Legitimation and effects of mission-oriented innovation policy: A spillover perspective

Matthijs Janssen
Introduction

• R&D policy is commonly legitimized by the existence of spillover externalities
• R&D policy and STI policies are evolving into ‘mission-oriented innovation policy’ (MIP)
• MIP is systemic, cumulative and directional
• MIP involves firms in collective transformations

What spillover externalities may we expect?
Emerging mission-oriented policies

Overall outlines of ‘the rise of MIP policy’: (Mazzucato, 2018; Schot & Steinmueller, 2018; Foray, 2019, …)

• Evolution from generic to specific policy
• Targeted at ‘grand societal challenges’
• Innovation as one part of the solution
• Policy for socio-economic transformation
• “Systemic, preferential, experimental, adaptive”

Which MIP types (steps and their key features)?
<table>
<thead>
<tr>
<th><strong>Objective / Policy priority</strong></th>
<th>R&amp;D policy</th>
<th>Mission-oriented R&amp;D policy</th>
<th>Mission-oriented innovation policy</th>
<th>Mission-oriented policy</th>
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</thead>
<tbody>
<tr>
<td><strong>Boost innovative economic activity</strong></td>
<td>Boost innovative economic activity with wider societal impact</td>
<td>Spur complementary innovative solutions to societal problems</td>
<td>Search solutions, with or without innovative market parties</td>
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<tr>
<td><strong>Rationale</strong></td>
<td>Market failures</td>
<td>Same, especially coordination failures. + System failures (NIS)</td>
<td>System failures (TIS) / directional failures / etc.</td>
<td>Transition failures</td>
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<tr>
<td><strong>Mechanism</strong></td>
<td>Push: Generic innovation policy</td>
<td>Push: Targeted innovation policy</td>
<td>Push-Pull: Demand-driven innovation policy / programs</td>
<td>Disentangle challenges into underlying problems</td>
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<tr>
<td><strong>Transformation focus</strong></td>
<td>Knowledge creation</td>
<td>Novelty creation</td>
<td>Novelty implementation + institutional change</td>
<td>Institutional change</td>
</tr>
<tr>
<td><strong>Responsibility</strong></td>
<td>Industry (or science; not both)</td>
<td>Industry-science complex</td>
<td>Triple helix coordination</td>
<td>Policy makers + citizens + societal parties</td>
</tr>
<tr>
<td><strong>Governance</strong></td>
<td>Via policy execution agency</td>
<td>Priority setting (Top-down, or bottom-up)</td>
<td>Facilitate collective roadmap development (“top-down-bottom-up”)</td>
<td>Wicked = organize debate; Non-wicked = Project mgmt., procurement</td>
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<tr>
<td><strong>Suitable instruments</strong></td>
<td>Tax credits</td>
<td>Norms, subsidies, vouchers</td>
<td>Purchasing (PPI), regulation, spurring broad interaction</td>
<td>Public discourse, nudging, prizes, contests</td>
</tr>
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<td><strong>Monitoring</strong></td>
<td>R&amp;D expenditure, patent rate, etc.</td>
<td>Do R&amp;D and innovation efforts follow priorities?</td>
<td>Are regime pressures converging and cumulating?</td>
<td>Are we reaching the actual goals?</td>
</tr>
<tr>
<td><strong>Challenges</strong></td>
<td>Trickling down of knowledge production</td>
<td>Accumulation of inventions</td>
<td>Conflicting solution paths, market distortion</td>
<td>Identifying urgent + manageable problem</td>
</tr>
<tr>
<td><strong>Examples (NL)</strong></td>
<td>WBSO, Patent box</td>
<td>Valorisation grant, Topsector policy</td>
<td>Catalytic SBIR, Launching customership</td>
<td>Direct SBIR, National science agenda</td>
</tr>
</tbody>
</table>
Spillovers as a policy rationale

• Spillovers = innovation-based value benefitting other parties, without full compensation

• Innovation *externalities* (Breschi & Lissoni, 2001): not just unintended, but incomplete appropriation

• Implication: private returns below social returns

• Policy for *internalizing* externalities: e.g. via protection (IP) and/or compensation (subsidies)

• From an innovation systems and industrial policy perspective: policy for *augmenting* spillovers. 
  **But which ones?**
Different types of spillovers

Rent spillovers (Grilliches, 1992)

- Innovation-induced value not fully charged in prices ("customer surplus not entirely captured")
- Inherent uncertainty of innovation obscures how customers will use it $\Rightarrow$ Exaptation

Policy response targeted at strong competition, asymmetric information, transaction costs, etc.
Different types of spillovers

**Business stealing** (Bloom et al., 2013)

- Firms using their innovation to capture a disproportional large share of the market.
- The R&D investor appropriates more than it creates; it is a *negative spillover* (good for the firm, bad for society)

*Policy response*: competition law
Different types of spillovers

Knowledge spillovers (Hall et al., 2009; Aghion & Jaravel)

