Firms and universities: a Portuguese view

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Portugal

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1. Portugal: improve resource allocation and productivity growth
   • Firms produce to profit and to remunerate investment
     o Most SMEs lack the needed resources (human capital, financing, know-how) to make in-house applied and experimental research

2. There is a gap between firms and universities:
   • Universities have a different aim (besides education):
     o To produce knowledge: fundamental and applied research

3. How to connect them: common interest, market driven research, and appropriated public policy
   • Positive externalities justify innovation and R&D policies
     o As long as these externalities are correctly addressed
   • Market failure in terms of coordination amongst economic agents
1 - Firms

Too few firms with more than 50 employees in Portugal, half (% of the total) of the EU28 average, one third of the UK and Ireland or one fifth of Germany.

Source: European Commission
1 - Firms

Portuguese firms: Lower level of expenditure in R&D

![Business Expenditure on R&D (% of GDP)]

Source: OECD
Firms represent less than half of total R&D expenditure (47.1%)

Source: OECD
Researchers are too concentrated in the state sector (businesses: 29%)
• 11,784 in firms, for a total of 38,672 (2015 - FTE)
1 - Firms

Portugal: insufficient international patenting

Number of patent applications per 1,000 researchers (FTE) (Patent Cooperation Treaty)

Source: OECD
## 1 - Firms

Technological receipts: **Portugal is improving, but still a long way to go**

### Technological receipts in % of GDP

<table>
<thead>
<tr>
<th>Country</th>
<th>2014</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Netherlands</td>
<td>7,06</td>
<td></td>
</tr>
<tr>
<td>Sweden</td>
<td>4,77</td>
<td>2,51</td>
</tr>
<tr>
<td>Finland</td>
<td>4,24</td>
<td>1,76</td>
</tr>
<tr>
<td>Hungary</td>
<td>3,62</td>
<td>1,44</td>
</tr>
<tr>
<td>Belgium</td>
<td>3,59</td>
<td>1,78</td>
</tr>
<tr>
<td>Austria</td>
<td>3,02</td>
<td>1,54</td>
</tr>
<tr>
<td>Denmark</td>
<td>2,39</td>
<td>1,75</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>1,96</td>
<td>0,66</td>
</tr>
<tr>
<td>Estonia</td>
<td>1,85</td>
<td>0,55</td>
</tr>
<tr>
<td>Portugal</td>
<td>0,87</td>
<td>0,23</td>
</tr>
<tr>
<td>Greece</td>
<td>0,43</td>
<td>0,14</td>
</tr>
</tbody>
</table>

**Memo:**
- Ireland: 28.91
- Portugal: 10.18

Source: OECD
Apparently, there is a good complementarity in research

- Total expenditure in R&D: fundamental 23%, applied 40%, experimental 37%
Portugal is converging in the level of education...

- Expenditure in tertiary education (2013): Portugal and EU average (1.4% of GDP)

**Level of education in Portugal and in the EU core**

**Employed population (15-64 years) with tertiary education (%)**

- Gap 8,2 p.p.

**Age Group 55-64 years**

- Gap 15,0 p.p.
- Gap 13,0 p.p.

**Young people with tertiary education attainment (%)**

- Gap 0,3 p.p.

2 – Firms and universities

... It is growing faster in Social sciences and Humanities: now almost half of new PhD’s in Portugal (45%) and of new graduates with tertiary education (45% – 2015/16)
2 - Firms and universities

• PhD’s per scientific area (2012)
  o Social and Humanities: 36%

<table>
<thead>
<tr>
<th>PhD's per scientific domaine</th>
<th>TOTAL</th>
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<tbody>
<tr>
<td></td>
<td>Nº</td>
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<tr>
<td>TOTAL</td>
<td>24,992</td>
</tr>
<tr>
<td>Exact sciences</td>
<td>4,038</td>
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<tr>
<td>Natural sciences</td>
<td>3,591</td>
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<tr>
<td>Engineering and technology</td>
<td>4,773</td>
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<tr>
<td>Medical and Health</td>
<td>2,808</td>
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<tr>
<td>Agrarian sciences</td>
<td>932</td>
</tr>
<tr>
<td>Social sciences</td>
<td>5,723</td>
</tr>
<tr>
<td>Arts and Humanities</td>
<td>3,128</td>
</tr>
</tbody>
</table>

Incentives are biased for research in social sciences: higher earnings and job security but less market driven work and low mobility.

