Science, technology and innovation in times of Covid-19 and policy responses

Preliminary overview in June 2020

Caroline Paunov and Sandra Planes-Satorra

18 June 2020

Item 4b - 55th Meeting of the Working Party on Innovation and Technology Policy
In short, the preliminary report:

- Explores the short-term and possible long-term impacts of the Covid-19 crisis on STI.
- Discusses policy options to leverage STI to respond to the crisis as well as approaches to protect and strengthen STI capacities in the Covid-19 crisis and the recovery.

Based on:

- Available evidence (surveys, statistics, recent papers) and insights from past shocks
- Expert interviews & opinion pieces
Structure

1. The short-term effects of the Covid-19 crisis on STI
   STI policy measures as of June 2020
2. Longer-term opportunities and challenges for STI
3. Possible implications for future STI policy
The Covid-19 crisis has affected the entire STI ecosystem

1. Rapid **mobilisation** of R&D and innovation efforts to **combat Covid-19**

2. **Disruption in research & innovation** activities of universities, research centres & businesses
The Covid-19 crisis has affected the entire STI ecosystem. Rapid mobilisation of R&D and innovation efforts to combat Covid-19. Disruption in research & innovation activities of universities, research centres & businesses.
Large public and private R&D efforts to address the Covid-19 health challenge

- R&D efforts to rapidly develop **vaccines** (131 candidates in May 2020), **treatments** and **diagnostics**
- Surge of **scientific publications** related to the virus

Scientific diffusion is speeding up

- Scientific journals accelerate peer-review processes of Covid-19-related papers
- **Pre-prints** (i.e. academic papers that have not been peer-reviewed yet) become more common

---

**Pre-prints posted on MedRxiv, by month**

- New
- Revised

Open science & innovation initiatives (with civil society engagement) have proliferated

- **Data sharing initiatives**, e.g. Covid-19 Open Research Dataset (CORD-19) with +50,000 machine-readable scholarly articles on Covid-19 and other coronaviruses

- **Online collaborative platforms**, e.g. Coronavirusmakers with +20,000 volunteer researchers, developers and engineers to produce emergency medical equipment

- **Distributed computing projects** that encourage citizens to donate their spare computing power to run complex modelling for Covid-19 research (e.g. Folding@home)
1. Rapid mobilisation of R&D and innovation efforts to combat Covid-19

2. Disruption in research & innovation activities of universities, research centres & businesses
STI actors affected by limited access to R&I infrastructures during lockdown

Activities requiring access to research facilities or involving field work & clinical trials were highly disrupted (except Covid-19 related)

→ Challenges to deliver results in expected timescales (incl. last-year PhDs & postdocs)

Shift to activities that can be done at a distance (e.g. data analysis)

→ Declines in labour productivity (due to school closures, anxiety, no benefits of direct interactions...)
Activities of universities & public research were disrupted

- **Restricted researcher mobility**, affecting:
  - Conferences → increasingly virtual
  - Field work (e.g. interruption of polar research expeditions)
  - Exchange programmes (e.g. postdoc research fellowship programmes abroad)

- **Universities**:
  - Rapidly adopted **online education tools**
  - Face short-term **financial challenges** (e.g. 230,000 fewer students expected to enter UK universities in 2020, implying a USD 3 billion drop in student fees for 2020-21)

- **Risks of diversion of research efforts** ("covidisation" of research)
Liquidity constraints and market uncertainty reduce **business** investments in R&I projects

- **Decline in investments in innovative star-ups** across countries (particularly early-stage venture capital)
- **Lower market entry** & more bankruptcies in Q1 of 2020

Reduction in business **willingness to introduce new products** or processes in the short run...

... But the crisis (as past ones) **also offers opportunities** for some innovative businesses
Some actors benefitted from increased demand for some innovative (digital) products

- Teleworking tools
- Online shopping
- Video streaming & online gaming
- Online learning
- Telemedicine
- Cybersecurity
- ...

Innovation investments in those areas is likely to increase
Effects of Covid-19 differ significantly across STI actors, with implications for inclusiveness

Some actors are particularly affected:

<table>
<thead>
<tr>
<th>Individuals</th>
<th>Organisations</th>
<th>Regions</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Early career researchers</td>
<td>- Start-ups &amp; SMEs</td>
<td>- Regions with important presence of highly affected sectors</td>
</tr>
<tr>
<td>- Women researchers</td>
<td>- Firms in <strong>severely hit sectors</strong> (incl. tourism, manufacturing with long supply chains)</td>
<td>- Regions with more severe local outbreaks</td>
</tr>
<tr>
<td>- Tertiary education students from disadvantaged backgrounds</td>
<td>- Universities with lower capacities to adapt</td>
<td></td>
</tr>
</tbody>
</table>

**Policy action** is required to avoid widening gaps
Structure

1. The short-term effects of the Covid-19 crisis on STI
2. STI policy measures as of June 2020
3. Longer-term opportunities and challenges for STI
4. Possible implications for future STI policy
STI policy responses in the Covid-19 context have focused on two objectives:

1. Support research and innovation to address the Covid-19 health emergency

2. Support STI actors most hardly hit by the crisis
1. Support research and innovation to address the Covid-19 health emergency

2. Support STI actors most hardly hit by the crisis
Large amounts of funding for R&D have been mobilised at unprecedented speed.

