

Governance of research and innovation: UK in an international comparative context

How are research & innovation agencies divided between government ministries in different countries?



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Dr. Viktória Döme, Dr. Eoin O'Sullivan

Summary

- Recent developments in the governance of R&I include the reorganization of key ministries and establishment of new intermediary agencies.
- Two main R&I governance models dominate: the more prevalent, **two-pillar model** separating education & research ministries from industry ministries with responsibilities for **two separate intermediary funding agencies**, usually a research council and an innovation agency (e.g., Sweden, Germany, Finland, Japan, South Korea).
- Whereas the **integrated model** joins research and innovation responsibilities under a single ministry. This could be under an innovation ministry (UK, Denmark), the prime minister's office (Singapore) or joined with industry ministry (Switzerland, Canada). Each country, however, has **two separate intermediary funding agencies** except for Singapore.
- Except for the UK, Denmark and Singapore, the **industry ministries analysed have an innovation agency** with potentially important implications for industrial policy.
- Both models benefit from a **high-level policy council** with an advisory role, steering a shared vision and setting R&I priorities, and coordinating different levels of government (often at cabinet office level or chaired by the prime minister as best practice e.g., in Finland, Japan, Singapore). Currently, coordination of innovation policies is insufficient across cross-cutting and sectoral ministries.
- A recent trend has also been the **(re)merging of industry ministries with energy ministries** as a sector of key national interest for net zero goals (e.g., Sweden, South Korea, Germany).

1. Overview

There have been recent developments in the governance of research and innovation (R&I) following the shifting trends towards revitalizing strategic domestic sectors, rebuilding key industrial capabilities and competitiveness, and addressing global grand challenges. Several examples of changes in governance include the reorganization of key ministries (e.g., merging industry and energy ministries in Sweden, South Korea, Germany or separating super ministries such as the UK's Department for Business, Energy, and Industrial Strategy) and creating new agencies (e.g., Canada's Canadian Innovation Corporation, US's Directorate for Technology, Innovation, and Partnerships). The variety of governance models thus prompts various questions such as: Is it better to have super ministries or to use external cross-ministerial coordination mechanisms? Is it better to integrate research and innovation agencies or to separate them under different ministries, including an industry ministry?

In addition, the widening boundaries of R&I policies across cross-cutting and sectoral ministries (education, research, innovation, industry/economy, health, energy, defence) and technology convergence (Industry 4.0, engineering biology, etc.) make it timely to review current R&I governance models. This study aims to comparatively assess international best practice in the governance of R&I across leading innovation economies with implications for improving R&I systems and governance. It also considers examples of energy R&I governance as one of the key sectoral policies addressing net zero goals.

2. Background

Multi-level institutional settings of R&I can be divided into three policy layers¹:

- 1) political layer consists of elected officials in the parliament, ministries, departments, and advisory boards responsible for R&I priority setting and strategy formulation
- 2) administrative layer consists of research councils, innovation agencies, other organizations responsible for policy implementation including resource allocation, managing programs and research activities, and ensuring compliance
- 3) operative layer is made up of universities, research institutions, private companies, etc. that carry out research, develop technology and bring innovations to market

Giving certain autonomy to the administrative layer (intermediary funding agencies) often established as quasi-public or private organizations puts the longer R&I cycles at some distance from shorter political cycles at the political layer.² Agencies in countries such as Finland, Sweden and Norway have high degrees of freedom from their parent ministries, which has certain advantages in terms of decentralised, system-changing policies.³

Effective policy making and implementation requires collaboration and coordination among all three levels. Some examples of **high-level policy council** such as Finland's Research and Innovation Council and Japan's Council for Science Technology and Innovation are found to work well, especially if at the cabinet level or chaired by the prime minister providing political legitimacy and power to set R&I priorities. The role of the policy council or advisory board is to advise on such priorities and to coordinate across ministries and sectors. Involving experts from industry, research councils and innovation agencies is also a common practice.⁴ Currently, however, coordination of innovation

¹ Magro et al. (2014). [Coordination-mix: The hidden face of STI policy](#)

² OECD (2022). [OECD reviews of innovation policy: Germany 2022](#)

³ OECD (2017). [OECD reviews of innovation policy: Finland 2017](#)

⁴ OECD (2022); OECD (2017); Braun (2008). [Lessons on the political coordination of knowledge and innovation policies](#)

policies is insufficient across cross-cutting and sectoral ministries among the countries analysed here. This has implications for policies to affect system transformation and the ability to tackle societal challenges.⁵

3. The two R&I governance models: the two-pillar model and the integrated model

Among the leading innovation economies analysed here, two main R&I governance models seem to exist. Table 1 highlights the different governance models used by different countries.

