



Plenary Session

Does Science, Technology and Innovation matter for development? What is the balance between science, technology and innovation?

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Issues for the debate

Lets divide the issues into two groups: 'positive' and 'normative'

1. Positive Issues

While everybody agrees that innovation nowadays lies at the heart of economic growth in both advanced and industrializing economies, still there is no agreement concerning the processes linking the two. On the one hand we have the simplistic view that innovation influences economic growth directly, I think that this view is part of the New Growth Theory view of the link. My point of view follows a more structuralist and systems-evolutionary perspective where for innovation to affect economic growth it should trigger structural change which for the purposes of this discussion is identified with new sectors (or widely defined product classes); new markets, new clusters, the creation of large multinational companies, and other forms of what may be termed *Multi-agent structures* e.g networks, regional or sectoral innovation systems, etc. Thus under this view, the impact of innovation will be relatively weak if it does not trigger *emergence* of these higher level, multi-agent structures; and will be strong if it does.

This view corresponds to the structuralist perspective to economic growth which we could identify with the work of Kuznets e.g 1971, currently of Saviotti and Pyka, some of my past work with collaborators, and others. It also fits very well with an Industry Life Cycle Perspective where a major issue is characterizing the early, fluid or pre-emergence phase as well as the subsequent growth or emergence phase of new sectors or industries, and the conditions for successful transition to the latter phase. The early fluid/pre-emergence phase is characterized by inventions/innovations which contribute, together with collective and interactive learning, to define a new product class that is the *qualitative dimension* which lies at the root of new sectors or industries. But the real impact on economic growth is a successful transition to the growth/emergence phase that is the *quantitative dimension*, a central aspect of structural change. This transition is not automatic, our presumption is that there are many fluid phase attempts to create new industries which do not actual lead to new industries. This also suggests very strongly that government policy may have a very important role in the process (also it suggests very strongly the important of updating an analytically satisfying view of what new industries, markets, clusters

are....which could contribute not only *allocative efficiency* but to *dynamic/technological/Schumpeterian efficiency* as well.

The basic overall process of ‘innovation based economic growth’ would therefore seem to be as follows:

Invention/innovation- → triggering emergence of new multi-agent structures (e.g structural change)→economic growth

To this we should add feedback mechanisms, co-evolutionary processes etc. The outcome might or might not be an overall cumulative, auto-catalytic process with positive feedback (see policy below).

Before shifting to the ‘normative side’ let me mention that in a globalized world, the business sector of any country could be visualized as comprising at least three components:

- Firms being part of domestic sectors or industries (or other multi-agent structure)
- Firms being part of global industries, networks, etc where their survival and growth depends crucially of their being part of a *global* multi-agent structure;
- Firms not being part neither of a domestic nor of a global sector or industry e.g. they are still in the fluid phase of an industry/market which does not yet exist or because they survive (maybe fleetingly) without ‘being part’ of a multi-agent structure whether domestic or foreign

While the Statistical Bureaus of countries classify firms according to ‘the industry to which they belong’ the underlying conceptual framework underlying such a taxonomy is one where industries automatically exist or are created with the first firm operating in the relevant area. In contrast to this and following what was mentioned above, the relevant concept of *industry* or other multi-agent structure is that of a *social institution that emerges* with the latter process not being automatic e.g. requiring a critical mass of agents, interactions, etc.

2. Normative Issues

What could the role of innovation policy (broadly conceived as including *incentives programs, institutional/regulatory changes and other policy actions* e.g. in setting priorities or creating new policy institutions or policy capabilities) be in the above process? It is clear (especially when looking at the feedback mechanisms underlying the above, and given the Life Cycle Perspective adopted for part 1) that *policy should possess a clear systemic-evolutionary (S/E) outlook* that is the application of the systems of innovation, evolutionary and institutional approaches to the analysis of policy. Policy should be understood as a process starting with the setting of strategic priorities, following by policy design, policy implementation, links & coordination between policies through time, and links and coordination between policies at a point of time.

Example 1

For example, a successful process of direct support of innovation in firms may generate conditions for the subsequent implementation of high impact venture capital policies in the future.

Example 2

Horizontal, direct support today may create option for the successful targeting of new sectors or clusters in the future.

Example 3

Direct support of *regular* R&D in firms if successful may set the base for direct support of consortia of firms (with or without Universities) undertaking *generic (or General Purpose Technology) R&D programs*

Example 4

Direct support of non-R&D based innovation in firms may set the stage for the successful implementation of a direct support program of R&D based innovation at firms

Example 5

A successful early policy mix emphasizing direct support of innovation in firms may set the stage for the successful implementation of a new policy mix with a greater emphasis on the support of the Science, Technology and Higher Education infrastructure (i.e. *indirect* support of innovation at firms)

A major point in the current, turbulent global environment is to recognize that policies and policy making *require an explicit thinking/research component*, that is policy making is not only doing but also ‘thinking’.

In previous work and together with collaborators we have enumerated a number of principles of such a S/E perspective to innovation policy:

- The overarching objective is to trigger cumulative processes of innovation based growth
- Policies should be *framed*, and the links between strategic priorities and actual policies should be made explicit since it lies at the heart of the policy process (the link is *many to many* rather than one to one)
- A distinction between a *strategic and an operational* level of policy and linking the former to Metcalfe’s *adaptive policy maker* perspective
- The links between *actual policies implemented* (policy ‘products’) and the *configurations/capabilities/objectives of the relevant policy institutions* (policy ‘processes & institutions’), etc