

# Die (Geo)-Politisierung von Forschung & Innovation: IKT als doppelte Kritikalität

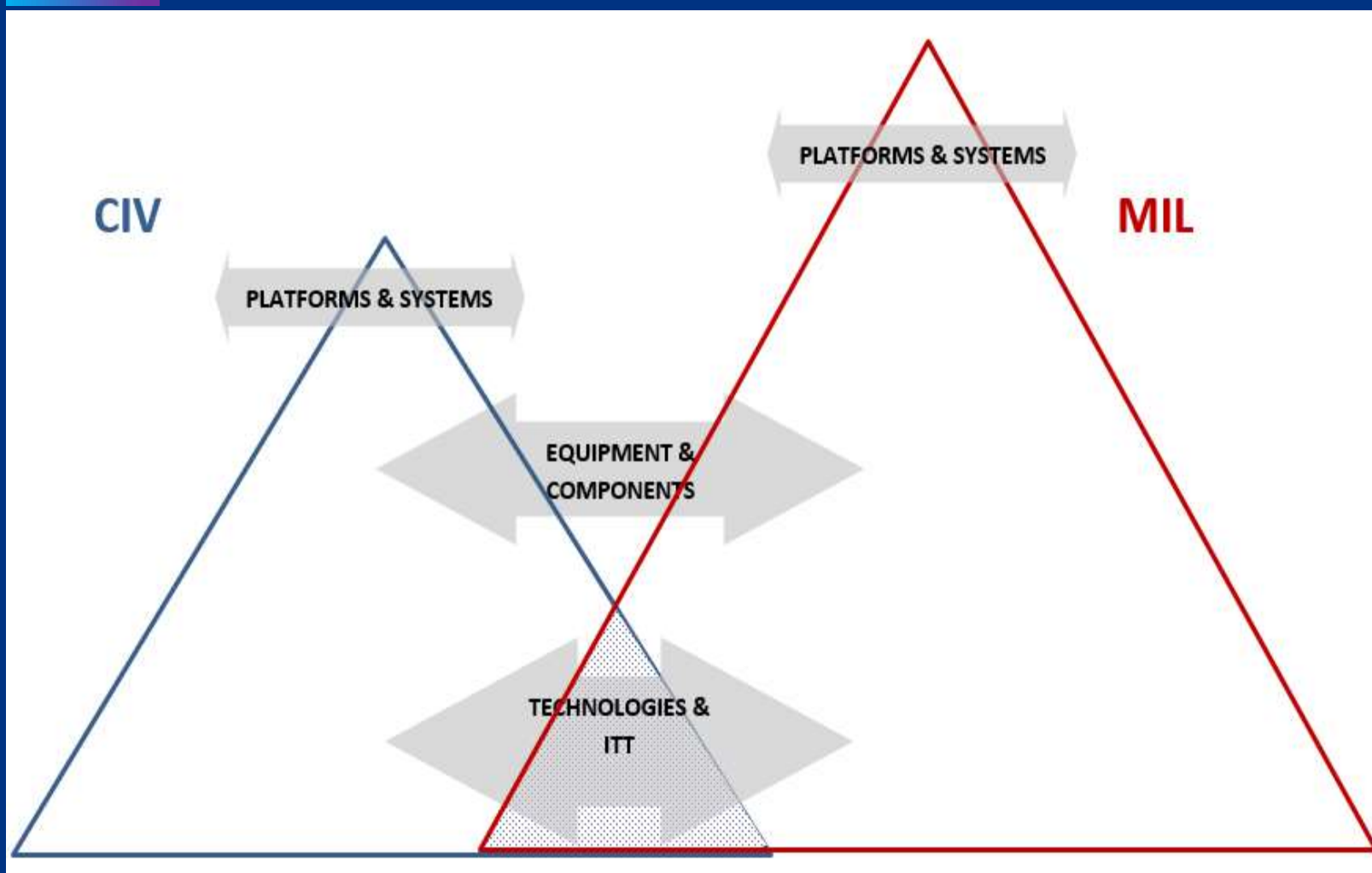
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Dr. Georgios Kolliarakis