The US National Institutes of Health (NIH) spent **USD 1.8 billion** to Covid-19 research and the EU mobilised **EUR 1 billion** under Horizon 2020 (as of April/May 2020).

- **Fast-track competitive research funding** to develop Covid-19 vaccines, treatments & diagnostics.
- Part of the support is channelled through **existing funding mechanisms**.

Source: [ScienceBusiness](https://www.sciencebusiness.com), 2 June 2020

Note: The graph illustrates the number of published funding opportunities as of 22 May; it does not illustrate amounts of allocated funding. The full database reports more than 270 funding calls from 44 countries.
Quick innovation responses are also encouraged using a diversity of instruments.

- Fast-track open competitions
- Virtual hackathons
- Policy responses to accelerate Covid-19 innovation
- Promote research collaboration & knowledge sharing
- Access to research infrastructures
- IP rights incentives
- Regulatory flexibilities
STI policy responses to Covid-19 have raised some debates

Has STI funding for Covid-19 been appropriate?
- Vaccine underinvestment due to lower private than social return
- Global free-riding?
- Winner-take-all races and duplication of efforts?
- Ex-post returns on investment & global access to the solutions?
- Coordination & complementarities of inputs to address Covid-19?

Have resources for STI to address Covid-19 been spent efficiently?
- Possible duplications & insufficient quality in research efforts
- Limited transparency as to what different actors are doing
- Speedy allocations risk rewarding superstars only but reduce diversity of contributions or rewarding bad projects
- Funding agencies face operating challenges due to heavy increases in number of proposals
The Covid-19 crisis has affected the entire STI ecosystem.

1. Support research and innovation to address the Covid-19 health emergency.

2. Support STI actors most hardly hit by the crisis.
1. **Flexibilities for current beneficiaries**
of research & innovation programmes, e.g.:
   - EU postponed application deadlines of most calls
   - Research Council of Norway released measures & principles to assist grant holders & applicants to new projects
   - UK Research and Innovation provides grant extensions of up to 6 months for UKRI-funded PhDs in final year

2. **Support HEIs** cope with short-term challenges, e.g. helping HEIs provide tools and training to academic staff to be able to effectively deliver their teaching activities online
1. **Facilitate access to funding** to entrepreneurs & innovative firms to mitigate liquidity problems, e.g.:
   - France: EUR 4 billion for Emergency Startup Relief Plan
   - Germany: EUR 2 billion to expand venture capital to support start-ups

2. **Support businesses (incl. SMEs) adapt to Covid-19** context, e.g.:
   - Ireland: Lean Business Continuity Vouchers & Business Improvement Grants
Structure

1. The short-term effects of the Covid-19 crisis on STI
2. STI policy measures as of June 2020
3. Longer-term opportunities and challenges for STI
4. Possible implications for future STI policy
The longer-term impacts of Covid-19 on STI are uncertain & will depend on characteristics of the recovery.

Will we experience a “V” or “W”-shaped recovery? Is this the beginning of a “new normal”? 

A collapse in output followed by a slow recovery

World GDP, index 2019-Q4=100

In both scenarios, we won't be back at 2019-Q4 level for at least 2 years

### 2020 Projected Change in GDP

<table>
<thead>
<tr>
<th>Country</th>
<th>Single-hit scenario</th>
<th>Double-hit scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spain</td>
<td>-11.1%</td>
<td>-14.4%</td>
</tr>
<tr>
<td>France</td>
<td>-11.4%</td>
<td>-14.1%</td>
</tr>
<tr>
<td>Italy</td>
<td>-11.3%</td>
<td>-14%</td>
</tr>
<tr>
<td>UK</td>
<td>-11.5%</td>
<td>-14%</td>
</tr>
<tr>
<td>Poland</td>
<td>-9.6%</td>
<td>-13.2%</td>
</tr>
<tr>
<td>Sweden</td>
<td>-9.1%</td>
<td>-11.5%</td>
</tr>
<tr>
<td>Greece</td>
<td>-9.4%</td>
<td>-11.3%</td>
</tr>
<tr>
<td>Belgium</td>
<td>-8.9%</td>
<td>-11.2%</td>
</tr>
<tr>
<td>Germany</td>
<td>-9.9%</td>
<td>-11.2%</td>
</tr>
<tr>
<td>Norway</td>
<td>-9.3%</td>
<td>-11.1%</td>
</tr>
<tr>
<td>Austria</td>
<td>-8.1%</td>
<td>-10.4%</td>
</tr>
<tr>
<td>Switzerland</td>
<td>-8.1%</td>
<td>-10.2%</td>
</tr>
<tr>
<td>Poland</td>
<td>-8.3%</td>
<td>-10.1%</td>
</tr>
<tr>
<td>Portugal</td>
<td>-8.9%</td>
<td>-10%</td>
</tr>
<tr>
<td>Sweden</td>
<td>-8%</td>
<td>-10%</td>
</tr>
<tr>
<td>Spain</td>
<td>-8.4%</td>
<td>-10%</td>
</tr>
</tbody>
</table>

1) Will the crisis accelerate the digitalisation of research, innovation & STI policy making?

