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Reinhilde Veugelers

An Innovation-Based Industrial Policy for the EU

Recognising the opportunities and challenges of the transition from dirty to clean technologies, economies have ventured into clean tech industrial policy and are competing for their share of the global economic opportunities from clean tech while reconciling their decarbonisation and socio-economic transformation objectives. Another recent trend is the growing emphasis on strategic autonomy and security of supply as an objective in industrial policymaking. A new world of geopolitical and geo-economic competition pushes countries to retake control in strategic industrial sectors or technologies with a directed industrial policy, picking selected targets deemed to be “strategic” for support.

Countries are still figuring out how to reconcile the multi-dimensional objectives of a current day industrial policy, particularly when these dimensions counteract each other. How to combine economic growth, jobs and building globally competitive ecosystems with decarbonisation while assuring resilience and security of supply? A challenge for industrial policymaking is the view that the new geopolitical setting justifies watering down competition policy and using trade policy instruments to build fences around markets. However, if this is translated into restrictive trade policies such as tariffs, local content restrictions and diluted competition policy enforcement to allow local “champions”, would it be at the expense environmental and economic efficiency?

Mastering the multi-dimensionality of industrial policymaking will require the innovation system at full capacity. Innovations can be the cornerstone of a successful tran-

sition that can reconcile competitive value creation and jobs, decarbonisation and security of supply. The recent Draghi (2024) report rightly lists innovation as a first priority: “First – and most importantly – Europe must profoundly refocus its collective efforts on closing the innovation gap with the US and China... We must unlock our innovative potential” (p. 2).

What will ultimately define the success of an industrial policy is whether it succeeds in unleashing private sector innovative investments to meet society’s net-zero targets in a globally competitive and resilient manner. But the innovation system cannot do this on its own, even if supported by a well-functioning classic horizontal industrial policy ensuring open and contestable markets. In view of the combination of knowledge, environmental and security externalities, together with path dependencies, and considering the urgency, it needs to be properly steered. As a more directed approach is necessary, policymakers need to be able to allocate resources to technologies and projects, without creating more government failures than the market failures they aim to address.

Choosing technologies and projects should also take into account the externalities and path dependencies of any choice on other, non-selected technologies or projects. This calls for a good mix between vertical and horizontal instruments, supported by a regulatory framework that promotes competition and open trade to ensure a predictable and level playing field. Having a vibrant innovation system that encourages a wide pipeline of new ideas for commercialisation should always be high on a directed industry policy agenda in order to be resilient to government failures and allow for future breakthroughs that may not have initially been on the policy radar.

This article first briefly lays out the state of affairs of the EU’s innovation ecosystems to check their capacity to deliver for an innovation-based industrial policy. It then discusses the challenges the EU faces regarding an innovation-based industrial policy and concludes with recommendations.

State of affairs

The EU economy failed in recent years to grow as vigorously as countries in its peer group, particularly the United States: EU GDP per capita has remained stable at two-thirds of the US level (see e.g. Pinkus et al., 2024).

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Table 1
Trends in R&D spending (2015/2022)

	EU27	US	China	EU27-US gap (%)
Spending on research and development (% of GDP)	2/2.2	2.8/3.5	1.9/2.4	71/63
Government-financed R&D (% of GDP)	0.64/0.66	0.69/0.69	0.44/0.46	93/97
Business performed R&D (% of GDP)	1.28/1.41	2.02/2.68	1.58/1.87	63/52

Sources: Author's own calculations based on OECD, Main Science and Technology Indicators; National Science Foundation, Science & Engineering Indicators.

On total factor productivity growth, an important driver of GDP growth, the EU has trailed the US since the 1990s. Although it managed to catch up from 2013 to 2019, the US pulled ahead of the EU during the most recent, 2020-2022 period, reflecting its more vigorous recovery from the COVID-19 pandemic.

The EU has been lagging behind in total factor productivity growth, which is related to its business sector innovation performance (see e.g. Pinkus et al., 2024). While the evidence on the recent performance of the EU's research and innovation system compared to the US and China offers some encouraging signs, it contains mostly alarming wake-up calls (see also Veugelers, 2024).