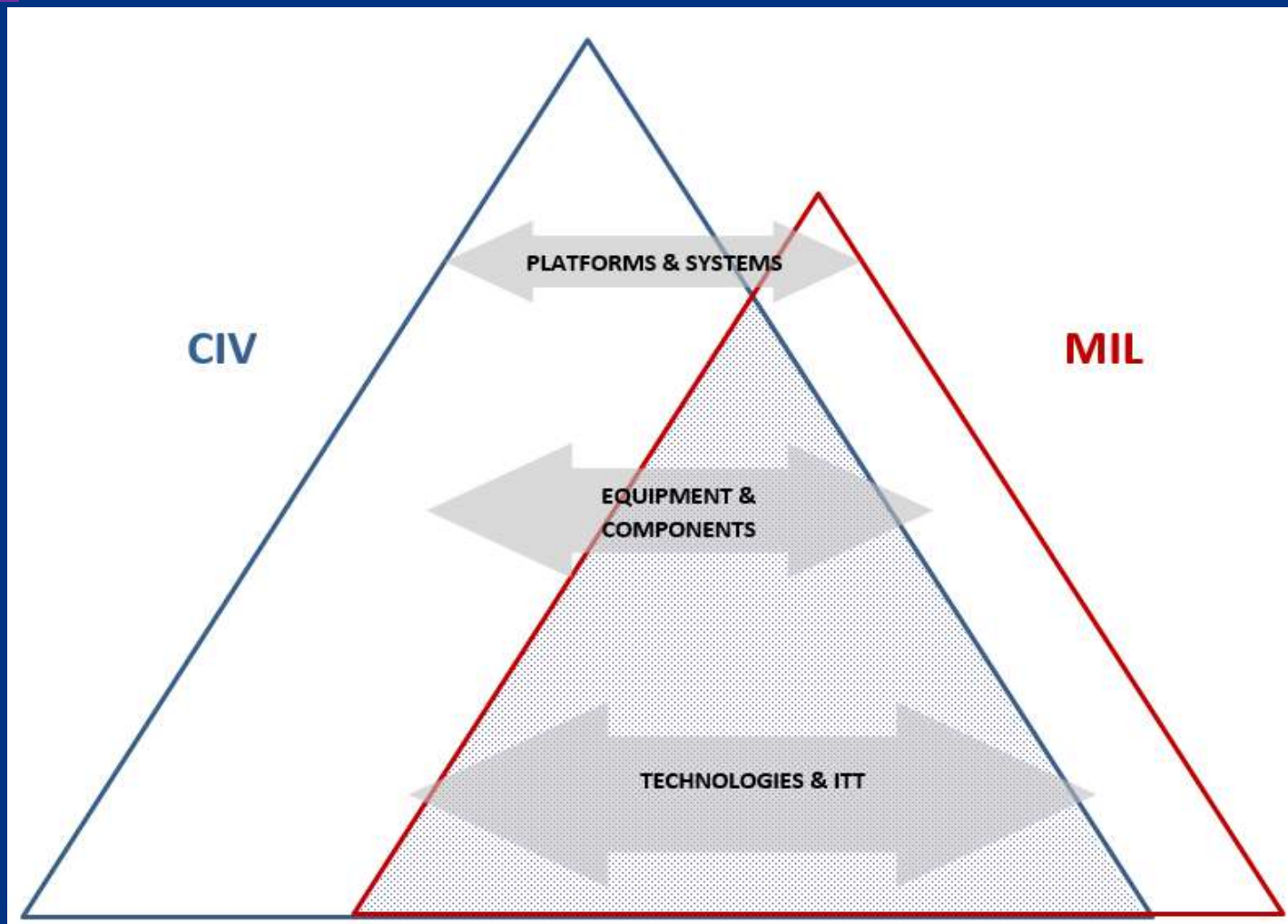
FFG FORUM

Wien, 11. September 2024

# TRANSFER DYNAMICS (Spin-in/Spin-out) I



# TRANSFER DYNAMICS (Spin-in/Spin-out) II



# EU CRITICAL DUAL-USE TECHNOLOGIES

Sector	Technologies
<b>ELECTRONICS &amp; DIGITAL</b>	<ul style="list-style-type: none"> <li>• Artificial Intelligence, advanced analytics and big data</li> <li>• Cybersecurity and cyber defence technologies</li> <li>• Digital forensic technologies</li> <li>• High-performance computing, cloud and data spaces</li> <li>• Photonics</li> <li>• Ultra-low power microprocessors, lightweight printed or flexible electronics</li> <li>• Quantum technologies</li> <li>• Secure communications and networking</li> <li>• Sensors (including electro-optical, radar, chemical, biological, radiation, etc.)</li> </ul>
<b>MANUFACTURING</b>	<ul style="list-style-type: none"> <li>• Advanced and additive manufacturing</li> <li>• Advanced materials technologies and sustainable materials by design</li> <li>• Nanotechnologies</li> <li>• Robotics</li> <li>• Semiconductors and microelectronics</li> </ul>
<b>SPACE &amp; AERONAUTICS</b>	<ul style="list-style-type: none"> <li>• Space technologies (including design and manufacturing of launchers and satellites)</li> <li>• Secure precision timing, positioning and navigation technologies</li> <li>• High-definition Earth Observation technologies</li> <li>• Satellite-based secure communication and connectivity</li> </ul>
<b>HEALTH</b>	<ul style="list-style-type: none"> <li>• Biotechnologies</li> <li>• Chemical, biological, radiological and nuclear<sup>36</sup> technologies</li> </ul>
<b>ENERGY</b>	<ul style="list-style-type: none"> <li>• Energy technologies (including energy storage, energy resilience, renewables, hydrogen and nuclear)</li> </ul>
<b>MOBILITY</b>	<ul style="list-style-type: none"> <li>• Autonomous systems</li> </ul>

[EC, Roadmap on security and defence technologies 2021]

## SHIFTING FRAMEWORK CONDITIONS FOR STI Governance I

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**Technopolitical paradigm shift for Emerging Tech R&D: Securitisation/Weaponisation (Tech Race 2.0); Emergence of minilateral alliances/clubs in the G20+ context**

