1st Learning Pillar: Innovation Policy-Mix for Advanced Manufacturing

ORKESTRA
Basque Institute of Competitiveness
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THE CONCEPT
Innovation Policy-Mix

A definition

“The combination of policy instruments, which interact to influence the quantity and quality of R&D investments in public and private sectors”

Nauwealers (2009)

- It is more than a portfolio of instruments
- Needs clarification about the concept of instruments itself:

Policy tools or government instruments can be defined as: (T)he actual means and or devices governments have at their disposal for implementing policies, and among which they must select in formulating a policy. (Howlett and Ramesh, 2003).

Types of policy instruments:

- Economic
- Regulatory
- Soft

Supply or demand side
Innovation Policy-Mix

In this context, evaluation needs to evolve from capturing the effects of a single instrument to analysing the effects of a combination of instruments, which has implications on the governance of the evaluation.

**Types of combination**

<table>
<thead>
<tr>
<th>Relation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precondition (P)</td>
<td>Defined as a relation that is strictly required for the successful implementation of another policy measure. For instance, if policy measure B is a precondition to policy measure A, the successful implementation of policy measure A can only be achieved if policy measure B is successfully implemented beforehand. The precondition relation is a direct relation.</td>
</tr>
<tr>
<td>Facilitation (F)</td>
<td>In a case where a policy measure ‘will work better’ if the outcome of another policy measure has been achieved, the relation is considered as a facilitation relation. For instance, policy measure B facilitates policy measure A when policy measure A works better after policy measure B has been implemented; however, policy measure A could still be implemented independently of policy measure B. The facilitation relation is also a direct relation.</td>
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<tr>
<td>Synergy (S)</td>
<td>A special case of facilitation relation in which the ‘will work better’ relation is bidirectional (undirected relation). It can be argued that such a relation can be treated as a two-way facilitation; however, we believe that treating this relation as a separate type is advantageous, as it suggests a higher effectiveness of both of the policy measures having the synergetic relation vis-à-vis the overall policy.</td>
</tr>
<tr>
<td>Potential contradiction (PC)</td>
<td>A potential contradiction exists between policy measures if the policy measures produce conflicting outcomes or incentives with respect to the policy target under certain circumstances, hence the contradiction is ‘potential’. This relation is undirected.</td>
</tr>
<tr>
<td>Contradiction (C)</td>
<td>In contrast to the conditional nature of potential contradiction, the contradiction relation is defined when there are ‘strictly’ conflicting outcomes or incentives between policy measures. Similar to the potential contradiction relation, this relation is undirected.</td>
</tr>
</tbody>
</table>

**Source:** Taeihag et al. 2013

**Types of interaction**

- PRECONDITION
- FACILITATION
- SYNERGY
- POTENTIAL
- CONTRADICTION
Innovation Policy-Mix

Dimensions than impact on a certain system/territory

Source: Magro and Wilson (2013)
Innovation Policy-Mix in the framework of RIS3: Implication for AM strategies.

*Importance of two dimensions*

01 Verticality of policy mixes among different levels, which varies from the presence of different instruments (a policy-mix) from a single administrative level, to the presence of different instruments from different administrative levels. (Multi-level governance)

02 Directionality of policy mixes in terms of regional priorities, which varies from the presence of neutral instruments (a policy-mix that doesn’t seek to influence the direction of innovation by prioritising specific activities/sectors/clusters), to the presence of instruments that seek to influence the directionality of innovation.

Source: Magro & Wilson (2016)
BEST PRACTICES ON POLICY-MIXES FOR ADVANCED MANUFACTURING
Regional approaches to policy-mixes: an overview.

Innovation policy-mixes for AM are conditioned by regional approaches to policy-mixes

Regional differences with regards policy-mixes:

**FOCUS ON BUSINESS SUPPORT**

- Grants, loans and venture capital to support business innovation (DE, FR, AT, BE, ESP, IT, most regions in UK). Low share of European funds.

**FOCUS ON SCIENCE-INDUSTRY COLLABORATION**

- Mainly grants and larger share of EU funds (DE, IT, FR, NL, SE, CZ, GR).

