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Annamária Inzelt DSc
IKU Innovation Research Centre at FR Co. and University of Szeged, Hungary
Email: annamaria.inzelt@uni-corvinus.hu
inzelt.annamaria@penzugykutato.hu
Why the linkages are important for Tajikistan?

Weak or absent linkages between S & E actors challenge the firms and farms

- *to overcome* on technology-related, managerial and so on problems,
- *to involve* in adaptation-based innovations,
- *to assist* to potentially innovative firms

Why ESLs instead of ISLs?

- Innovation in agricultural sector may have a high economic impact, owing to the sector’s significant overall weight
Outline of the Chapter

I. Government towards facilitating ESLs

II. Economic and Science actors for ESLs

III. ESLs in the practice (stock taking of early stage)

IV. Recommendations
Government towards facilitating ESLs

- Legal provisions and institutional mechanisms concerning technology transfer between science and industry

- Legislation for
  - transforming scientific organizations (HEIs, Academy, Tech Parks)
  - business organizations (State Protection and Business Support, Public Procurement)


- Regulation and impact of existing IPRs

- Policy targets needed for ESLs (Initial steps in ESLs and TT)
Economic and Science actors for ESLs

- Role of ESLs in development
- HEIs for ESLs
- The Academy as a Science actor
- Science parks/technoparks (Technoparks at universities, Innovation Centers at the Academy of Sciences)
Science organisations (HEIs, Academy): multi task organisations

1st Mission Education
2nd Mission Research
3rd Mission Collaboration with economy and society

The main role of ESLs if the innovation mainly adaptation based:
To make the education and research activities more useful to society
- Provide well educated people with up-to-date knowledge
- Involve in train and retrain labour force supporting modernisation
- Support and strengthen the adaptation capabilities of firms with various R&D services
- Beyond exploitative and imitative research involve in exploratory research for future innovations
Innovation and firms R&D capacity

- R&D intensive sectors / firms are rare birds in developing, low innovative countries
- Firms in the medium- and low-tech sectors have some R&D capabilities in developed countries which help to search for and acquire knowledge produced outside the company

In Tajikistan the knowledge receptive, absorption capabilities are very weak at technically obsolete firms and at agricultural farms where productivity is low and, in some fields, actually decreasing.

Improve *adaptation-based innovation capabilities*
Illustrating few actors
## Taking stock of early stage ESLs by four dimensions of 3rd mission

### Dimension: Human resources

<table>
<thead>
<tr>
<th>HEIs</th>
<th>Academy</th>
</tr>
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<tbody>
<tr>
<td>PhD students:</td>
<td></td>
</tr>
<tr>
<td>- Supported by industry/agriculture</td>
<td>No</td>
</tr>
<tr>
<td>- Contract with industry/agriculture</td>
<td></td>
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<tr>
<td>- Going to industry/agriculture before/after degree</td>
<td></td>
</tr>
<tr>
<td>- Joint supervision of PhD and master theses by university/academy and firm members</td>
<td></td>
</tr>
<tr>
<td>Students (any level) supported by industry/agriculture</td>
<td>No</td>
</tr>
<tr>
<td>Practical training at firm/agricultural farm during education</td>
<td>Yes</td>
</tr>
</tbody>
</table>
## The existing forms of E(I)SLs

<table>
<thead>
<tr>
<th>Dimension: Intellectual property</th>
<th>HEIs</th>
<th>Academy</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Active patents owned by univ./academy</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>• Joint IPRs by university professors / researchers of Academy &amp; firm empl.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patents produced by faculty members, students /researchers at Academy</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Returns for the university; licences from patents, copyright</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Proactive policy (patent office, transfer office)</td>
<td><strong>Preparatory phase</strong></td>
<td></td>
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</tbody>
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## The existing forms of E(I)SLs

<table>
<thead>
<tr>
<th>Dimension: Spin-offs</th>
<th>HEIs</th>
<th>Academy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presence of techno-parks, science parks</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>• Spin-off firms funded by universities /Academy</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>• Presence of incubators</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>• Incentives for firm creation</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>• Seed capital funding</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
### The existing forms of E(I)SLs