**Proliferation of R&D actors (incl. Academia, RTOs, SMEs,...)**

**Rise in RDI Budgets for Defence & Dual-Use Technologies**

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**“Critical” due to risk of misuse, proliferation of WMDs, terrorism, violation of human rights**

# LEAD COUNTRY AND TECHNOLOGY MONOPOLY RISK

Technology	Lead country	Technology monopoly risk
<b>Artificial intelligence, computing and communications</b>		
13. Advanced radiofrequency communications (incl. 5G and 6G)	China	high
14. Advanced optical communications	China	medium
15. Artificial intelligence (AI) algorithms and hardware accelerators	China	medium
16. Distributed ledgers	China	medium
17. Advanced data analytics	China	medium
18. Machine learning (incl. neural networks and deep learning)	China	low
19. Protective cybersecurity technologies	China	low
20. High performance computing	USA	low
21. Advanced integrated circuit design and fabrication	USA	low
22. Natural language processing (incl. speech and text recognition and analysis)	USA	low

[ASPI's Critical Technology Tracker: the global race for future power, 2023]

# BI- & TRILATERAL TECHNOLOGY AND TRADE PARTNERSHIPS ON MICROPROCESSORS

 	EU – US Trade and Technology Council (TTC)	2021.06	■■■■■ ■■■■ ■■
 	Japan – U.S. Commercial and Industrial Partnership (JUCIP)	2021.11	■■■■■ ■■■■
 	U.S. – Taiwan Technology Trade and Investment Collaboration Framework (TTIC)	2021.12	■■■■■ ■■■■
 	EU – India Trade and Technology Council (TTC)	2022.04	■■■■■ ■■
 	India – U.S. Initiative on Critical and Emerging Technology (ICET)	2022.05	■■■■■ ■■
 	Japan – EU Digital Partnership	2022.05	■■■■■ ■■
 	Malaysia – U.S. MOC on Semiconductor Supply Chain Resilience	2022.05	■■■■■ ■■
 	ROK – EU Digital Partnership	2022.11	■■■■■
 	U.S. – ROK Supply Chain and Commercial Dialogue (SCCD)	2022.11	■■■■■
 	EU – Singapore Digital Partnership	2023.02	■■■
 	India – U.S. Commercial Dialogue	2023.03	■■■
 	Japan – UK Semiconductors Partnership	2023.05	■■
 	Japan – Netherlands MOC on semiconductors	2023.06	■■
  	Japan – ROK – U.S. Trilateral Partnership	2023.08	■
 	U.S. – Vietnam MOC on Semiconductor Supply Chains, Workforce and Development	2023.09	■

[Hess & Kleinhans, 2023]



## SHIFTING FRAMEWORK CONDITIONS FOR STI Governance II

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**RDI transfer direction shift increasingly from Civil towards Defence and Space domains**

**Lack of methodologies to reliably assess risk of “mission creep”, and probability/severity of diversion for misuse and WMD proliferation (End-use/End-user/Vector evaluation).**

**Innovation & Harm Control modalities of ICT (very) different than those of Nuclear, Chemical, Biological technologies**

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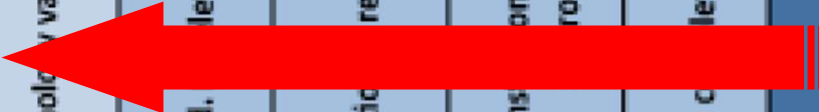
**“Critical” for the essential state and societal functions, ensure their supply chains, and their research & industrial base**

# RISK OF MISUSE MOVING UPSTREAM

TRL	1	2	3	4	5	6	7	8	9	10	11	12
	Basic principles observed	Technology concept formulated	Experimental proof of concept	Technology validation in lab	Tech valid. In relevant environment	Demonstration in relevant environment	Demonstration in operational environment	System complete and qualified	Successful mission operations	First client/user/taker	National market maturation	Export and internationalisation
	Phase 1: Fundamental research	Phase 2: Technological research			Phase 3: Product demonstration				Phase 4: Competitive manufacturing	Phase 5: Market penetration		

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## FOUR PATHWAYS TO TECHNOLOGY TRANSFER (ILLICIT & LICIT) FOR MALICIOUS PURPOSES