**FOCUS ON INNOVATION CLIMATE AND ECOSYSTEM**

- Large share of EU funds. Grants, loans and venture capital (IT, FI, FR, DK).

**PUBLIC R&D INVESTMENTS AND COMPLEMENTARY ACTIVITIES**

- Notable share of EU funding. Focus on grants and support on public R&D complemented by business R&D and science-industry collaboration (IT, ES, SE, FR, HU, PL).

**HOLISTIC APPROACH, INCLUDING SOCIAL CAPITAL.**

- Less developed regions that focus on business R&D and innovation complemented by other measures. Mainly by grants (IT, ES, HU, PL).

**CONVERGENCE CLUSTER**

- High rate of EU funds. Only use of grants and main focus on business R&D and innovation.

*Source: Kroll (2016)*
Regional approaches to policy-mixes: an overview.

Innovation policy-mixes for AM are conditioned by regional approaches to policy-mixes (II)

**Typology of regions**

**Effective innovation policy-mixes seem to combine:**

- Direct and indirect measures for R&D in firms (subsidies plus tax incentives) (Cunningham et al., 2012)
- Instruments that combine technology push and pull (supply and demand side) for specific domains/technologies (Buen, 2006) over time.

**Source:** Kroll (2016)
Understanding challenges for Advanced Manufacturing.

*Specific challenges related to Advanced Manufacturing plus traditional problems and failures related to innovation (uncertainty, lack of collaboration industry/science), justifies the need of a policy mix in this area.*

**Barriers for the adoption of Advanced Manufacturing Technologies by users**

1. High cost of investment for AMT acquisition and lack of financial resources
2. Difficulty to assess the performance of AMT and its business return
3. Lack of skilled personnel to integrate and use AMT
4. Market uncertainty and turbulence

**Barriers for the adoption of Advanced Manufacturing Technologies by producers**

1. Lack of understanding of customers' precise needs
2. Lack of resources to reach out to customers more actively
3. Technologies not mature enough, technical reliability issues
4. Lack of access to potential customers

Source: Kroll et al. (2016)

Policy instruments for Advanced Manufacturing.

Examples of best practices of instruments for Advanced Manufacturing still focus on individual instruments and not on policy-mixes approaches.

Types of measures for overcoming these barriers

Examples of best practices at different levels

<table>
<thead>
<tr>
<th>Shortcomings derived from critical analysis</th>
<th>Regional Level</th>
<th>National Level</th>
<th>European Level</th>
<th>Outside the European Union</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fragmented policy actions</td>
<td>Innovation Voucher (Lombardy)</td>
<td>Cluster Fabbrica Intelligente (Italy)</td>
<td>INNOSUP</td>
<td>Made In China 2025</td>
</tr>
<tr>
<td></td>
<td>GLOBALmit (Central Denmark)</td>
<td>RobotstartPME (France)</td>
<td>INTERREG IV</td>
<td></td>
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<td></td>
<td>VINC (Salzburg)</td>
<td>ActPhast</td>
<td>INTERREG MED</td>
<td></td>
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<tr>
<td>Limited number of Initiatives for uptake of AMT in SMEs</td>
<td>RENOVA Maquinaria (Basque Country)</td>
<td>SIRIR</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Robotics (France)</td>
<td>STTR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Difficulty in access to pilot infrastructure</td>
<td>Vanguard Initiative</td>
<td></td>
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</tr>
<tr>
<td>Lack of mid-range universities linked to SMEs</td>
<td>DHBW (Baden-Württemberg)</td>
<td>Steinbeis (Germany)</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Friedrich (Germany)</td>
<td></td>
<td>MEP</td>
<td></td>
</tr>
</tbody>
</table>

Most Pressing Need for Policy (and other) Support

- Developing skills for advanced manufacturing
- Improve collaboration between science and industry
- Accompanying actions for companies in transition towards factories of the future
- Upgrade regional firms technological capacities to EU28 standards


Source: Kroll et al. (2016)
Policy instruments for Advanced Manufacturing.