The EU27 spending on R&D (expressed as a share of GDP) hovers around 2% and is still far away from the 3% target the EU had set to achieve by 2010 (Table 1). With the US currently at 3.5%, the spending gap between the EU and the US is widening rather than shrinking. China has also made more progress than the EU27, even managing to overtake the EU27 on this indicator.

Although progress on the public part of R&D expenditure in the EU27 is too slow to reach its stated 1% target, the EU deficit relative to the US on the publicly funded part of R&D is almost on a par. However, it is not the public sector, but the business sector that is responsible for the persistent and growing EU R&D deficit relative to the US.

Looking at science performance, and more particularly high-quality science, as measured by top cited publications, the EU27-US gap is shrinking (Table 2). But it is China that has taken the lead over the US.

While Europe may have pockets of scientific excellence, it typically succeeds less in turning this into great innovative successes. The EU's lag in patent performance over the

Table 2
Trends in scientific performance (2015/2022)

	EU27	US	China	EU27-US gap*
Share of world top 1% most-cited publications, all fields (%)	23/19	33/22	12/25	70/87
Share of world top 100 universities (%)	19/18	48/37	2/11	40/49

Notes: * Numbers represent the position of the EU27 relative to the US (which is scaled to 100), i.e. an EU score of 70 would mean that the EU scores 70% of the US score. Because of whole count of co-publications, country/region shares of world publications do not have to sum to 1. Whole count rather than fractional count is used to avoid penalising international co-publications.

Sources: National Science Foundation; Academic Ranking of World Universities (Shanghai Ranking).

US has been reduced somewhat over time, but again it is China that is rising quickly. The substantial lead that the US enjoyed over China in the Patent Cooperation Treaty (PCT) applications has shrunk extremely rapidly and turned into a lag (Table 3), feeding the US-China technology leadership frenzy.

AI-related publications and patents are a major battleground for "strategic" general-purpose technology. While the EU has a lead, albeit shrinking, in AI-related publications relative to the US, this is absolutely not the case for AI-related patents (see Table 4). This reflects the EU's general and well documented challenge of turning its science into innovation power, coined as the "European paradox" (e.g. Dosi et al., 2004), which also applies to this battleground technology. The EU has been and continues to be a dwarf in AI patents. The AI patent race is between the US and China, with China growing massively and outpacing the US.

Delving further in the EU's persistent business R&D gap, we look at the position of EU firms in the ranking of the

Table 3
Trends in patent performance (2015/2022)

	EU27	US	China	Japan	EU27-US gap*
Share of PCT applications	24/19	28/22	14/26	21/18	84/87

Notes: * Numbers represent the position of the EU27 relative to the US (which is scaled to 100), i.e. an EU score of 70 would mean that the EU scores 70% of the US score. The patent applications filed under the Patent Cooperation Treaty (PCT) show the number of inventions whose owners have sought international protection across many countries or economies simultaneously. It does not include patents filed solely in an inventor's home jurisdiction. Not all applications are subsequently granted. PCT application data are classified based on the receiving office, which usually corresponds to the location of the inventor.

Source: Author's own calculations based on National Science Foundation/World Intellectual Property Organization patent applications filed under the PCT.

Table 4

Science and technology performance in artificial intelligence

	EU27	US	China	EU27-US gap*
Share in AI-related world publications (2015/2022)	28.5/15	18/10	24/34	162/146
Share in world AI patents (2000-2022)	5	22	48	23

Notes: * Numbers represent the position of the EU27 relative to the US (which is scaled to 100), i.e. an EU score of 70 would mean that the EU scores 70% of the US score. Numbers only cover granted international patent families. The technology-level analysis of international patent family data from the European Patent Office's Global Patent Index database covers years since 2000 with AI patents granted.

Source: Author's own calculations, National Science Foundation/PATSTAT.