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# RESEARCH & INNOVATION AS AN EU STRATEGIC ASSET

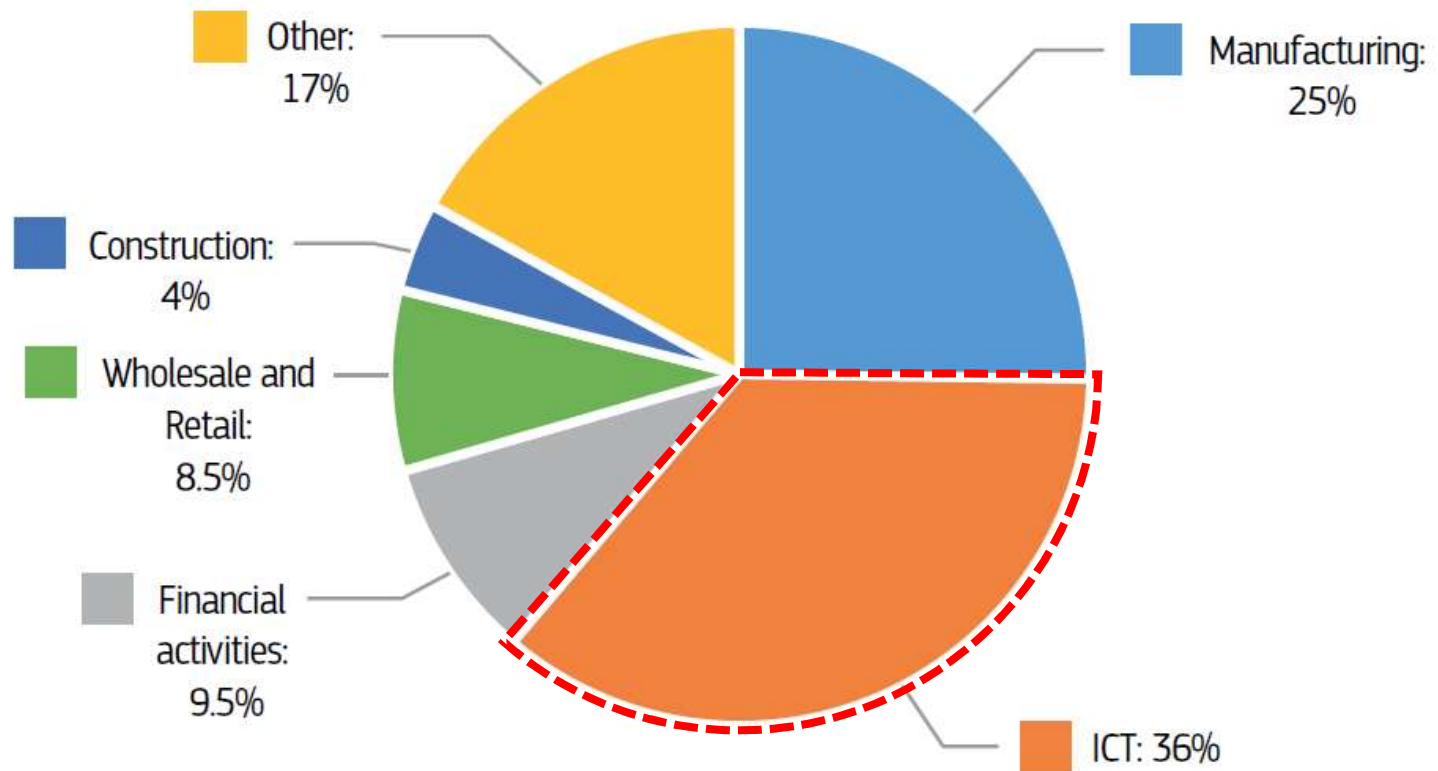


[BAFA 2019]



[EC 2022]

## MAIN FDI TARGETED SECTORS IN 2021



[Annual Report on Strategic Trade & Investment Controls, EC 2022]

# EU ECONOMIC SECURITY STRATEGY

## WHITE PAPER

ON ENHANCING RESEARCH AND DEVELOPMENT SUPPORT INVOLVING TECHNOLOGIES WITH DUAL-USE POTENTIAL



**PROMOTING**  
the EU's competitiveness by bolstering its Single Market, innovation, technological and industrial capacities.

**PROTECTING**  
the EU's economic security through a range of existing and new tools.

**PARTNERING**  
with others to strengthen economic security, notably by working with reliable partners to address shared security concerns through diversified and improved trade agreements, strengthening international rules and institutions, and investing in sustainable development.