The more predominant model⁶, **the two-pillar model** follows the linear model of innovation separating research from innovation/industry. On one hand, there are the education & research ministries responsible for education and academic research, generally, funded through research councils. On the other hand, there are the industry ministries responsible for technology development and innovation in companies funded through innovation agencies. Figure 1 presents a schematic diagram of this governance model.

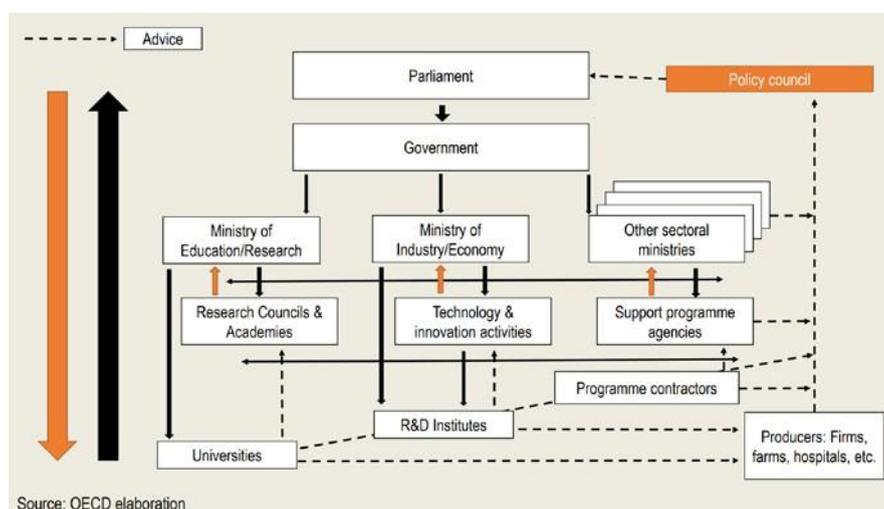


Figure 1 Schematic diagram of the two-pillar R&I governance model. Note: The figure only shows the highest potential level of R&I coordination (policy council), which could however also exist at the cross-ministry or cross-agency level. Source: OECD (2022).

Nevertheless, there is a handful of countries that have a more versatile but generally an **integrated approach** to R&I such as the UK, Denmark, Singapore, Switzerland, Canada. All these countries have a joined research and innovation ministry. For example, the UK and Denmark have an overall ministry responsible for all R&I activities, including sectoral R&I such as in the energy sector. Singapore stands out as R&I activities are under the Prime Minister's Office integrated under the National Research Foundation. **All three of these countries have a separate industry ministry and an energy ministry with a limited role in their respective R&I areas.** Switzerland and Canada on the other hand do not only integrate R&I activities under one ministry but also industrial policy/economic development. Yet, at the agency-level all countries have a separate research council and innovation agency (except for Singapore).

⁵ Borrás & Serger (2022). *The design of transformative research and innovation policy instruments for grand challenges*

⁶ OECD (2022).

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Table 1 Brief description of research and innovation (R&I) governance models (see Appendix for full table).

