Systems of Innovation and Innovation Policy

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Background definitions

Innovations = new creations of economic and societal significance primarily carried out by firms (but not in isolation). They include new *products* and new *processes*.

Innovation Policy = Actions by public organizations that influence innovation processes, i.e. the development and the diffusion of innovations. (Includes actions by public organizations that unintentionally affect innovation.)

Innovation system = The **determinants** of innovation processes *and* the **innovations** themselves.

Evolutionary!

- Innovation processes develop over time and involve the influence of many factors and feedback processes, and they can be characterized as **evolutionary**: set-up of products and processes -- innovations introduce novelties -- selection reduces diversity -- new set-up, etc, etc.

- Innovation processes are open-ended and path-dependent, and no optimal solution to a technical problem can be identified.

Optimal?

- Therefore, **an optimal or ideal SI cannot be specified.**

- **Neither** can we talk about an **optimal innovation intensity** for a certain category of innovations – or an optimal level of investments in R&D.

- The notion of **optimality** is **irrelevant** in a SI context.

Reasons for policy intervention

Two conditions must be fulfilled for public intervention to be motivated in a market economy:

(1) Private actors must fail to achieve the objectives formulated; i.e. a **'problem**' must exist.

(2) Public actors must have the **ability** to solve or mitigate the problem.

Innovation Policy Analysis:

- What is a (policy) problem?
- How can we identify the problems, and their causes?

Problem identification

- **An innovation policy problem** is a low performance (output) of the innovation system = a low innovation intensity for a certain category of innovations (for which the direct objective is a high intensity).

- Problems can be identified through **comparative** analyses between **existing** systems of innovation (over time and space)

- Remember: Comparisons cannot be made with optimal systems! This is **contrary** to most policy analysis

Objectives of Innovation Policy

- The **ultimate** objectives of innovation policy are politically determined.
- They can be economic, military, environmental, social, related to health, etc.
- If economic, the objectives concern economic growth, productivity growth, employment and competitiveness.
- But they have to be ’translated’ into **direct** objectives, i.e. into **innovation** terms = **self-evident but rarely done.**

Most important things to do to design innovation policy = **comparisons**!

- The **output** of innovations **PROPER**:
  - Can **NOT** be mesured by R&D expenditures!
  - Can **NOT** be measured by patents
  - **Can only be measured as** output of **new products and new processes**
  - Therefore direct Innovation policy **objectives** must be formulated in innovation **output** terms (= in terms of **comparative innovation intensities)**
  - But we do not know them in enough **detail**! There is a lot of **work** to do here!

Identify Causes!

- An identification of a problem only indicates **where** and **when** policy intervention is called for – it says nothing about **how** it should be pursued.
- When the ”problems” have been identified, we also need to know the main **causes** or determinants behind the ”problems”.
- This is necessary to identify appropriate policy instruments.
- This can be the same as pursuing the analysis in terms of **the ten activities – to which I will now turn**:

The ’activities’ view on SI’s

- The early view of SI’s stressed the components in SI’s: **organizations** and **institutions**. More recently, some of us wanted to focus more on what actually **happens** in SI’s.

- The **overall purpose of** SI’s is to pursue innovation processes = develop and diffuse innovations (new product and processes).

- What we call ’**activities**’ in SI’s are those factors that influence the development and diffusion of innovations.

10 important activities in SI's (1)

Provision of **knowledge inputs** to the innovation process:

1. Provision of **Research and Development** (R&D), creating new knowledge, primarily in engineering, medicine and the natural sciences.
2. **Competence** building (provision of education and training, creation of human capital, production and reproduction of skills) in the labor force to be used in innovation and R&D activities.

10 important activities in SI's (2)

Demand-side activities:

3. Formation of new product **markets**.

4. Articulation of **quality requirements** emanating from the demand side with regard to new products.

10 important activities in SI's (3)

Provision of constituents for SI's:

5. **Creating and changing organizations** e.g. enhancing entrepreneurship and intrapreneurship, research organizations, policy agencies, etc.

6. **Networking** through markets and other mechanisms, including **interactive learning** between different organizations

7. **Creating and changing institutions** - e.g. IPR laws, tax laws,environment and safety regulations, R&D investment routines, etc

10 important activities in SI's (4)

Support services for innovating firms:

8. **Incubating activities**, e.g. providing access to facilities, administrative support, etc.

9. **Financing** of innovation processes and other activities that can facilitate commercialization of knowledge and its adoption.

10. Provision of **consultancy services** of relevance for innovation processes, e.g. technology transfer, commercial information, and legal advice.

Policy = division of labour between public and private

- Innovation policy is public intervention with regard to **all** the ten activities – it is **not** a separate activity.
- Policy is a matter of **division of labour** between what public and private organizations do.
- We can analyze the **existing** division of labour as well as how it should be **changed** to mitigate a certain ”problem”.
- But policy (change) is also to change the nature and operation of what public organizations are **already** doing.

Are some of the 10 activities more important?

- The ten activities are actually hypothetical **determinants** of the development and the diffusion of innovations.
- It is **not** possible to single out one or two activities that have been most crucial for all systems at all times.
- They **all** have to be present.
- Their relative importance depends on the **place** and **time** = context-dependent = analyze SI's over and over again!

Is more innovation always better?

- **No**, but we cannot know the optimum = a **dilemma**!
- There has to be some **balance** between categories of innovations. This includes balance between innovations with different ultimate objectives.
- **How**?

Balance between categories:

- ‘New to the world’ (development) and ‘new to the firm’ (diffusion) innovations
- Radical and incremental ones
- Product and process innovations
- High-tech products and low-tech products
- Innovations in specific sectors of production
- Innovations related to certain objectives of innovation policy, etc.

Selectivity

- Public policy intervention is seldom neutral – it has an element of ”picking winners” or to ”avoid supporting loosers” (this is what firms try to do)
- Policies target ”problems”(just like firms)
- Selective policies:
  - Regional policies
  - R&D policies
  - A tax break on R&D expenditures
  - Public procurement for innovation, etc, etc

Uncertainty and timing

- Firms perform least efficiently with regard to **new** activities, where uncertainty and risk are large.
- Uncertainty is largest for innovation in **new** fields.
- Large-scale and radical technological shifts rarely take place without public intervention.
- A **minor** intervention at an **early** stage in the innovation process may have a very large impact. A **major** effort at a **mature** stage may have only a small impact.

Implications

- Public resources are limited.
- Public action should **not duplicate** private action – but supplement it. = **additionality** should be sought!
- Hence innovation policy should focus on **new** fields: it should serve as a **midwife** – not provides support towards the end of life.

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