**MONITORING AND RISK ASSESSMENT OF OUTBOUND INVESTMENTS**

**EU FOREIGN DIRECT INVESTMENT SCREENING 2024 REVISION**

**COUNCIL RECOMMENDATION ON RESEARCH SECURITY**



24 January, 2024

**EUROPEAN ECONOMIC SECURITY STRATEGY**

**TOWARDS MORE EFFECTIVE CONTROL OF DUAL-USE GOODS EXPORTS**

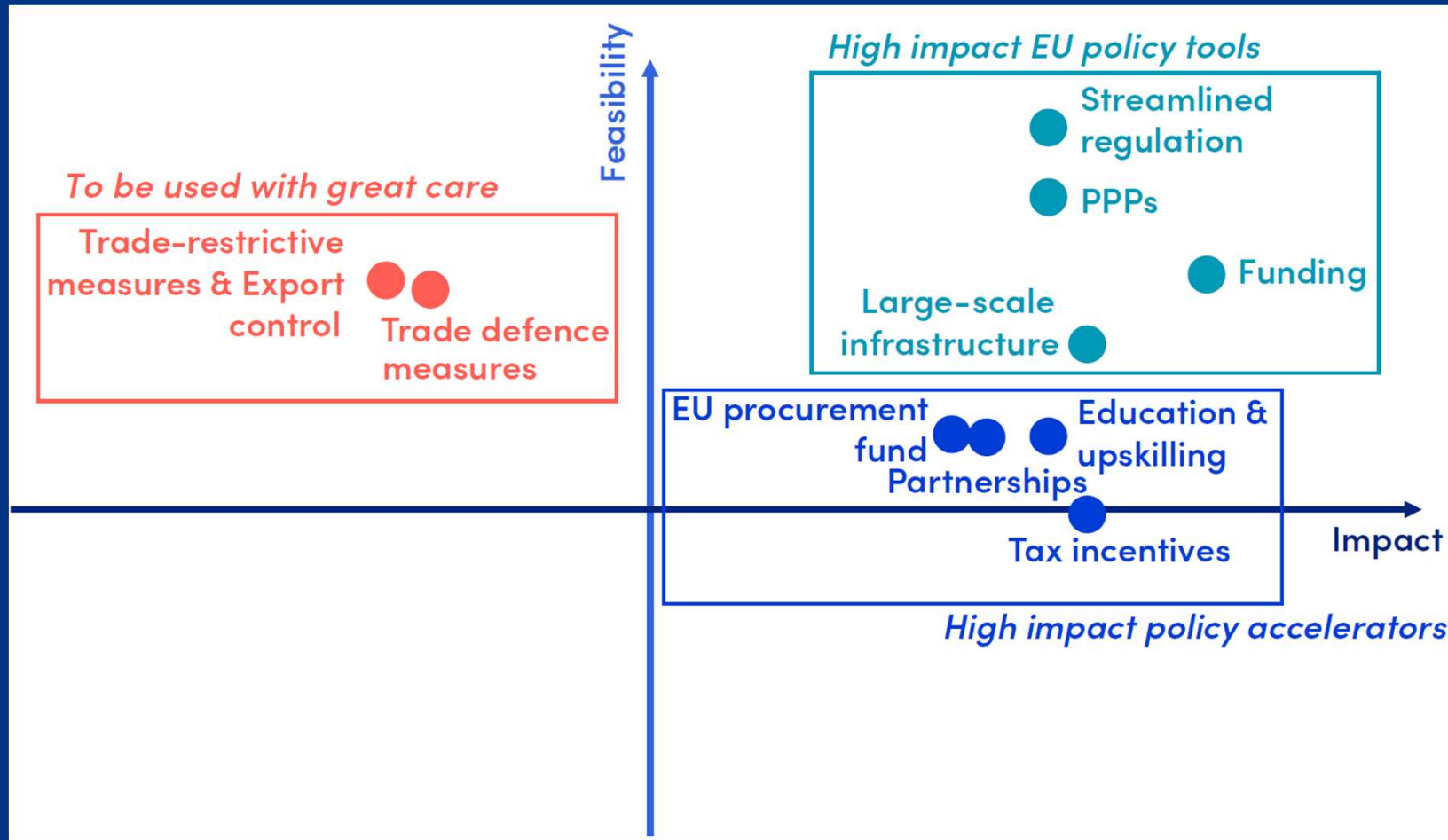


**TACKLING R&I FOREIGN INTERFERENCE**

Staff Working Document



# EU ECONOMIC SECURITY STRATEGY: Impact-Feasibility Matrix



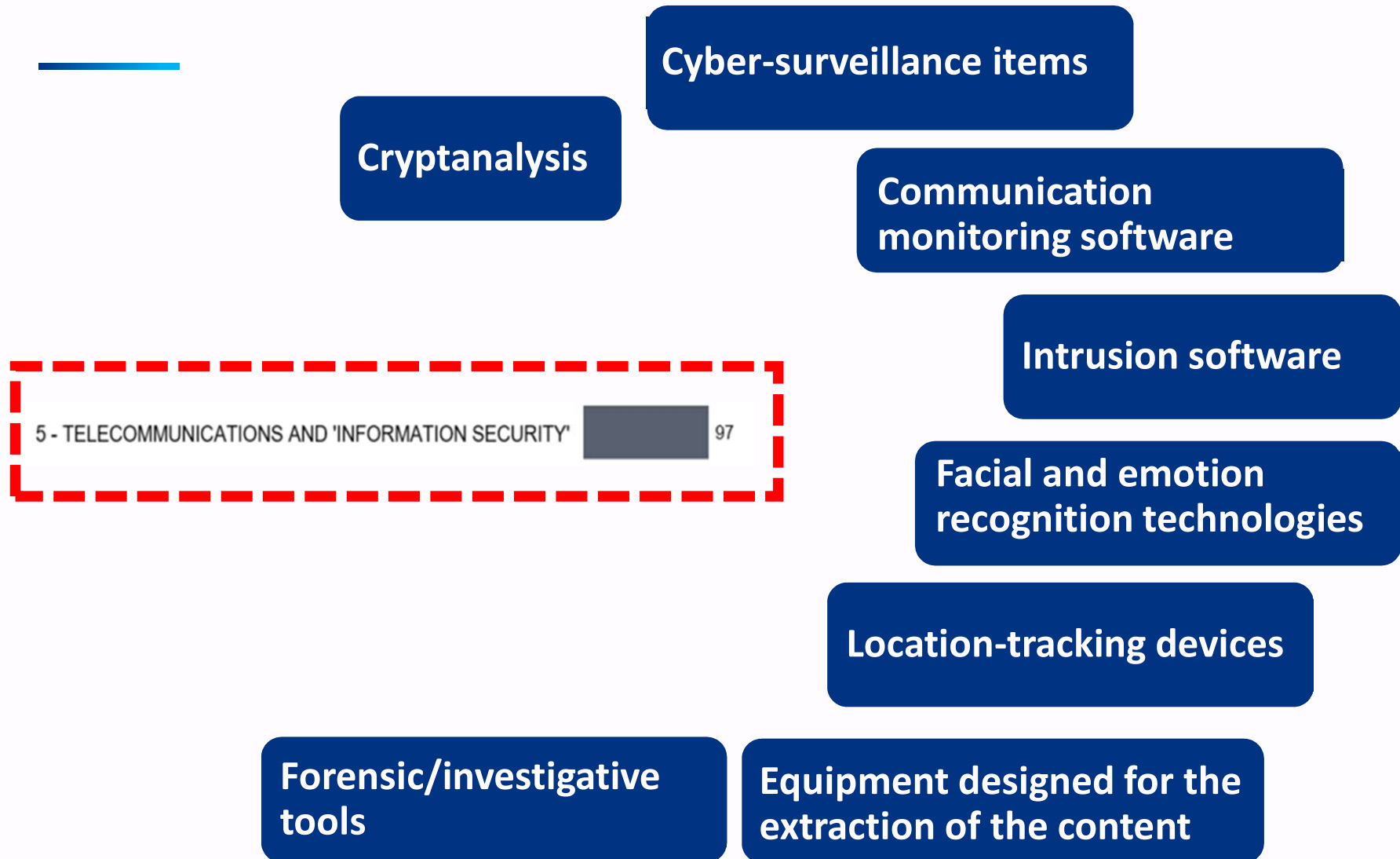
[Digital Europe, 2024]