**AI applications** have been used at different stages of the Covid-19 crisis:

- **Detection**
  - Early warning
    - Detecting anomalies and digital “smoke signals”, e.g. BlueDot
  - Diagnosis
    - Pattern recognition using medical imagery and symptom data, e.g. CT scans

- **Prevention**
  - Prediction
    - Calculating a person’s probability of infection, e.g. EpiRisk
  - Surveillance
    - To monitor and track contagion in real time, e.g. contact tracing
  - Information
    - Personalised news and content moderation to fight misinformation, e.g. via social networks

- **Response**
  - Delivery
    - Drones for materials’ transport; robots for high-exposure tasks at hospitals, e.g. CRUZR robot
  - Service automation
    - Deploying triaging virtual assistants and chatbots, e.g. Canada’s COVID-19 chatbot

- **Recovery**
  - Monitor
    - Track economic recovery through satellite, GPS and social media data, e.g. WeBank

Positive experiences using digital technologies & services may accelerate adoption

But insufficient absorptive capacities (skills), access to infrastructure & financial resources for investments may prevent wider uptake
2) Will private R&D and innovation investments resist the business cycle?

The impact of the business cycle on business R&D investments, OECD countries

Annual growth rate

Note: BERD stands for Business expenditure on R&D.
3) Will STI ecosystems be more open, global and inclusive?

- Increased public awareness and exposure to STI-related topics during Covid-19
- STI systems increasing focus on societal challenges
- More students may be attracted to scientific careers, incl. those currently underrepresented in STI (e.g. women, minority groups)
- Surge of unprecedented number of open science initiatives during Covid-19
- Required to address future health threats as well as other global challenges
4) Will gaps across industries, regions and research institutions widen?

Unequal effects risk leaving lasting traces

- Unequal preparedness of businesses & research institutions to leverage digital tools
- Some sectors are severely hit (e.g. tourism, automotive) while others thrive during the crisis (digital sector)
- Possible reinforcement of large players at the expense of small players
- Gap may widen between leading universities and others

But some factors could reduce inequalities:

- Digital technologies & new work arrangements can contribute to more evenly spread innovation activities across regions (‘the death of distance’)
- Incentive to reduce global concentration of production to be less vulnerable to shocks (possible push back to globalisation)
5) What may be the impacts on public research institutions funding & STI labour force?

Quarterly unemployment rate for highly-skilled workers for selected countries, 2005-11

Annual growth rate

Risks of budgetary cuts & brain drain in most affected countries

Note: Reported unemployment rates are smoothed using three-quarter centred moving averages for the age group 25-64. High-skilled is defined as ISCED 5/6.
Source: OECD (2012), based on OECD Main Economic Indicators Database and national Labour Force Surveys, March 2012.
Structure

1. The short-term effects of the Covid-19 crisis on STI
2. STI policy measures as of June 2020
3. Longer-term opportunities and challenges for STI
4. Possible implications for future STI policy
A more complex set of policy goals with impacts on STI

- Economic growth & competitiveness
- Resilience
- Environmental sustainability
- Inclusiveness

Complementarities & trade-offs
Possible shifts in STI policy

- R&D funding trends
- Change in priority fields
Possible shifts in STI policy

- R&D funding trends
- Change in priority fields

Changes in STI funding allocations

New data and tools for policy

- Use of more granular, real-time data sources
Possible shifts in STI policy

- R&D funding trends
- Change in priority fields
- Use of more granular, real-time data sources
- Account for systems’ dependencies to better respond to future shocks
- Changes in STI funding allocations
- New data and tools for policy
- Systems transformation approaches
Possible shifts in STI policy

- R&D funding trends
- Change in priority fields
- Use of more granular, real-time data sources
- Account for systems’ dependencies to better respond to future shocks
- Higher civil society engagement
- New data and tools for policy
- New governance models
- Changes in STI funding allocations
- Systems transformation approaches
1. What specific **topics should we focus on** more specifically in the next version(s) of the report?

2. We very much welcome:
   
   - Additional **evidence** (e.g. relevant data sources, statistics, existing reports) on the impacts of Covid-19 on STI
   
   - Relevant **policy examples** to be included in the report and in the STIP Covid-19 survey: stip.oecd.org/Covid.html
Thank you

**Document Reference:**
DSTI/STP/TIP(2020)2

**OECD Survey**
on STI policy responses to Covid-19:
https://stip.oecd.org/Covid.html

Caroline Paunov,
Caroline.Paunov@oecd.org

Sandra Planes-Satorra,
Sandra.PlanesSatorra@oecd.org

Science, technology and innovation in times of COVID-19

What policy responses for the recovery?

Virtual workshop / 17 and 24 June 2020 / oe.cd/tip-covid19

BACKGROUND REPORT