• University professors (with a PhD): 32,580 (59% - 19,163)

• PhD’s living in Portugal: 24,992 (13% employed as researchers)
  o Tertiary educ.: 82.7% (20.6 th.)
  o State sector: 7.9% (2 th.)
  o Private nonprofit: 5.3% (1.3 th.)
  o Firms: 4.2% (1,050)

• PhD’s at university earn 20% more than at a firm
2 – Firms and universities

The weak link between firms and universities is seen by the small share of SMEs collaborating with research institutions (9% - 2014)

Source: Eurostat and OECD
The weak links between firms and universities is confirmed by the small share of higher education R&D financed by businesses.
Consequence of a weak link between firms and universities: Total factor productivity growth is not sufficient and Portugal is not converging.
3 - Firms and universities: a common interest

**Workshop with stakeholders – Main Conclusions**

a) Weak links between firms and universities

b) Portuguese **firms do not invest sufficiently** in innovation
   - 99.8% are SMEs, a barrier to R&D dissemination
   - No connection with S&T institutions

c) **Universities: market driven research is undervalued**
   - Publications by researchers overvalued, often without evaluation
   - Incentives for researchers to be associated with “start-ups” not sufficiently attractive

d) **Stronger links between firms and universities are thus needed**
   - Matching supply and demand for knowledge, skills and technology
1 – Adequated incentives for universities are needed:

- **Performance based criteria** to evaluate research effects
  - To measure knowledge transfer on a medium to long term basis through e.g. employment creation or sales
  - To differentiate proactive researchers (towards business)
  - To mitigate redundant research and inefficient resource allocation

- **Revision of the labour law**
  - Flexible placement of university researchers in firms (part-time, temporary)
  - Labour contracts in line with society
2 - Firms and universities can jointly prioritize research areas (digital, health, sea, ...) to:

- Market screening to check the need and the desirability of research
- Patent database where research themes are listed in order to
  - Prevent frequent redundancy in research
  - Improve international patenting by Portuguese entities

3 – Joint training by researchers and managers

- Good research is necessary but not sufficient
  - Universities should complement traditional management courses with innovation and technology management
  - Knowledge and Technology Transfer Offices
- For CEOs and Managers on how to bring research to the market
3 - Firms and universities: a common interest

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**Workshop with stakeholders - Suggestions**

4 – Adequated and oriented **financing**
- Given their small size, firms may prefer to get financing for a partnership with researchers rather than receiving it directly
- To finance business ideas from priority areas and not just “ideas”
- To reach an higher Technology Readiness Level

5 - **Digitalization of the economy is an opportunity:**
- Horizontal application to different industries
- Training may strengthen the links between firms and universities
- Digital platform where:
  - Firms may present research questions and problems to universities, in accordance with their business needs
  - Researchers may ask firms their needs in terms of research
Interface: to bridge the gap between firms and universities in “old” and new areas: energy efficiency, circular economy, digitalization, etc.

• To further develop existing partnerships firms-researchers:
  o Formally recognized clusters (20)
  o Research and Technology interface centers (135)
    ▪ Mapping of technological centers, C&T parks, Incubators
    ▪ Support on financing, human resources, new areas
  o New partnership models:
    ▪ Colaborative Laboratories to define and implement a research and innovation agenda and to stimulate scientific employment and international activities
    ▪ Suppliers “clubs” to promote the integration and participation of SMEs in international value chains and ensure better access to technologies and skills.
Thank you!
Research and Technology Interface Organizations

Empowerment of the Research and Technology Interface Organizations: Measures and Intervention Areas

- Multiannual funding
- Funding by activity
- Support to the creation, reinforcement/reorientation of the interface structures
- Support to equipments upgrade

- Teachers and researchers in Higher Education Institutions
- PhDs' holders in companies
- Young technician internships
- International exchange of HR

- Energy efficiency in Industry
- Circular economy
- Industry 4.0

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<thead>
<tr>
<th>Financial instruments</th>
<th>Multiannual funding</th>
<th>Project funding</th>
<th>Human Resources</th>
<th>Equipments</th>
<th>Firms</th>
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<tbody>
<tr>
<td>FITEC European Structural Investment Funds</td>
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RESEARCH AND TECHNOLOGY INTERFACE ORGANIZATIONS