## UNSCR 1540 (2004) on non-proliferation of Weapons of Mass Destruction

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The resolution establishes the obligations under Chapter VII of the United Nations Charter for all member states to develop and enforce appropriate legal and regulatory measures against the proliferation of WMDs and their means of delivery, in particular, to prevent their spread to non-state actors.

# EU DUAL-USE REG 821(2021) LIST ITEM CATEGORIES

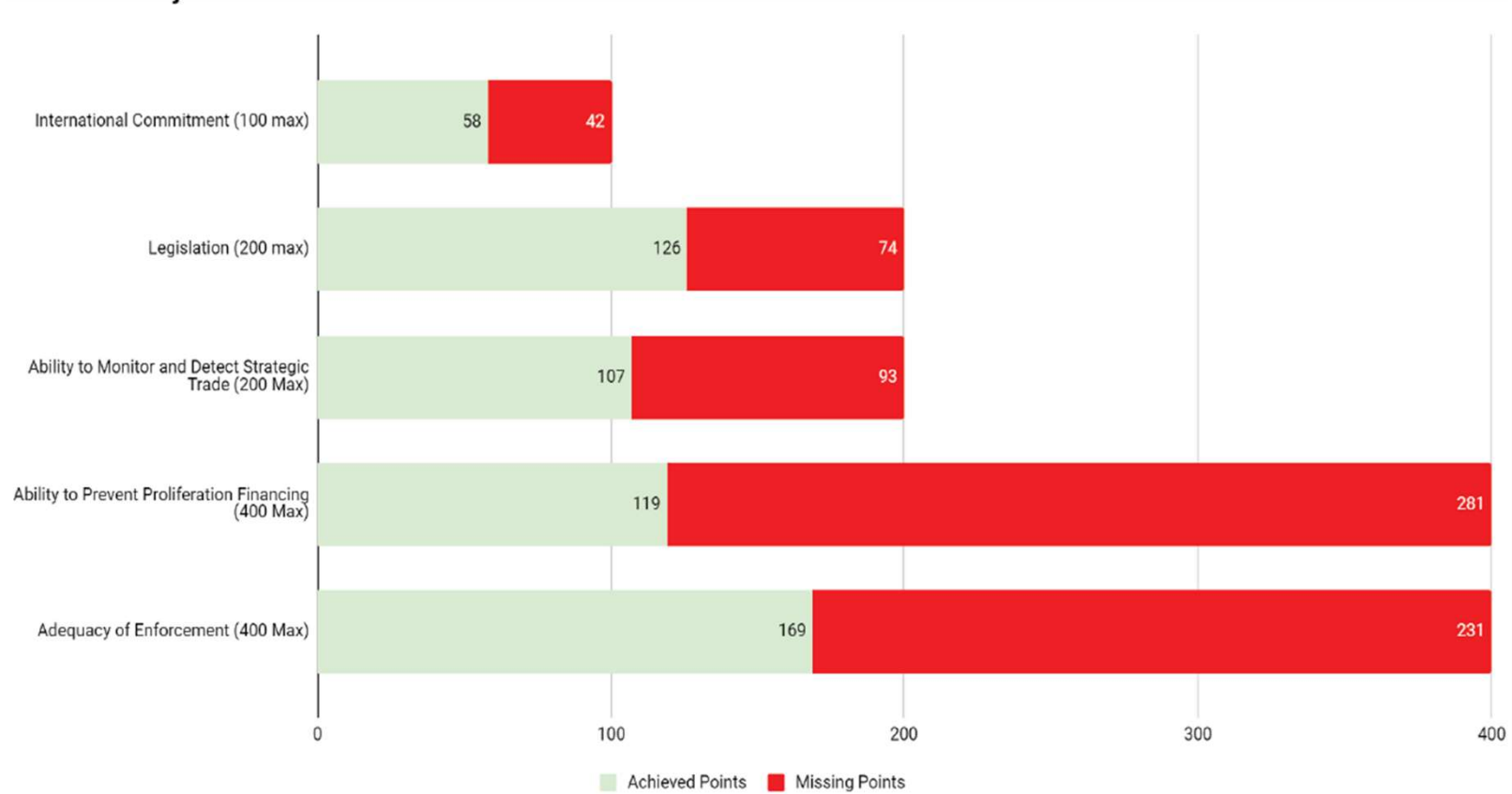


# GOVERNANCE MODALITIES OF NUCLEAR, BIOLOGICAL, ICT

Governance Measure	Nuclear Technology	Biological Technology	Information Technology
<b>International Initiatives Outlawing Hostile/Weapons Activities</b>			
Prohibition on development and possession of dual-use (DU) materials for weapons purposes	Partial (NPT)	Yes (BWC)	No
Prohibition on assisting other countries to acquire DU materials for weapons purposes	Yes (NPT)	Yes (BWC)	No
International oversight of national DU activities and materials to ensure nonuse for weapons purposes	Yes (IAEA safeguards)	No	No
Commitment to adopt national laws outlawing hostile/weapons activities with DU materials	Yes (NPT)	Yes (BWC)	Yes (Budapest Convention)
<b>International Efforts to Control Access to DU Materials</b>			
Requirement to share information on terrorists' efforts to acquire DU materials	Yes (UNSCR 1373)	Yes (UNSCR 1373)	No
Requirement for national measures to prevent terrorists' acquisition/use of DU materials and equipment	Yes (Convention on Physical Protection of Nuclear Materials, amended)	Yes (UNSCR 1540)	No
Commitment to harmonize national controls on transfers of DU materials and equipment to other countries	Yes (Zangger Committee and Nuclear Suppliers Group)	Yes (Australia Group)	Yes (Wassenaar Arrangement)