COUNTRY	R&I GOVERNANCE STRUCTURE
INTEGRATED MINISTRY WITH RESPONSIBILITY FOR RESEARCH AND INNOVATION (NOT INDUSTRIAL POLICY)	
UK	<ul style="list-style-type: none"> -R&I integrated under Department for Science, Innovation and Technology (DSIT) -R&I funded by separate agencies with horizontal coordination through UK Research and Innovation -no separate funding agency for energy R&I -lesser role of Department for Energy Security and Net Zero (DESNZ) in energy R&I -role/presence of high-level policy council difficult to determine
SINGAPORE	<ul style="list-style-type: none"> -R&I under the Prime Minister's Office integrated under National Research Foundation (NRF) -no separate funding agency for energy R&I -Research Innovation Enterprise Council (REIC) as high-level policy council chaired by PM
DENMARK	<ul style="list-style-type: none"> -R&I integrated under Ministry of Higher Education and Science -R&I funded by separate agencies -energy R&I funded partly by general R&I agencies and partly by energy agency under energy ministry
INTEGRATED MINISTRY WITH RESPONSIBILITY FOR RESEARCH, INNOVATION, AND INDUSTRIAL POLICY	
SWITZERLAND	<ul style="list-style-type: none"> -R&I integrated under Federal Department of Economic Affairs, Education and Research (EAER) -R&I funded by separate agencies -energy R&I under energy department with funding from an energy agency
CANADA	<ul style="list-style-type: none"> -R&I integrated under Innovation, Science and Economic Development Canada (ISED) -R&I funded by separate agencies -created its innovation agency Canada Innovation Corporation in 2023 -energy R&I under energy department with funding from an energy agency
TWO-PILLAR MODEL: SEPARATING MINISTRY WITH RESPONSIBILITY FOR RESEARCH FROM MINISTRY WITH RESPONSIBILITY FOR INNOVATION AND INDUSTRIAL POLICY	
SWEDEN	<ul style="list-style-type: none"> -R&I funded by separate agencies -joint industry & energy ministry since 2023 funding energy R&I via Swedish Energy Agency -research council for sustainable development and health moved under relevant ministry in recent years
GERMANY	<ul style="list-style-type: none"> -R&I funded by separate agencies -joint industry & energy ministry directly funding energy R&I -no high-level policy council
FINLAND	<ul style="list-style-type: none"> -R&I funded by separate agencies -energy under industry ministry with energy R&I funding through its innovation agency -Research and Innovation Council as high-level policy council since 1963
JAPAN	<ul style="list-style-type: none"> -R&I funded by separate agencies -energy under industry ministry with energy R&I funding through its innovation agency -Council for Science Technology and Innovation (CSTI) as has high-level policy council chaired by PM
SOUTH KOREA	<ul style="list-style-type: none"> -R&I funded by separate agencies -joint industry & energy ministry
SPAIN	<ul style="list-style-type: none"> -R&I funded by separate agencies

4. References

- Boekholt, P., Arnold, E., Deiacio, E., McKibbin, S., Simmonds, P., Stroya, J., & de la Mothe, J. (2002). *The governance of research and innovation: An international comparative study country*. Technopolis, Amsterdam. Available from: https://www.academia.edu/es/54803104/The_Governance_of_Research_and_Innovation_An_international_comparative_study
- Braun, D. (2008). Lessons on the political coordination of knowledge and innovation policies. *Science and Public Policy*, 35(4), 289-298. <https://doi.org/10.3152/030234208X310347>
- Edquist, C. (2014). Striving towards a holistic innovation policy in European countries-but linearity still prevails!. *STI Policy Review*, 5(2), 1-19. https://ec.europa.eu/futurium/en/system/files/ged/34-edquist-striving_towards_a_holistic_innovation_policy_in_eu_-_linearity_still_prevails.pdf
- Magro, E., Navarro, M., & Zabala-Iturriagagoitia, J. M. (2014). Coordination-mix: The hidden face of STI policy. *Review of Policy Research*, 31(5), 367-389. <https://doi.org/10.1111/ropr.12090>
- OECD. (2016). *OECD reviews of innovation policy: Sweden 2016*. OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264249998-en>
- OECD. (2017). *OECD reviews of innovation policy: Finland 2017*. OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264276369-en>
- OECD. (2013). *OECD reviews of innovation policy: Sweden 2012*. OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264184893-en>
- OECD. (2022). *OECD reviews of innovation policy: Germany 2022 – Building Agility for Successful Transitions*. OECD Publishing, Paris. <https://doi.org/10.1787/50b32331-en>
- Borrás, S., & Schwaag Serger, S. (2022). The design of transformative research and innovation policy instruments for grand challenges: The policy-nesting perspective. *Science and Public Policy*, 49(5), 659-672. <https://doi.org/10.1093/scipol/scac017>