2,500 companies with highest R&D spending worldwide (EC-JRC EU Industrial R&D Investment Scoreboard). As shown in Table 5, EU27 firms account for less than half of the positions held by US companies in the most recent 2022 Scoreboard, a gap that has widened over time. While China held as many positions in the ranking as the EU27 in 2017, by 2022 it doubled the number of EU27 positions.

The US lead over the EU27 of R&D spending is not only larger but continues to grow: while EU27 corporate R&D spending represented 82% of US spending in 2017, this has declined to only 55% in 2022. US Big Tech firms Alphabet, Meta, Microsoft and Apple take up the top four places on the Scoreboard in 2022, followed by China's Huawei in fifth place. The first EU27 firm on the Scoreboard is Volkswagen (sixth place). Volkswagen had first place in 2014 (see also Fuest et al., 2024).

The continued and increasing dominance of the US over the EU27 and the catching up of China is very much driven by sectoral composition. We briefly zoom in on differences between and within the sectors in the EU and US (see also Pinkus et al., 2024). The largest and strongest growing sector in the innovation landscape is ICT (broadly defined as electronics, hard and software, and services), clearly a high-tech sector with a high R&D intensity. The overall high corporate R&D-to-sales ratio of the US compared to the EU corresponds to the US having a strong presence of firms in this sector and with a high R&D intensity. EU27 has significantly fewer ICT firms among its Scoreboard firms; additionally, the ones it does have are less R&D intensive. This is mostly due to the absence of software and services ICT firms, which have particularly high R&D intensity. Looking at the top 10% of largest ICT R&D spenders, the EU is lagging even further behind. US firms sit firmly on top in this sector (holding half of the top 10% of the largest positions). Although Chinese firms are

Table 5

Trends in global business R&D

	Share in no. of 2500 firms	Share in no. of 250 firms	Share in R&D	R&D to sales
2017				
CN	0.18	0.10	0.10	2.8
US	0.31	0.36	0.37	6.3
JAP	0.14	0.18	0.14	3.4
EU27	0.18	0.23	0.23	3.6
2022				
CN	0.27	0.19	0.18	3.8
US	0.33	0.36	0.42	8.1
JAP	0.09	0.12	0.09	3.8
EU27	0.15	0.20	0.18	3.8

Source: Author's own calculations based on EC-JRC Scoreboard data.

still far behind in terms of size of their R&D budgets, they nevertheless have made progress in the top decile of R&D spenders, illustrating the intensity of the US-China battle for digital technology leadership.

Health is the second most important sector in the innovation landscape, also a clear high-tech sector with a high R&D intensity. The US has many more Scoreboard firms than the EU27 (see Table 6). However, the health firms that the EU27 has in this sector are on average only mildly less R&D intensive than their US counterparts.

Table 6

Trends in business R&D in major sectors

	Share of sector in region's total no. of scoreboard firms			Sector's R&D to sales			
	ICT	Health	Cars	ICT	Health	Cars	All sectors
2022							
World	33.0	23.4	6.7	8.8	12.9	4.8	4.7
CN	35.6	14.6	7.1	7.7	7.6	5.2	3.8
US	37.5	38.6	4.4	12.3	13.1	5.1	8.1
EU27	19.6	18.8	12.3	7.2	11.6	5.5	3.8
	Share of region in sector total R&D				Share of region in sector top 10% scoreboard firms		
	ICT	Health	Cars	All	ICT	Health	Cars
2022							
CN	18	6	13	18	18	3	12
US	55	52	19	42	49	53	18
EU27	9	17	42	18	7	19	41

Source: Author's own calculations based on EC-JRC Scoreboard data.

As shown in Table 6, the sector where the EU27 has been dominating in terms of the number of Scoreboard firms is cars (and automotive parts), but this is a sector that has a relatively low R&D intensity (medium-tech). EU firms in this sector are not particularly more R&D intensive than their foreign counterparts. A strong concentration in this medium-tech sector contributes to the significantly lower overall corporate R&D intensity of the EU, dubbed by others as the EU's "mid-tech trap" (see Gros et al., 2024). Here, as well, there is no room for complacency. Firms are increasingly being challenged by the new wave of interconnected, autonomous and electric cars from China and the US.