Commitment to assist countries in eliminating weapons, material, and facilities and redirecting former weapons scientists in former Soviet Union and other countries	Yes (G8 Global Partnership)	Yes (G8 Global Partnership)	No
Commitment to interdict shipments of DU materials to countries/terrorists	Yes (PSI)	Yes (PSI)	No
Assistance to countries in tracking smuggling of DU materials	Yes (IAEA Illicit Trafficking Database)	No	No

[Harris, 2016]

# GLOBAL EFFECTIVENESS OF STRATEGIC TRADE CONTROLS ALONG 5 CRITERIA



[Peddling Peril Index 2024, Institute for Science & International Security]

## DISRUPTIVE INNOVATION: MORE OF THE SAME? OR CHANGE THE GAME?

**Out-of-sync R&I Governance: Re-contextualization of International Collaboration policies; Transfer policies; Restriction policies**

**Which “mix” of self-, soft, and hard instruments is needed? When go uni-lateral, or multi-/minilateral? Technology-specific (use-case-centred) or cross-cutting (red-lines)?**

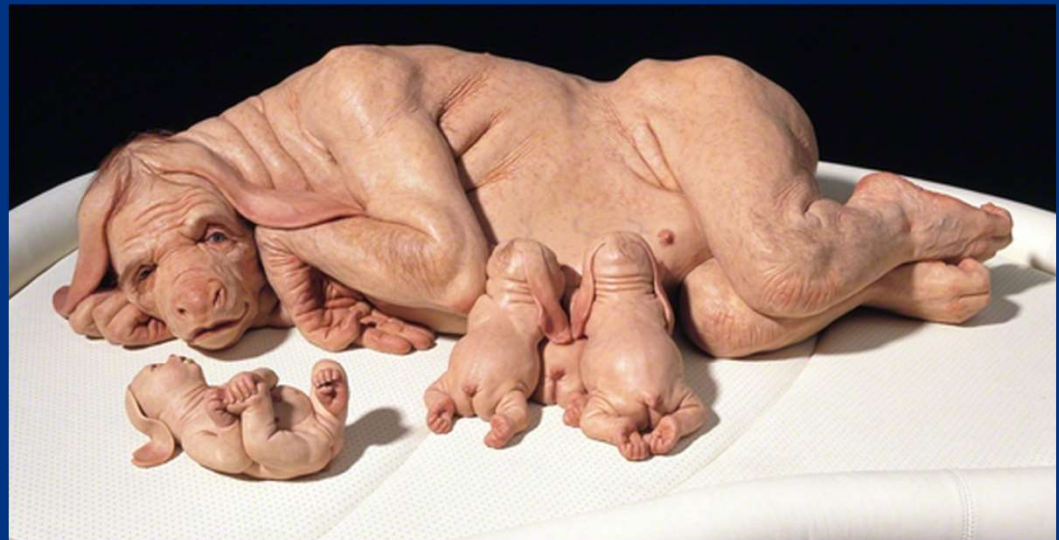
**To what extent should Research and Academia be responsive to societal concerns and governmental choices?**

**How to establish methodologically robust “early warning” governance mechanisms to mitigate risk without prematurely securitizing R&D?**

## HELGA NOWOTNY: Unersättliche Neugier. Innovation in einer fragilen Zukunft (2005)

“Überraschend ist auch die Geschwindigkeit, mit der sich eine innovative Idee in eine Innovation verwandelt, und die Beschleunigung, mit der eine Innovation sich ausbreitet und das Bestehende verändert. Innovationen bringen die Grenzen zwischen Gegenwart und Zukunft zum Fließen. In vielen Bereichen haben die dramatischen Veränderungen an neuen Anforderungen und an Möglichkeiten, die von der Zukunft zu erwarten sind, die Tür zur Gegenwart eingedrückt.

