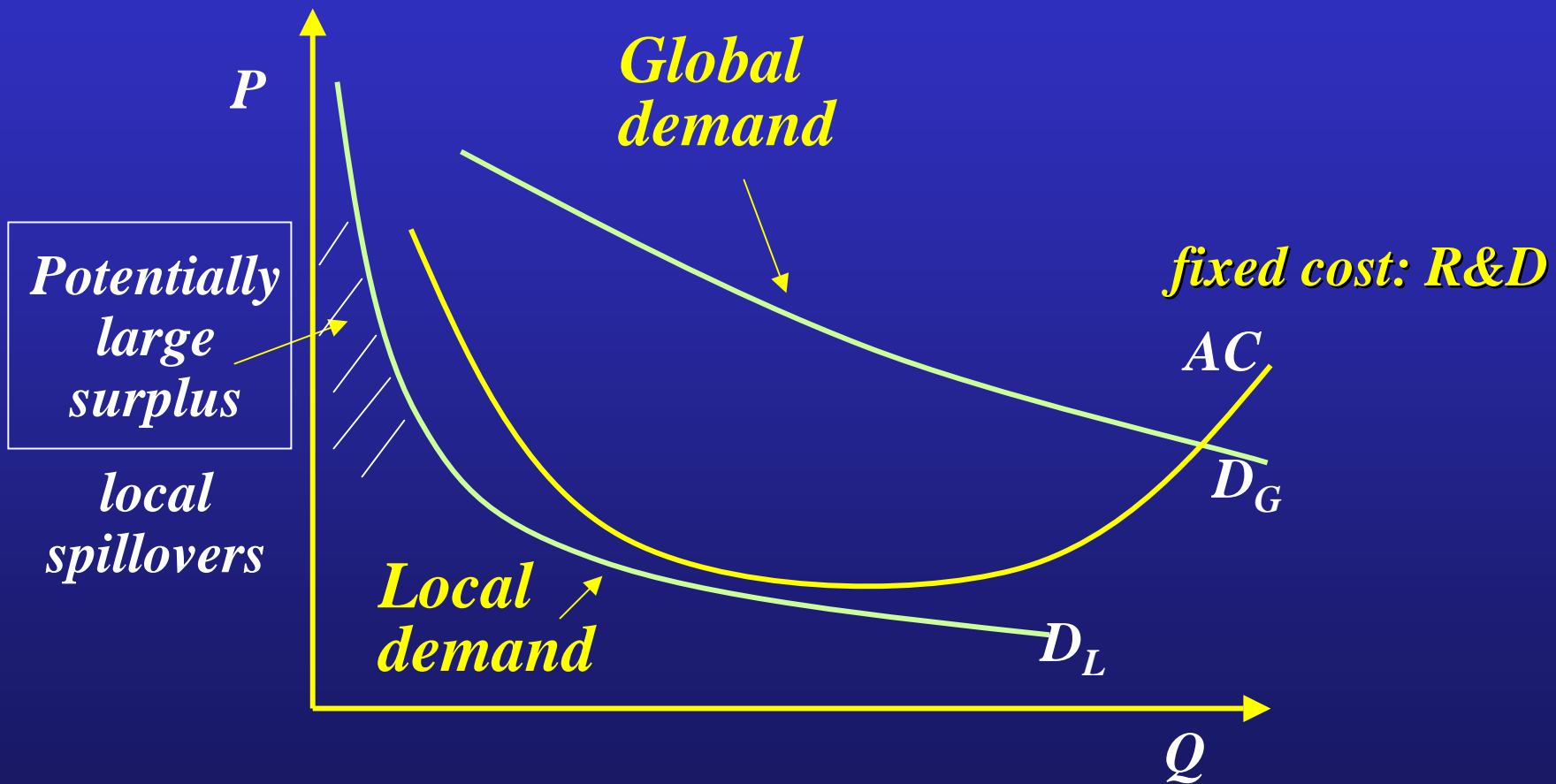
- (Wrong) perception that globalization implies there are no “local needs” or “local markets”, hence local innovators should only serve global demand.
- True, markets are global, linking up with them is important, but so is locally-oriented innovation.
- Recognition of inherent heterogeneity of preferences/“needs”, and of vast opportunities to increase consumer surplus and profits by catering to this heterogeneity - “mass customization.”

# The need for locally-oriented innovation in developing economies

## *Typical examples:*

- *Health care*: very different incidence of diseases; need for e.g. cheap prevention rather than high end technology, etc.
- In *ICT*: simpler software packages (not more features), less demanding on hardware, more backwards compatibility;
- If population spread over large, unwired areas: satellite-based broad band internet.

# Why the failure to innovate for local markets?



# Innovation and Development in the context of “General Purpose Technologies” (GPTs)

*GPTs* as “engines of growth”, e.g. the steam engine, electricity, ICTs:

- GPTs drive growth by spreading over a wide range of sectors, prompting them to innovate as well (i.e. “*innovational complementarities*”).
- Progress in the adopting sectors feeds back into the GPT sector => further advances in the GPT itself, feeding a positive, self-sustained loop.

# *GPTs continued*

- Growth in the US, 1995-2000, due not just to “High Tech,” but to *WalMart*! TFP growth in retailing via massive adoption of ICT-based methods.
- The GPT sector: *small*, cannot pull on its own the whole economy (no “*locomotive*”): if the rest of the economy fails to adopt the GPT, or fails to make complementary innovations, growth will not materialize.

*Policy: focus not just on the prevailing GPT (ICT now), but on the potential “Walmarts”...*

# **Promise and limitations of innovation policies:**

## **The case of Israel**

# Background and Features of Policies

## *Background (1970's):*

Israel had little resources, but highly skilled manpower, scientific prowess – how to mobilize them for growth? ***Strategic Decision:*** Jump-start and breed a “science-based” sector by providing broad financial support, and making up for market failures.