Another striking difference between the EU and the US (and China) is the age of its leading Scoreboard firms. This is most striking in ICT: the sector top five are seasoned, but still relatively young stars (Alphabet, Meta, Microsoft, Apple and Huawei), while stellar growers like Nvidia, established in 1993, was ranked 26 in 2022. The highest EU R&D spender in ICT is incumbent SAP followed by Nokia and Ericsson. Relatively young star ASML (established in 1984) ranks 36. In cars, all EU leading firms are incumbents, while Tesla is the US's highest R&D spender in this sector and BYD is China's second largest R&D spender. The same issue of firm age prevails in the health sector. Of the 31 US health firms in the top 10% of R&D spenders, 11 are new (including Gilead, Amgen, Novavax and Moderna). In contrast, the EU has only one new health firm, BioNTech, among its largest R&D spending companies.

Overall, the evidence on the performance of the EU's Science and Innovation System relative to the US is bad news. The major source of its lagging behind and failure to catch up with the US is not so much in its public funding and its science, but in its business sector R&D. While Europe might have pockets of scientific excellence, it is typically less successful at turning this into great innovative achievements. Compared to the US, and more recently China, who hosts most of the (new) R&D leaders (especially in digital sectors but also in other digital/AI using sectors such as pharma and automobiles), the EU corporate R&D system has a much weaker Schumpeterian creative-destruction power, generating fewer new innovators or dynamic incumbent leaders. These challenges are not new, but have become more urgent in a fast changing and highly competitive global technology environment.

EU's challenge to have a single market for an innovation-based industrial policy

The EU's corporate growth and innovation performance has many potential drivers, but its Single Market with

more than 440 million consumers and large scope for economies of scale and ecosystems, is a critical one, certainly when having to compete with US and Chinese firms.

Access to large markets for customers, suppliers, skills, resources and finance have become even more pivotal for firms investing in the current fast changing winner-takes-most global corporate landscape, where being able to scale fast has become more important. The cost of not having a single market for services has increased in a world dominated by digital giants. The cost of not having an integrated labour market has increased in a world in which productivity relies on the mobilisation of highly specialised skills in the creation and use of digital technology. The cost of not having a unified capital market has increased in a winner-takes-most world in which firms need to find the finances to rapidly scale their investments to compete in world markets. Also the increased turbulence in markets from geopolitical, climate and global health shocks, which require more resilient supply chains, upgrades the Single Market to a first class policy tool: the scale offered by the Single Market makes it a most efficient and effective tool to make us resilient to shocks (Poitiers et al., 2024).

It is thus quite natural to look at how the EU Single Market is performing as a driver of corporate innovation and productivity growth in the EU (see also Poitiers et al., 2024). While the costs of intra-EU trade have been falling continuously since the 1990s (e.g. Head & Mayer, 2021), it is also clear that the internal market remains a far cry from a fully integrated market. In its most recent 2024 Annual Single Market and Competitiveness Report, the European Commission had to acknowledge a stalling in its Single Market Programme. Looking at the trends in intra-EU trade flows (as a share of GDP) as a measure of EU internal market integration, the report shows that for goods this has been steadily increasing, reaching 26% in 2022 (up from 20% in 2013). Nevertheless, while this is consistently higher than the EU's share from extra-EU trade in goods (18% in 2022), internal market integration did not move faster than the EU's integration in world markets (12% in 2013). Goods trade between regions within the same member state is four times as large as trade across regions located in different EU countries (Santamaria et al., 2024). But it is particularly for services that the trend in market integration is bleak: intra-EU trade in services represented 7.5% of EU GDP in 2022, which is only marginally higher than what it was in 2013 (6%) and fails to rise above the share of extra-EU trade in services (7.7%). Costs of migration across EU borders remain almost ten times higher than across US states (Head & Mayer, 2021).

