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Innovation Policy for Development: An overview

Manuel Trajtenverg – Tel Aviv University

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Innovation Policy for Development: an Overview

Manuel Trajtenberg
Tel Aviv University, NBER, CEPR

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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 <u>development</u>?

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.

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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

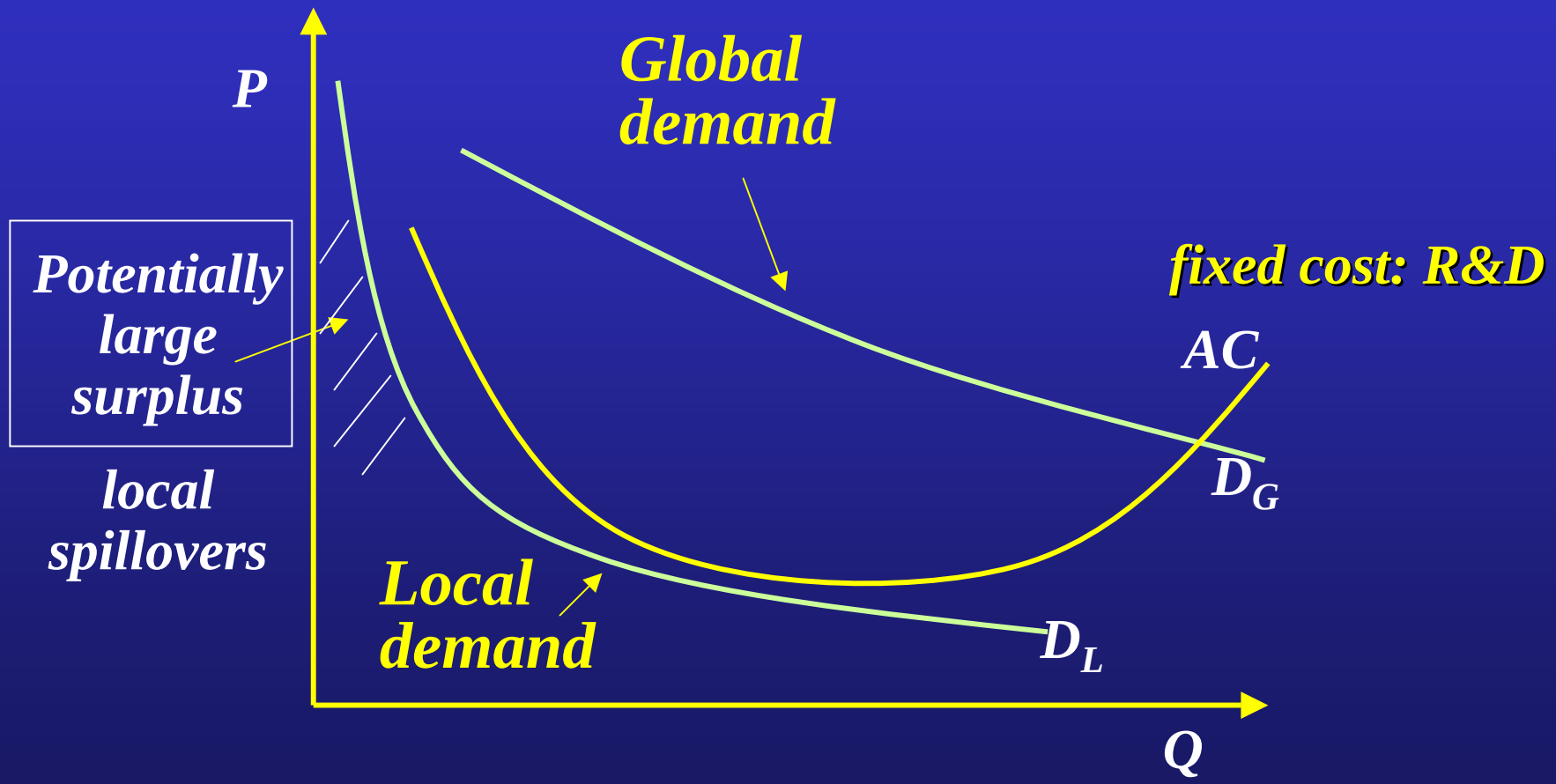
- (Wrong) perception that globalization implies there are no “local needs” or “local markets”, hence local innovators should only serve global demand.
- True, markets are global, linking up with them is important, but so is locally-oriented innovation.
- Recognition of inherent heterogeneity of preferences/“needs”, 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;
- 2nd 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!