- ‘Technical’ knowledge (stemming from e.g. research, production, usage) informing others on how to do something. *Codified* or *tacit*.
- *Public good* nature if not protected $\rightarrow$ Imitation
- Leakage of knowledge can cause positive or negative *product rivalry effect* (Bloom et al., 2013)

Policy response targeted at protection and compensation
Different types of spillovers

Absorption externalities (Bye et al., 2011)

- Unaccounted improvements in absorptive capacity → Enhanced ability to receive and use spillovers (Cohen and Levinthal, 1989)

Network trust

- Unaccounted improvements in reputation and partnership possibilities

Policy response: capacity + system building
Different types of spillovers

**Information externalities** (Hausmann & Rodrik, 2002)

- ‘Commercial’ knowledge informing others on the existence of some unfulfilled demand.
- Typically the result of self-discovery processes.
- *Public good* nature $\rightarrow$ Imitation (‘crowding in’)

**Policy response:** *new industrial policy* driving bottom-up entrepreneurial experimentation (Rodrik, 2004)

- Also: *green industrial policy* (Rodrik, 2014)
Different types of spillovers

Coordination externalities (Rodrik, 2004)

- Collective benefits due to *complementarities* between innovation activities (private & public)
  - Regime pressures, infrastructure, regulation, etc.

- Firms yield more than they can appropriate; (selfish?) contributions to niche development → system transformation as a *club good*.
  - Similar to ‘supply-side’ network externalities, or adoption externalities (Arthur, 1983; Foray, 2019)

Policy response: transformative innovation policy (Weber & Rohracher, 2012; Schot & Steinmueller, 2018)
An integrated spillover framework

- Coordination (adoption) externalities
- Information externalities
- Business stealing
- Rent spillovers

• Knowledge spillovers (specific)
• Knowledge spillovers (generic)

R&D (process) → Innovation (output) → Turnover (outcome)

Appropriated value

Mission policy
Mission-oriented innovation policy
Mission-oriented R&D policy
R&D policy
Empirical illustration (case study)

How are the various spillover types dealt with?

- **‘Technology Push’**
  - Valorisation Grant (n = 170)
    - Grant for further development of academic inventions with commercial and societal potential
    - → Mission-oriented R&D policy
  - SBIR Catalytic (n = 65)
    - Government uses calls to support sets of innovation projects reducing the need for public services
    - → Mission-oriented innovation policy
  - SBIR Direct (n = 41)
    - Government uses calls to support innovation projects aimed at improving its own public services
    - → Mission policy

- **‘Demand Pull’**

Appendix of this presentation
Discussion

(In)consistencies rationale vs. spillovers

• Mission-oriented R&D: mostly new knowledge
• M-o innovation policy: transformative effects
• Solution policy: just incidental (‘local’) adoption?
  → Solution-focus can hamper scaling up?
  *MIP-related policy myopia*

• New positioning expects even more transformation, without policy changes
  → *MIP-related policy drift*
Discussion

The relation between MIP approaches

- **Evolution** of innovation policies
  - From R&D policy to mission-oriented innovation programs, or ‘working back’ from solution-oriented policy?

- **Extension** of innovation policies
  - Complementarities in the policy mix?
Janssen, Hekkert & Frenken (2019)
Conclusions

- Parallel literatures on MIP and spillovers. *Spillovers matter when MIP involves markets.*
- STI policies evolving into MIP correspond with *broader range of relevant spillover types*
- Case study: not evident that new policies address and monitor the appropriate set of spillovers, fitting their rationale → *MIP policy myopia & MIP policy drift*

- Further research: Combination of MIP types?
  - Also: measurement of (neglected) spillovers
Thank you!

M.j.janssen@uu.nl / janssen@dialogic.nl
Mission-oriented Innovation Policy Observatory

Societal challenges

Missions (goals+ambitions)  Mission Governance  Mission-oriented Innovation Policy

Transformative governance

Innovation system

Innovation paths

Innovation paths

Catalytic functions
Empirical illustration

*How are the various spillover types dealt with?*

**Case study: Dutch SBIR schemes**

- *Valorisation Grant*
- Public Procurement of Innovation (PPI)
  - *Catalytic SBIR*
  - *Direct SBIR*

- >20 interviews
- 267 survey responses
Empirical illustration: spillovers

To what extent do you regard your project as an experiment at the frontier of a broader innovation path?

Answer: "To a reasonable/large extent"
Empirical illustration: spillovers

Do other parties already provide products/services based on your project?

Answer: "To a reasonable/large extent"

- Valorisation Grant: 47%
- Catalytic SBIR: 67%
- Direct SBIR: 43%
Empirical illustration: spillovers

Contributions to innovation development/adoPTION
(Answer: “To a reasonable/large extent”)

- Driving relevant knowledge development
- Enhancing knowledge exchange
- Boosting market formation
- Creation of public legitimacy
- Removing legal barriers
- Improving government policies

Valorisation Grant  Catalytic SBIR  Direct SBIR