The type of region and industry condition the focus of policy in AM

Typology of regions and instruments:

- **High R&D intensity**
  - Innovative-business & public-research-oriented (BERD > 1.2%; GOVERD > 1% GDP)
  - No. of Regions: 16
  - Focus of policy on excelling cooperation to reinforce leadership. Promotion of companies cooperation
  - BQ, Piadmont, Wales

- **Moderate R&D intensity**
  - (BERD < 1.25; > 0.6% GDP)
  - No. of Regions: 16
  - Focus of policy on market-pull instruments, transnational cooperation and vertical oriented instruments to generate critical mass

- **Low R&D intensity**
  - (BERD < 0.6% GDP)
  - No. of Regions: 41
  - Focus on levering innovation in the regions. Development of a comprehensive policy-mix for innovation

Source: Walendowski and Rivera León (2014)
Best practices of innovation policy portfolios for AM. Examples of best practices of policy portfolios combine public-private support and go beyond traditional R&D instruments.

**NEED TO COMBINE INSTRUMENTS TARGETING DIFFERENT INNOVATION RESULTS**

**Factory of the future: Flanders**

1. Intake / Ambition level
2. 0-audit
3. Design new production process IWT 3 mio €
4. Start execution
5. FoF-Audit
6. Competitive-position

Last steps are non-government funded: Valley of Death.

**LimburgMarkets programme**

<table>
<thead>
<tr>
<th>Service</th>
<th>Percentage</th>
<th>Amount</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Voucher</td>
<td>100% of 75%</td>
<td>€5,900</td>
<td>€8,850</td>
</tr>
<tr>
<td>Feasibility</td>
<td>35%</td>
<td>€15,000</td>
<td></td>
</tr>
<tr>
<td>Innovation Manager</td>
<td>35%</td>
<td>€20,000</td>
<td></td>
</tr>
<tr>
<td>Innovation Project</td>
<td>35%</td>
<td>€20,000</td>
<td></td>
</tr>
<tr>
<td>Performance Consult</td>
<td>35%</td>
<td>€5,000</td>
<td></td>
</tr>
<tr>
<td>Innovation Assistance</td>
<td>100%</td>
<td>€15,000</td>
<td></td>
</tr>
</tbody>
</table>

Source: RIM Plus thematic paper, European Commission, 2014

**WALES AS A BEST PRACTICE OF POLICY MIX**
INNOVATION POLICY-MIX IN THE MANUMIX REGIONS
A DEEPER UNDERSTANDING OF THE SITUATION IN EACH REGION (MINI-MIX)
Basque Country

Some highlights about the specific instruments and the innovation policy-mix for Advanced Manufacturing

- Large portfolio of instruments from different levels
- Business-oriented policy-mix but also emphasis on R&D collaboration
- Predominance of direct instruments (e.g. grants for R&D projects) and economic instruments (complementarity with other policies (i.e. cluster policies)
- Some instruments implemented through Ministerial Agreements (multi-level approach)
- Instruments directed to Advanced Manufacturing also at sub-regional level
- Strong focus on direct measures (grants and loans) targeting firms (mainly SMEs)
- Instruments have different and complementary objectives, covering a whole range of TRLs from TRL 1 to TRL 7)
Basque Country

Policy Mix description

HAZITEK
Collaboration & R&D investments. Grants

GAUZATU
Investments. Loans

BASQUE INDUSTRY 4.0
Incorporation of ICT. Subsidies

Hazitek
Facilitation/ Unintentional

Gauzatu
Facilitation/ Unintentional in the design/ Intentional in the implementation

Basque Industry 4.0
Facilitation/ Unintentional
Lithuania

Some highlights about the specific instruments and the innovation policy-mix for Advanced Manufacturing

- Research institutes and universities oriented policy-mix (also firms are beneficiaries)
- Predominance of direct instruments (i.e. grants)
- Horizontal instruments but advanced manufacturing is one of the selecting criteria.
- Strong focus on direct measures targeting research organisations
- Instruments have different and complementary objectives and try to cover high TRLs (commercialisation of R&D)
- High dependence of EU funding
Lithuania

Policy Mix description

Promotion of act. of centres of competence and centres for innovation and technology transfer (I)

Promotion of act. of centres of competence and centres for innovation and technology transfer (II)

Facilitation/Intentional

Commercialization of R&D

Capacity building. Grants

Promotion of act. of centres of competence and centres for innovation and technology transfer (I)