Multiple reports by both the European Commission and outside authors (e.g. Dahlberg et al., 2020) have sought to identify the actual barriers that keep causing these frictions. EU countries differ in terms of industrial structure, geography, firm and consumer demography and preferences. These differences imply that EU-level proposals for harmonisation can be divisive (and they usually are), even mutual recognition if the distance between specific regulations is too wide. This has been delaying progress in completing the Single Market, e.g. with regards to regulated services; has resulted in complex regulatory designs in an attempt to accommodate heterogeneity; and has resulted in consistent transposition or implementation deficits.

Recommendations for an EU innovation-based industrial policy

Given how structural, long-standing and serious the EU's deficient innovation and growth performance is, a big jump in policymaking will be needed, as also noted by Draghi (2024). Massive investments will be needed, and not only from public investments. The key is to leverage private innovative investments.

Central to an innovation-based industrial policy strategy are public-private partnerships, where public entities mobilise the innovation capacity, information and resources at firms and research entities so as to develop and deploy new solutions. Coordination among the many different types of stakeholders, policy governance areas, instruments and projects requires strong operational governance for a successful innovation-based industrial policy. And as a more directed approach is necessary, policymakers need to have a stronger governance structure to build the information capacity to allocate resources to technologies, projects and entities (see also Tagliapietra & Veugelers, 2021; 2023).

Such an innovation-based industrial policy is not proven yet, and will therefore require experimentation and flexible policy design, where learning, monitoring and evaluating on key performance indicators is tantamount. In the following section, we zero in on what this would imply for industrial policymaking reforms at the EU level, taking an innovation based approach.

An EU-level industrial policy centred around innovation and leveraging the Single Market

More public funding support can help to address the EU's business innovation debacle, but only if flanked by policies with framework conditions that shape the incentives for private investments in research and innovation.

The most important framework condition is a large, integrated and open competitive EU market, providing access to customers, suppliers, skills, as well as finance for innovative ideas to be commercialised. The challenge is not only to invigorate an EU Single Market regulatory policy that can effectively raise corporate innovation investments and productivity growth, but also to ensure that the complementary policies needed for a strong Single Market are properly tuned, particularly competition policy and trade policy.

At the same time, the right vertical policies are needed. Smart subsidisation is the key to avoiding the waste of public money and distortive interventions. Support needs to be carefully and smartly targeting those areas where market and ecosystem failures prohibit the building or maintaining of solid comparative advantages, particularly in technologies and markets of EU societal concerns, such as clean tech and resilience. This directedness applies particularly to projects that have the potential to be the next big breakthrough, but whose high-risk profile impedes private support. This is true in particular for new companies and new ecosystems, as limited access to finance may impede their investments to scale their commercialisation.

It cannot be emphasised enough that vertical policies, which target specific areas, need to be flanked by a Single Market regulation agenda, supported by competition and trade policies as major horizontal instruments in an innovation-industrial policy toolbox. Without such complementary horizontal policies, vertical policies will be far less efficient (Poitiers et al., 2024).

A better governed and evidence-supported EU industrial-innovation policy

Given the inherent complexities of both innovation-industrial policy and the EU as policymaking machinery, strong governance is a prerequisite for an effective EU innovation-industrial policy. Only leadership that is competent, independent, accountable to meet goals and milestones, and that encourages risk-taking may coordinate the progress of different government groups across policy competences and across geographic levels.

This EU body should be flanked with a monitoring, analysis and evaluation (M&A&E) unit of experts. They should provide the evidence base for EU policy actions in order to identify the actions with the highest efficiency and effectiveness, as well as the possibilities for the biggest bottlenecks, the highest returns and the lowest costs of implementation. These experts should monitor instruments to determine whether they are on track to deliver

on their targets and regularly evaluate the mix of policy tools in order to come up with alternatives when instruments are not delivering.

Taking an evidence-based approach means looking at how EU funding complements other public funding at the EU level (e.g. structural and regional funding), the European Investment Bank, Innovation Fund and the much bigger pots of national and regional funding for research and innovation. It also means assessing whether complementary policies are in place at EU and member-state levels to address any missing framework conditions necessary to leverage research and innovation investment into sustainable economic effects.