5. Appendix Research and innovation (R&I) governance models in leading innovation economies.

Country/ governance level	Research	Innovation	Energy research & innovation	Notes
1. United Kingdom				
Advisory level		?		National Science and Technology Council (NSTC) reinstated as a Cabinet committee chaired by the Prime Minister in 2023; previously under the Office for Science and Technology Strategy (OSTS), which is now part of DSIT
Ministry-level	Department for Science, Innovation and Technology (DSIT); smaller role of Department for Energy Security and Net Zero (DESNZ) in energy R&I			There is a separate Department for Business and Trade (DBT) and Department for Energy Security and Net Zero (DESNZ). Department for Energy Security and Net Zero (DESNZ) has a smaller role in energy R&I which it supports via the Net Zero Innovation Portfolio with funding for low carbon technologies and systems
Agency-level	UK Research and Innovation (UKRI) as funding agency for R&I, brings together 7 Research Councils, Research England and Innovate UK			Research England allocates quality-related research funding/bloc grants to universities, while Research Councils allocate competitive grant funding to universities; Research Councils also fund institutes/independent research organizations; Innovate UK provides 1/3 of funding of Catapults as core grants; public sector organizations (known as PSREs) funded through core and programme funding from relevant departments (DSIT, Defra, DfT)
2. Singapore				
Advisory level	Research Innovation and Enterprise Council (RIEC)			Research Innovation and Enterprise Council (RIEC) is chaired by the Prime Minister with NRF acting as its secretariat. RIEC comprises Cabinet Ministers, local and foreign members from companies, science and technology communities. Its goals are to advise the Cabinet on R&I strategies and catalyse value capture in key strategic areas through strengthening enterprise innovation capabilities and accelerating technology translation.
Ministry-level		Prime Minister's Office		There is a separate Ministry of Education and Ministry of Trade and Industry.
Agency-level	National Research Foundation, Singapore (NRF) ; NRF provides most funding for energy R&I			National Research Foundation (NRF) of Singapore operates under the Prime Minister's Office as a single entity/department responsible for research, innovation and enterprise (RIE). Originally, the R&D strategy of the National Science and Technology Board (NSTB) was expanded to include innovation and enterprise in 2010 with a growing emphasis on translation and commercialisation. NSTB was restructured as A*STAR and replaced by NRF. NRF's RIE2025 plan focuses on 4 strategic domains and 3 cross-cutting horizontals (academic research, research and innovation talent, enterprise innovation).
3. Denmark				
Advisory level		?		
Ministry-level	Ministry of Higher Education and Science; smaller role of Ministry of Climate, Energy and Utilities in energy R&I			superministry joining ministries of education and STI since the 2000s; has a separate Ministry of Industry, Business and Financial Affairs and Ministry of Climate, Energy and Utilities; Ministry of Climate, Energy and Utilities has a smaller role in energy innovation with some R&D programs including the Energy Technology Development and Demonstration Program (EUDP)
Agency-level	Danish National Research Foundation (DNRF); Independent Research Fund Denmark	Innovation Fund Denmark	smaller role of Danish Energy Agency	