User entities

- Big companies
- Medium companies
- Small and micro companies

Higher Education entities

Interface services differentiation and sophistication level

Technological Infrastructures

- Universities / Polytechniques
- R&D Units
- Interface institutions
- Incubators / Science & Technology Parks
- Engineering Centres
- Technological Centres
COMPETITIVENESS CLUSTERS

• Knowledge and innovation platforms - partnerships and networks that integrate companies, business associations, public entities and relevant support institutions;

• **Goal:** to stimulate and support the emergence and consolidation of strategies of collective efficiency in the Portuguese economy;

• Clusters play a key role in supporting SMEs in their competitiveness strategies and to boost collaborative networks involving S&T and R&D entities;

• Clusters are a key instrument of public policy to implement the smart specialization strategies, diagnosing on the ground the difficulties of companies in a given sector, providing responsible entities with the data needed to design and implement effective policies that benefit business growth.
February 2017: the Portuguese Government recognized 20 clusters in several economic areas: industry, agroindustry and services

- Forest Industries Cluster
- Cluster AEC - Architecture, Engineering and Construction
- Automotive Cluster
- Aeronautic/Space/Defense Cluster
- Portuguese Railway Platform Cluster
- Cluster of Vine and Wine
- Cluster of Petrochemical, Industrial Chemistry and Refining
- Cluster of Competitiveness of Creative Industries
- Footwear and Fashion Cluster

- Cluster of Mineral Resources
- Sustainable Habitat Cluster
- Cluster Smart Cities Portugal
- Cluster Textiles: Technology and Fashion
- Engineering & Tooling Cluster
- Health Cluster Portugal
- AgroFood Cluster
- PRODUCECH - Technologies of Production
- TICE.PT – ICT Cluster
- Tourism Cluster
- Sea Cluster

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<tr>
<th>Financial instruments</th>
<th>Coordination and networking</th>
<th>Project funding / Internationalization</th>
<th>Firms / S&amp;T Institutions / Collaborative projects</th>
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<tr>
<td>SIAC (Portugal 2020)</td>
<td>✓</td>
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<tr>
<td>Structural Funds (financial incentives)</td>
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COLOABS - COLLABORATIVE LABORATORIES

Association or consortium of several national and/regional institutions:
• Research units, higher education institutions, enterprises, intermediate and interface institutions, technology centers, companies, business associations and other relevant partners in the productive, social or cultural area - State laboratories, municipalities, local organizations, hospitals, museums, etc.
• Flexible geometry / Integrated Action Plan / Programmatic funding

Main objectives:
• To define and implement research and innovation agendas aimed at creating economic and social value, including processes of internationalization of the national scientific and technological capacity in relevant intervention area (s);
• To stimulate scientific employment and R & D activities to strengthen synergies with higher education institutions, in particular through specialized, vocational or advanced training programs in close cooperation with social and economic partners.

In preparation the legal framework of this programme
SUPPLIERS “CLUBS”

- Aims to promote the integration and participation of Portuguese companies, especially SMEs, in international value chains;
  
  ➢ More cooperation to ensure better access of SMEs to global markets, technologies and skills.

Mains goals:
- Empowering SMEs to integrate globally competitive and innovative global supplier networks;
- Leveraging the integration of technologies that facilitate adaptation to Industry 4.0 and to the framework of the Circular Economy;
- Promote adaptation to the technological requirements of processes and products that provide specialized know-how, resources and critical knowledge, increased productivity, more flexibility and higher product quality;

In preparation the legal framework of this programme
### KNOWLEDGE & COLLABORATIVE INNOVATION: Integrated approach to the R&I cycle

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- **SAICT**
- **SI Empresas - I&DT**
- **SI Emp. - Inovação Empresarial**
- **SI Emp. - Qualificação e Internacionalização**
- **SIFIDE**
- **SIAC - Proj.Semente/TT/IP/Dem/Disseminação Proj. Europeus**

- **Marie Curie**
- **Research & Innovation projects**
- **Innovation projects**
- **SME Instrument**
- **FastTrack to Innovation**
- **Eurostars II**

- **EIB**

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