## *Hallmark of policies:*

- “**Neutrality**”: respond to market demand/signals, do not “pick winners.”
- **Dynamic/Innovative:** create new and varied support programs according to evolving needs; avoid “self-perpetuating” programs.

# Main R&D-Support Programs in Israel

- *Matching grants to commercial R&D projects* - criteria: innovativeness, tech and commercial feasibility, risk, spillovers; paybacks if success; some strings attached.
- *“Magnet” Program for support of generic, pre-competitive R&D consortia*: corporations + academia; longer term, higher support. Examples: Nano Functional Materials, Streaming Media Messaging, Digital Printing.
- *Technological “Incubators” Program*: from innovative ideas to start-ups.
- *“Yozma” Program 1993-97*: Jump-started the Venture Capital Industry – success, hence discontinued

# Indicators of Innovation and R&D performance in Israel: 1990-2000

- ICT production grew **4.6** times (16% per year); share of GDP grew from 5% to 14%;
- Exports grew **6.2** times (to \$ 15 billion), 1/3 of total exports;
- The ICT sector contributed **30%** of the growth of GDP;
- 2<sup>nd</sup> largest VC market after the US;
- US Patents per capita: fourth (after US, Japan, Taiwan);
- Major innovations: ICQ, disk-on-key, camera/pill for gastro imaging, shopping.com, etc.;
- 2004: R&D/GDP= **4.6%** (*world highest, but...*), ~ 4,000 high tech companies.

# And yet, sustained growth elusive...

- Wide *disparity* between fast growing High Tech sector and the rest of the economy; stagnant productivity of non-tradable, non-ICT sectors – a “dual economy”:
- In 1996-2004 the ICT sector grew at **10.5%** per year, the rest of the economy at just **2.3%**; in many sectors TFP declined: Business Sector average: **-0.8!**
- Rising *socio-economic inequality*: concern in itself, and narrowing future pool of human capital.

# Why?

## Innovate here, benefit elsewhere...

1. In spite of neutrality, support mostly *product* rather than *process* innovations that could be applied locally; hence little R&D in e.g. services, chemicals, etc.
2. Innovations made in Israel mainly for *exports*, some spillovers internal, but benefits (e.g. TFP growth) realized mostly abroad.



*no “Wal-Mart effect” in Israel*

## *Innovate here, benefit elsewhere – cont.*

- 3. R&D labs of multinationals: absorb local talent, but where do the benefits of the new  $K$  go? (e.g. Intel Israel designed the Centrino chip for laptops – so what?)*
- 4. VC-backed star-ups: must exit, mostly by selling off to US-based corporations – again, who benefits? (very few large Israeli-based corporations)*



*Israel: powerhouse in generating innovations,  
but not quite in benefiting from them.*

*And this is a successful case!*

# Some lessons from the Israeli experience

1. Cannot have sustained growth by relying just on one fast-growing sector (ICT), while the rest of the economy stagnates:

*Need to encourage and channel innovativeness also to non-High Tech sectors*

2. Cannot have growth while widening gap across socio-economic segments of the population:

*Need policies of inclusion, of reaching out to left-behind segments, of expanding the pool of human capital.*

# Some (cautious) Corollaries

Drawing guiding principles for development-targeted innovation policies;

Main levers of policies:

*skills,*

*incentives,*

*information,*

*finance.*

# Guiding principles for Policy

1. Innovation should be *widely distributed* across sectors (not just “high tech”), and type of innovations (not just formal R&D projects).
2. *Bottom up* policies, not top down: provide enabling conditions and incentives => growth-enhancing innovation should spring from widening cohorts of would-be entrepreneurs.
3. Alter the payoffs between innovations aim at *rent creation* versus ingenuity in rent extraction.

## *Policy levers: (i) Skills*

Wide spectrum of skills needed for innovation-based growth strategy, acquired via formal education, training, learning by doing.

### *Two-pronged strategy:*

- Supply universal, baseline education – literacy, basic math, English. Revise and upgrade often. Rely on ICT: shortcut.
- Ensure responsiveness (endogeneity) of institutions supplying vocational and advanced skills (Rosenberg: “Universities as Endogenous Institutions”).

## *Policy levers: (ii) Incentives*

Crucial attractor: Expectation of large rewards to innovation, given risks, costs.

- Traditional factor: appropriability, IP.
- Would-be innovators should have a stake in the firm, good prospects of promotion, outward mobility.
- Low “barriers to innovation” within markets (officially sanctioned regulations, tacit collusion)

Policies promoting,

*inclusion* (of potential innovators),  
*openness* (of markets).

## *Policy levers:*

### *(iii) Access to Information*

- Necessary condition for innovation: access to *K*, info about technology, about markets (substitutes, market size, prices).
- Innovation as “recombination of ideas”, hence wide knowledge base.
- *Policy:*
  - Internet access, computer and search skills
  - Openness and competition in media,
  - knowledge intermediaries,
  - transparency in businesses.

# *Policy levers:*

## **(iv) Availability of Finance**

- Chronic problem in developing countries, much more acute for innovation, given information asymmetries, lack of collateral, lack of screening expertise.
- Need “angel investors”, internal finance, VCs, etc. Not much available in LDCs.

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- Preeminent government role: provide funding for innovation, many channels possible, e.g. matching grants, conditional loans, etc.
- Lots of international experience – tap it!

*To conclude...*

**Need genuinely innovative research on  
“Innovation and Development”**

- Cannot just translate Arrow (1962) to Swahili...
- Cannot just extrapolate from experience in a handful of successful countries, cannot just borrow their tools and policies

*The truth is, we know little,  
big payoff to economic research in this area!*