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Country/ governance level	Research	Innovation	Energy research & innovation	Notes
4. Switzerland				
Advisory level		?		
Ministry-level	Federal Department of Economic Affairs, Education and Research (EAER)		Federal Department of the Environment, Transport, Energy and Communications (DETEC)	
Agency-level	Swiss National Science Foundation (SNF)	InnoSuisse	Swiss Federal Office of Energy (SFOE)	
5. Canada				
Advisory level		?		
Ministry-level	Innovation, Science and Economic Development Canada (ISED)		Natural Resources Canada	
Agency-level	Canada National Research Council (CNRC), sectoral research councils	Canada Innovation Corporation (CIC)	Office of Energy Research and Development (OERD)	National Research Council's Industrial Research Assistance Program (IRAP) will join the CIC. IRAP will provide a strong foundation upon which the CIC will be able to build an integrated platform and continuum of support, service, and strategy across all technologies and industries.
6. Sweden				
Advisory level		?		
Ministry-level	Ministry of Education and Research		Ministry of Climate and Enterprise	Ministry of Education and Research leads the Research and Innovation Bill process published every four years on research policy (and more recently innovation policy), sets important initiatives and provides budgetary framework (OECD, 2016); Ministry of Climate and Enterprise since 2023 (formerly Ministry of Enterprise and Innovation merged with the Ministry of the Environment)
Agency-level	Swedish Research Council	VINNOVA ; Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (FORMAS)	Swedish Energy Agency	many medium-sized agencies funding innovation-related activities with medium-sized budgets but with good coordination; FORMAS, VINNOVA and the Swedish Energy Agency finance Strategic Innovation Programs; FORMAS, Swedish Research Council and FORTE (a council under the Ministry of Health and Social Affairs) run national research programs; FORMAS and FORTE used to be under the Ministry of Education and Research; Research Institutes Sweden (RISE) receives core funding directly, not through VINNOVA
7. Germany				
Advisory level		does not have one		Germany uses committees of state secretaries to oversee initiatives relevant to more than one ministry, but no single institution takes responsibility for systemic co-ordination across the whole national R&I system. Need for a cross-ministerial, federal-state, cross-institutional and cross-sectoral forum to steer the process of developing a shared vision based on key priority areas for action.
Ministry-level	Federal Ministry of Education and Research (BMBF) & 16 Ministries of Research/Education	Federal Ministry for Economic Affairs and Climate Action (BMWK) & 16 Ministries of Economy		R&I overseen by several line ministries with input from external expert bodies (e.g., the Commission of Experts for Research and Innovation (EFI)); R&I policy evolves incrementally, not subject to political cycles.; Strong role of regional STI governance with high degree of policy and strategic autonomy
Agency-level	German Research Foundation (DFG); Fraunhofer Society	AiF	BMWK-led Energiewende and its 7th Energy Research Program	BMWK-led Energiewende serves as Germany's national strategy for the sustainable energy transition and has a prominent innovation component; project funding by BMWK as part of the 7th Energy Research Program

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Country/ governance level	Research	Innovation	Energy research & innovation	Notes
8. Finland				
Advisory level		Research and Innovation Council (RIC)		Some form of Science Policy Council since 1963 today known as Research and Innovation Council (RIC) chaired by prime minister, includes ministers, small number of other stakeholders including heads of Academy of Finland and Tekes as a high-level coordinating mechanism with advisory role and decision making power. The motivation for centralising research funds at the Prime Minister's Office was to ensure that government-commissioned research would be relevant to society, not only to an individual ministry.
Ministry-level	Ministry of Education and Culture		Ministry of Economic Affairs and Employment	Ministry of Economic Affairs and Employment responsible for technology and innovation, industry, energy and climate, health and safety at work, employment policy, consumer policy, competition, regional development, etc. bringing together many research areas that may in other countries be separate
Agency-level	Academy of Finland divided into: Council for Basic Research funds HEIs, Council for Strategic Research funds PROs		Business Finland	In the Finnish system, as in Norway and Sweden, agencies have high degrees of freedom from their parent ministries. Funding and other instruments are typically designed at the agency level. Business Finland (formerly TEKES Finnish funding agency for innovation established in 1983 and based on Sweden's VINNOVA)
9. Japan				
Advisory level	Council for Science Technology and Innovation (CSTI) under Cabinet Office			top-down, strong coordination of cross-ministerial challenges through the Council for Science Technology and Innovation (OECD, 2016); Council for Science, Technology and Innovation (CSTI), former Council for Science and Technology Policy (CSTP), is one of the four councils of important policies of Cabinet Office. The CSTI is comprised of the Prime Minister, relevant Ministers, and experts. Please see the following for more details on CSTI.
Ministry-level	Ministry of Education, Culture, Sports, Science and Technology (MEXT)		Ministry of Economy, Trade and Industries (METI)	METI responsible for industrial policy and promoting innovation in various sectors
Agency-level	Japan Society for the Promotion of Science (JSPS), Japan Science and Technology Agency (JST)		New Energy and Industrial Technology Organization (NEDO)	Japan Society for the Promotion of Science (JPS) supports basic research with grant-in-aid for scientific research; Japan Science and Technology Agency (JST) coordinates longer term challenging research. It also manages the new £55 billion University Endowment Fund since 2021 established to support young researchers, strengthen research infrastructure in emerging fields and promote university reform that will be allocated to universities considered capable of achieving world class research