Taking an effects-based approach requires a monitoring and evaluation capacity that encompasses *ex ante* and *ex post* micro and macro assessments of long- and short-run impacts from policy instruments, both at the level of individual instruments as well as the whole portfolio. This should involve a permanent in-house monitoring and evaluation capacity based on open source data and methodologies such that external expertise can validate and complement internal analysis. This M&A&E toolbox will be needed not only for EU instruments, but also to support its pivotal role in coordinating with other policy-makers. More and better quality analysis can rebuild trust in EU instruments, most notably its internal market and its Framework Programme, demonstrating how EU instruments will provide benefits for member states beyond the euros that are directly allocated to them and by showing how their gains from EU instruments can be amplified by complementary local policies.

A Single Market 2.0 industrial policy

The Single Market truly is the EU's greatest asset for incentivising innovative investments. Only a well-functioning, globally linked EU market will indeed be able to achieve a similar scale to the domestic markets of the United States, China or India. Fragmented national measures will not lead to private innovative investments at the scale that Europe needs to become globally competitive in the key markets of the future, such as batteries or electric cars.

To achieve this, the EU needs to foster and deepen its Single Market for goods, services, finance, energy, people and ideas. It is the carrot of the win-win effects from the innovation and growth potential of the Single Market that should mobilise and align member states' interests on the Single Market 2.0 agenda.

From the long list of valuable suggestions for a Single Market 2.0 agenda (see Letti, 2024), we would like to

bring a few to the forefront, as they are likely to be high-leverage actions on the EU's innovation capacity, to be confirmed by M&A&E.

A 28th regime European Code of Business Law would be a transformative step towards a more unified Single Market, providing businesses with tools to operate within the Single Market. This Code will supplement national laws with a new instrument that businesses can choose to utilise. A European Business Code would provide businesses, especially new fast growing firms, with a 28th regime to aid their Europeanisation, making the Single Market their home market. It may also make it easier to incentivise venture capital to finance EU scaling firms, avoiding the need to navigate across the patchwork of national laws to assess their investability.

To be truly growth enhancing, the EU Single Market should be open and competitive. For this, it is essential to preserve the power of the EU's competition policy toolbox to avoid incumbency, protectionism and rent-seeking traps. This competition policy toolbox needs to evolve to look more dynamically at innovation markets, preserving markets that can be contested by new innovative projects. At the same time, EU trade policy should not fall into a reciprocal protectionist trap: it needs to remain open to allow the EU to import intermediate goods and natural resources that it cannot competitively produce itself, and to help keep export markets open.

EU public financing support programmes for innovation

While the European Commission leads on Single Market regulation, competition and trade policy, it has much weaker instruments to influence public investment. Most of public spending in the EU is done at the member state level. The Horizon Europe budget for research and innovation (R&I) only covers about 7% of public R&I spending by EU countries. But it can control national support policies through its EU state aid competence. For this, the EU State Aid Guidelines cannot be watered down, a tendency suggested by the evidence on the large increases in both the level and the cross-country dispersion of subsidies that have occurred because of recent crises, which have led to special legal regimes (e.g. Kleimann et al., 2023; Tagliapietra et al., 2023).

Since the EU can only go so far to steer coordination, it must be able, as part of the vertical industrial policy, to offer financial incentives in subsidiarity with national and regional incentives. Its own budget is only a small part of total EU public spending. EU funds will be needed for cases where the cross-EU externalities and resource mis-

allocation from fragmented national state-aid policy interventions are sizeable. This is why the EU needs to have a relevant “federal” budget. But beyond the size of the budget, a first issue is how to design the EU budget, identifying instruments where the EU can provide a clear value added over national or regional instruments. The M&A&E unit will need to provide this *ex ante* and *ex post* assessment. In what follows, we highlight some candidates for EU programmes to pass this test (see also Veugelers, 2024; Poitiers et al., 2024).