Promotion of act. of centres of competence and centres for innovation and technology transfer (II)

Facilitation/Intentional

Tech transfer activities. Grants

Commercialization of R&D

Tech transfer outputs. Grants

Grants

Grants

Grants
Piedmont

Some highlights about the specific instruments and the innovation policy-mix for Advanced Manufacturing

- Business-oriented policy-mix
- Predominance of direct instruments (e.g. grants for collaborative R&D projects) and linkage instruments.
- Some instruments implemented through Ministerial Agreements (multi-level approach)
- Combination of horizontal instruments specially aimed at the R&D collaboration domain with instruments specially aimed to Advanced Manufacturing
- Strong focus on direct measures (grants and loans) targeting firms (mainly SMEs, but also big companies)
- Instruments have different and complementary objectives, their rationale is to establish a policy mix supporting the whole process, from R&D to industrial investment. But the TRLs that cover the four first programmes are the same (from TRL 4 to TRL 7)
# Piedmont

**Policy Mix description**

<table>
<thead>
<tr>
<th>Collaboration. Grants</th>
<th>Facilitation/ Intentional</th>
</tr>
</thead>
<tbody>
<tr>
<td>IR2 - Industrializzazione dei risultati della ricerca</td>
<td>POLI D'INNOVAZIONE</td>
</tr>
<tr>
<td>Collaboration. Grants</td>
<td>Facilitation/ Intentional</td>
</tr>
<tr>
<td>POLI D'INNOVAZIONE</td>
<td>Sinergy/Intentional</td>
</tr>
<tr>
<td>Collaboration. Grants</td>
<td></td>
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<tr>
<td>PROGETTI ERANET</td>
<td>Sinergy/Intentional</td>
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<tr>
<td>Collaboration. Grant+ soft loan</td>
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<tr>
<td>Fabbrica Intelligente – Technology Platform</td>
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<tr>
<td>Collaboration. Grant+ soft loan</td>
<td></td>
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<tr>
<td>INNOVAZIONE MPMI</td>
<td>Facilitation/ Intentional</td>
</tr>
</tbody>
</table>

- **Reducing costs. Loans**
Wales

Some highlights about the specific instruments and the innovation policy-mix for Advanced Manufacturing

- Business-oriented policy-mix
- Predominance of direct instruments (e.g. grants for collaborative R&D projects) and economic instruments (except PPI)
- High dependence of EU funded and some links with national instruments (PPI-SBFI)
- Combination of horizontal instruments although AM is a priority area that is prioritised
- Strong focus on direct measures (grants and loans) targeting firms (mainly SMEs, but also big companies)
- Instruments have different and complementary objectives and cover from R&D to commercialisation activities
Wales

Policy Mix description

<table>
<thead>
<tr>
<th>Smart Cymru</th>
<th>Smart Innovation</th>
<th>Smart Expertise</th>
<th>Smart Partnerships</th>
<th>SBRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>R&amp;D Investment. Grants + Vouchers</td>
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</tr>
<tr>
<td>Smart Innovation</td>
<td>Sinergy/Intentional</td>
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<td>Collaboration. Grants</td>
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<tr>
<td>Smart Partnerships</td>
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<tr>
<td>Collaboration. Grant+ soft loan</td>
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<tr>
<td>SBRI</td>
<td>Facilitation/Unintentional</td>
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</tr>
</tbody>
</table>

Promoting innovation. Regulation (PPI)
CONCLUSIONS
Conclusions

- Different contexts and approaches to advanced manufacturing lead to different policy-mixes.
- Instruments implemented in a region/country are dependent on many factors, such as the industrial structure, the dependence of EU funding, the devolved competences (verticality of instruments) and the instruments historical roots (path dependency).
- Directionality has been included in all regions as a feature in policy instruments (with d).
- Regional policy-mixes have a strong focus on economic instruments but also includes soft (linkage) ones.
- Innovation policy-mixes are often designed in a intentional manner and facilitation tends to be the most usual target effect but it is also perceived unintentional effects.
- However, there is a need of evaluating policy-mixes so this facilitation/complementarity or even sinergy can be captured for policy learning purposes.
Thank you!

Questions welcome