CSTI Briefing Note

Country/ governance level	Research	Innovation	Energy research & innovation	Notes
10. South Korea				
Advisory level		?		
Ministry-level	Ministry of Science and ICT (MSIT)	Ministry of Industry & Energy (MOTIE); Ministry of SMEs and Start-ups		
Agency-level	National Research Foundation of Korea	Korea Institute for Advancement of Technology; Korea Evaluation Institute of Industrial Technology (under former ministry); Korea Technology and information Promotion Agency for SMEs (under latter ministry)		
11. Spain				
Advisory level		?		
Ministry-level	Ministry of Science and Innovation (MICINN)	Ministry of Economy, Industry and Competitiveness (MINECO)		
Agency-level	State Research Agency (AEI); Spanish Council for Research (CSIC); Spanish Foundation for S&T (FECYT)	Centre for Development of Technology and Innovation (CDTI)		

Notes: Innovation agencies are highlighted in blue. References by country: UK: [Office for Science and Technology Strategy - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/consultations/office-for-science-and-technology-strategy), [\[Withdrawn\] New National Science and Technology Council established - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/consultations/new-national-science-and-technology-council-established), [Net Zero Innovation Portfolio - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/consultations/net-zero-innovation-portfolio), [Research, development and innovation \(RDI\) organisational landscape: an independent review - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/consultations/research-development-and-innovation-rdi-organisational-landscape-an-independent-review); Singapore: [RIE Ecosystem \(nrf.gov.sg\)](https://www.nrf.gov.sg/); Denmark: [The Ministry of Higher Education and Science — English \(ufm.dk\)](https://ens.dk/en/the-ministry-of-higher-education-and-science), [Energy Technology Development and Demonstration Program | Energistyrelsen \(ens.dk\)](https://ens.dk/en/energy-technology-development-and-demonstration-program); Switzerland: [The Federal Department of Economic Affairs, Education and Research \(EAER\) \(admin.ch\)](https://www.admin.ch/gov/en/start/department-introduction.html), [Swiss Federal Office of Energy \(admin.ch\)](https://www.admin.ch/gov/en/start/department-introduction.html); Canada: [A Blueprint for the Canada Innovation Corporation - Canada.ca](https://www.innovation.ca/blueprint); Germany: [OECD Reviews of Innovation Policy: Germany 2022 : Building Agility for Successful Transitions | OECD iLibrary \(oecd-ilibrary.org\)](https://www.oecd-ilibrary.org/energy/energy-research-and-innovation-policy-germany-2022), [Energieforschung: Startseite des BMWK-Informationsportal](https://www.energieforschung.de/); Finland: [OECD Reviews of Innovation Policy: Finland 2017 | OECD Reviews of Innovation Policy | OECD iLibrary \(oecd-ilibrary.org\)](https://www.oecd-ilibrary.org/energy/energy-research-and-innovation-policy-finland-2017), [Responsibilities - Ministry of Economic Affairs and Employment \(tem.fi\)](https://tem.fi/en/responsibilities), [Research, development and innovation funding - Ministry of Economic Affairs and Employment \(tem.fi\)](https://tem.fi/en/research-development-and-innovation-funding); Japan: [Important Councils - Cabinet Office Home Page \(cao.go.jp\)](https://www.cao.go.jp/en/important-councils/), [Finalists announced for Japan's University Endowment Fund | British Council](https://www.britishecouncil.org/news-events/2020/05/20-finalists-announced-for-japan-s-university-endowment-fund/), [Nanotechnology R&D Policy of Japan and Nanotechnology Support Project | SpringerLink](https://www.springerlink.com/doi/10.1007/978-94-007-5000-0_1); Other: [OISE Counterpart Science Funding Agencies | NSF - National Science Foundation](https://www.nsf.gov/).

FOR FURTHER INFORMATION OR ENGAGEMENT WITH THE RESEARCH

Contact: Dr. Viktória Döme

Centre for Science, Technology & Innovation Policy

vd334@cam.ac.uk



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Cambridge Industrial Innovation Policy, 17 Charles Babbage Road, Cambridge, CB3 0FS, United Kingdom

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