...Dort, wo die Vorhersagen der Naturwissenschaften auf einigermaßen gesicherte Daten und Modelle stützen könnten, muss in weiten Bereichen das unberechenbare menschliche Verhalten mit einbezogen werden.“



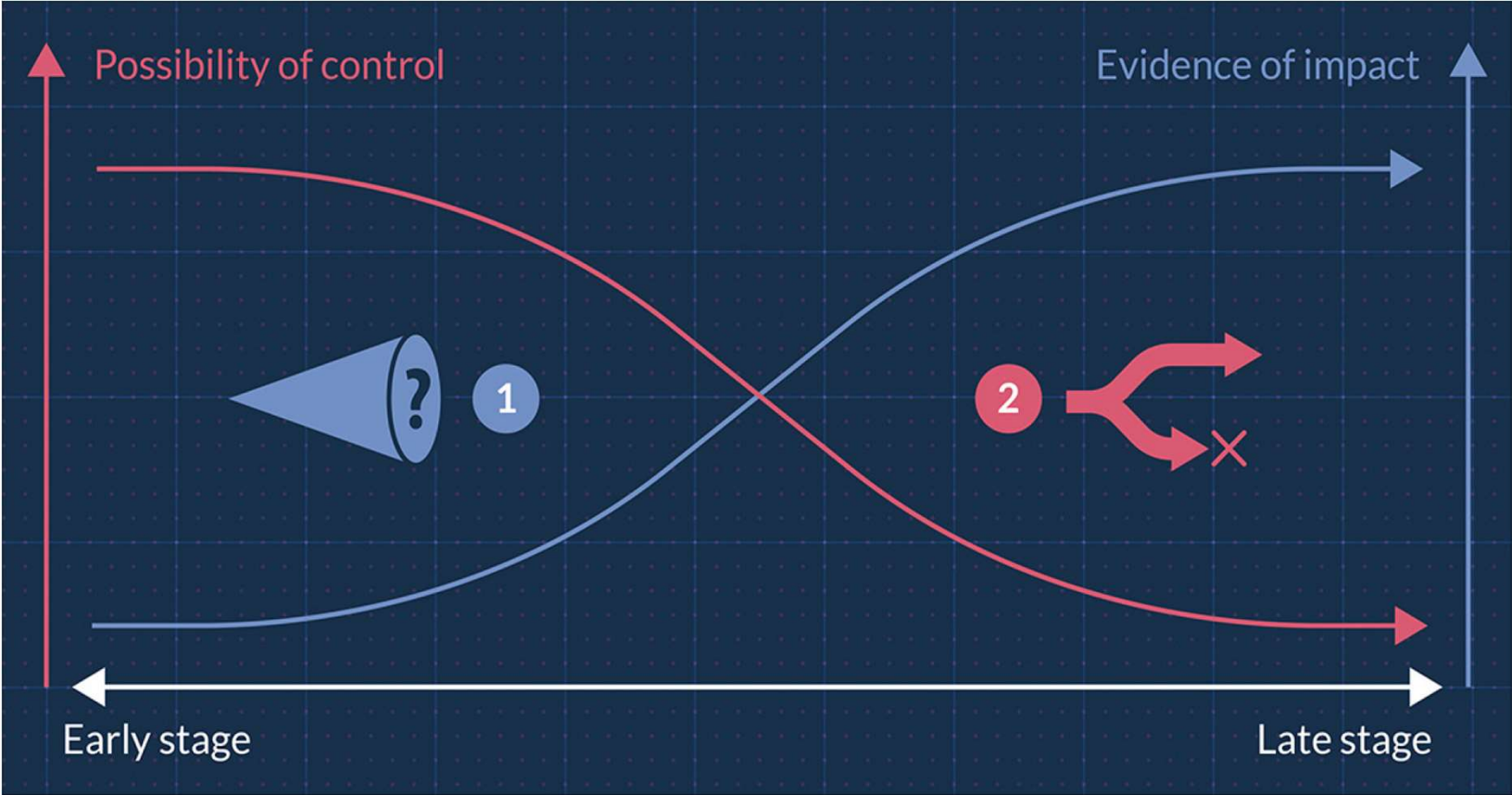
Patricia Piccinini | The Young Family (2002)

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THANK YOU!



# COLLINGRIDGE DILEMMA



- 1 • Easy to control
- Hard to know the impact

- 2 • High evidence of impact
- Hard to control

[OECD, OPSI 2020]