The Important Project of Common European Interest (IPCEI)/Alliances format, being a good example of the needed public-private partnerships (see above), can be strengthened with EU funding and more coordination. Current schemes are thin on synergy effects from cross-country collaboration, bureaucratically heavy and end up mostly supporting a few large incumbent firms that have the ability and experience to propose and manage such projects, which typically take place in the EU countries that have sufficiently deep pockets to support them. EU top-up funding will allow for projects with large spillovers that may have otherwise been overlooked due to a lack of capacity from MS with funding constraints. While large firms can play an anchor role in such projects, it is important to ensure that smaller players and radically new ecosystems can find their place. Otherwise, the risk is that the IPCEI format will fail to pick disruptive new technology solutions.

When it comes to strategic procurement, EU funds could be used to partly fund national public procurement of innovative technologies and encourage their roll-out at EU scale, sharing costs and risks with the government entities undertaking the procurement. Such topping up could help leverage the large amounts of public resources spent through innovative public procurement across the EU for the innovation-industrial policy agenda (see also Sapir et al., 2022).

The EU’s aspiring entrepreneurs, especially younger, more radical innovators, face obstacles in bringing their ideas to commercial fruition, particularly in relation to risk finance. Public funding support could help to address this barrier. Horizon Europe with its Open Innovation pillar and its new instrument, the European Innovation Council (EIC), took a clear step towards addressing this issue. Yet, as various support schemes already exist in member states and at the European level (for example, the European Investment Fund), the question is what new unique value added can the EIC bring to the public funding landscape in terms of subsidiarity and complementarity to other instruments. The value added of the EIC over similar instruments lies in its EU-level scope being a critical quality label. Being an EIC grantee could and should become

a valuable certification, which will help them secure other funding. For this, it is critical that an EIC governance model like the European Research Council (ERC) is installed, based on a sufficiently autonomous council composed of recognised technology leaders who can design the programme and select the evaluators. The potential for EIC value added is more obvious for high-risk proposals in their early stages of financing, when certification is much more critical. And, like the ERC, the EIC should be fully based on bottom-up proposals from entrepreneurs and not confined to specific top-down selected areas or other requirements such as collaboration.

Researcher mobility is a critical pathway for knowledge networks, collaboration, connectivity and spillovers. The Framework Programme instrument for research mobility is the Marie Skłodowska Curie Actions (MSCA). Yet, only a small part of the current MSCA budget, already relatively small, is spent on individual fellowships for mobility. Sending more EU researchers from academia to industry across borders will help bridge the EU’s gap between science and the commercialisation of innovative ideas. It would help address the skills shortfalls that are identified by start-ups as a constraint in scaling up, and by companies as a major constraint in adopting new digital technologies. Scaling up the MSCA for industry-science mobility and more targeting of MSCA mobility fellowships to specific missions would help address the European paradox and improve knowledge spillovers in key areas, such as AI.

Still underdeveloped in the current EU toolbox is a truly directed, missions-oriented perspective, with efforts fragmented and poorly implemented across various new initiatives. The “missions” programme of Horizon Europe is co-designed with stakeholders and managed by EU high-level officials, leaving a high government failure risk with allocations and specifications that best fit existing stakeholders. Still lacking is a Defense Advanced Research Projects Agency-type of a goals-oriented, top-down approach supporting high-risk, high-gain projects. Like Fuest et al. (2024) and Draghi (2024), we advocate the creation of an EU Advanced Research Projects Agency (ARPA), run by an independent agency, endowed with a dedicated budget to allocate to precisely defined missions related to EU policy priorities. The EU ARPA could have several sections (e.g. an EU-ARPA-Energy, EU-ARPA-Climate, EU-ARPA-Health, EU-ARPA-Defence). An ARPA-style approach requires sufficient funding – part of which could originate in the reallocation of existing budgets – to allow it to make multiple bets within a portfolio approach. Equally important is to design it properly, most notably, granting it autonomy and organisational flexibility, to recruit and accommodate the venture capital entrepreneur type of policy officers. Calls must have clear quantifiable

goals and trackable metrics, so that policy officers can be given elevated levels of autonomy, together with clear accountability. Because of its distinct features, it should not be integrated with the EIC, but rather be a dedicated agency.

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