<table>
<thead>
<tr>
<th>Dimension: Contracts with industry</th>
<th>HEIs</th>
<th>Academy</th>
</tr>
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<tbody>
<tr>
<td>Contractual, formal R&amp;D cooperation for knowledge acquisition</td>
<td><strong>Yes</strong></td>
<td><strong>Yes</strong></td>
</tr>
<tr>
<td>Ad hoc partners acquiring university / Academy research</td>
<td><strong>Yes</strong></td>
<td><strong>Yes</strong></td>
</tr>
<tr>
<td>• Formal R&amp;D cooperation for joint research projects</td>
<td><strong>No</strong></td>
<td><strong>No</strong></td>
</tr>
<tr>
<td>• Access to special equipment of firm/university/Academy (with or without assistance)</td>
<td><strong>No</strong></td>
<td><strong>No</strong></td>
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Lessons of the Rewieving ESLs

- **Currently** few ESLs exist in Tajikistan → limited economic effects in short-term

- **For the long-term future**: worth to invest in S and in nurturing ESLs with a focus on:
  - developing lacking TT & commercialization capabilities

- Low demand for innovation is a persistent challenge – **business interest in innovation** is crucial to ESLs

- **Adaptation-based innovation** may facilitate a *shift in import structure* from goods to capabilities and *attract FDI with increased* transfer of modern technology, and marketing and organisational techniques
Recommendation 1:

Innovation policy should seek
- to strengthen adaptation-based innovation capabilities by encouraging ESLs, and
- support the demand for novelty
Recommendation 1 in details: The authorities should consider:

- Moving away from isolated ESLs via government actors towards facilitating direct collaboration between industrial / agricultural and science actors;
- Investing in education and training capabilities at HEIs for both adaptation- and research-based TT by channeling donor and FDI-related training programs (see also 4.5) and encourage University professors to lecture at companies, discuss topics of mutual interest;
- Introducing direct incentives for encouraging business firms, farms and regional authorities to establish or broaden Ls with science and allocate sufficient financial resources to incentivize business firms;
- Offering special incentives for FDI to use local science capabilities, either accompanying technology transfer or acquiring inventions (see also 4.3 and 4.5).
Recommendation 2:

Since adaptation-based innovation is crucial for the country, innovation policy should devote attention to

- foreign technology transfer related ESLs
- as well as commercialization of domestic scientific results.
Recommendation 2 in details: The authorities should consider the following measures:

- **Facilitating the employment by scientific organizations of experienced (foreign) TT managers on a temporary basis**
  - to organize *on-the-job training*, and *develop revenue sources*
  - to *upgrade their physical and personnel capabilities and improve their commercial attractiveness*;

- **Reclassifying techno-parks from non-commercial organizations to not-for-profit organizations**, strengthening their rights to sell their products; and

- **Providing specific support to ESLs most likely to lead to successful adaptation, and penetration of foreign technology either through imports or FDI.**
Recommendation 3:

Make efforts on medium- and long-term to reach internationally accepted scientific performance in areas of economic and social priority
Recommendation 3 in details: The authorities should consider:

- A thorough evaluation of Tajikistani scientific performance and capabilities in existing fields (R&D organizations/departments) by international standards, shifting resources away from low priority areas of weak performance;

- Based on the evaluation, continued support for relatively strong fields where a critical mass of intellectual capacity is available or may be achieved within a few years;

- Developing new strategies for important fields for the Tajikistani economy, where current physical research infrastructure is outdated but with good intellectual capacities; and

- Developing new legal and organizational forms for institutes that need to transform into TSIs in either a for-profit or not-for-profit;

- Expanding competitive funding for R&D and making it conditional on the establishment of collaborative linkages between S-E (see also 2.5).
Recommendation 4: In order to improve access for businesses to understandable information on the research capabilities, activities and results of science organizations as a basis for identifying and realizing the potential for enterprise-science cooperation, the authorities should consider the following actions:

- Relevant ministries can organize a series of workshops where economic and scientific actors discuss relevant topics;
- Organization of events to upgrade knowledge of scientific performance and options for their applications targeting policymakers, civil servants, business people, students and the general public;
Recommendation 5: There is a need in the medium to long-term to increase IPR consciousness, and authorities should consider:

- Increasing IPR awareness among researchers, professors, students and scientific organizations generally;

- Specific training efforts for technology transfer managers;

- Training support for specialists in intellectual property with special attention to the staff of patent attorneys;

- Support for domestic inventors as well as for patenting abroad;

- Developing indicators for the TBPs for Tajikistan, which would be a useful tool for policymakers seeking to diminish the imbalance in licensing, knowhow and other invisible trade.
Thank you for your kind attention!

Students’ inventions for learning