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MISSION-ORIENTED INNOVATION IN THE USA

Shaping markets toward grand challenges: a new industrial policy frontier

Societal challenges demand a dramatic shift in how we think about innovation. As Congressman Frank Pallone (District of New Jersey) said: 'The time for slow, marginal change has gone.' The threats — from environmental degradation, climate change, global pandemics, potential bioweapons to antibiotic resistance — as well as the opportunities arising from new technologies like artificial intelligence and synthetic biology, all call for innovation in service to America's health and prosperity.

Moving from an era of relative certainty with fast solutions to consumer problems, to one that embraces complexity and uncertainty and the broader challenges the world faces, requires scientific progress and technological and social innovations. Put simply: we need new tools to face the future. These are the new frontiers of our time and they will demand mission-oriented collaborations between the state, businesses and civil society, working together to innovate and shape markets, fostering both public value and economic growth.

Inclusive and sustainable growth requires not just a rate, but also a direction and this cannot be left to the private sector alone. It is no longer enough for government to sit back and fix the market failures of the private sector. Today's policy makers must be future focused, creating and shaping new markets to meet the challenges that we face. The post-COVID recovery will not build back better on its own, it needs strong political leadership, clear direction, robust innovation policy and on the ground delivery capacity.

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Towards a mission economy

While President Kennedy's moon-shot is the best-known example of ambitious mission-oriented policies, governments in the 1960s were perhaps more open to such bold policies. First-generation mission-oriented innovation followed a 'big science meets big problems' maxim that worked spectacularly well in some instances (for example, the space race and the internet), and less so in others. Importantly, the success of mission-oriented policies relied on innovative institutional solutions (for example, creating demand for new solutions through procurement) and mission-oriented agencies (such as DARPA and NASA).

When the US government invested big, it got a man to the moon and back. That feat entailed guiding an extraordinary amount of public and private interactions for the best part of a decade. Apollo 11 was achieved directed by NASA but achieved also by many companies, including General Motors, Honeywell and Motorola. The innovation required was across sectors — in aeronautics, nutrition (baby formula), material (foil blankets), electronics (camera phone, cordless vacuum cleaners) and software. The government-led, cross sectoral innovation that led to such inventions is what Mazzucato calls in her recent book (*Mission Economy: a moonshot guide to changing capitalism*) a 'mission oriented' approach to innovation policy.

Professor Mariana Mazzucato and the Institute for Innovation and Public Purpose (IIPP) at University College London are pursuing a research and policy agenda in collaboration with political leaders and government agencies around the world to define how to shape and co-create markets that address grand challenges through innovation and industrial policy. This research [1] has found that to drive mission-oriented innovation, industrial policies should set long-term, politically resilient 'missions' that are concrete, time-bound, ambitious, bottom-up and cross-sectoral. By going beyond a focus on sectors, missions can define new pathways for investment as they focus on problem-specific societal challenges, which many different sectors interact to solve and they create the potential for greater spillovers.

Applying mission-oriented thinking in our times requires not just adaptation, but also institutional innovations and dynamic capabilities within public organisations that create new markets and reshape the existing ones. As American economist Richard Nelson argued in his seminal 1977 book *The Moon and the Ghetto*, getting man to the moon and back is not the same as solving the problem of ghettos in American cities. Social problems are 'wicked' in the way that social, political, technological and behavioural factors intersect. It is impossible to get greener cities, for example, without paying attention to all four of these dimensions. In that sense, the moon-shot was easier.

Apollo is the blueprint, not the map for action plans to create innovation-led and sustainable growth; the truth is that our problems today are harder, and more complex than putting a man on the Moon. They are not purely technological but profoundly social, requiring behavioural and regulatory change. How do we ensure scientific and technological progress will truly benefit the society, especially the regions and populations that are 'left behind'? Beyond investments in technology, what institutions and structures are needed to enable the translation of innovation into societal benefit? And crucially, how do we build — or indeed, rebuild — the society and the process to co-create consensus for the kind of world people want to live in? A huge amount of investment by business and governments is required to help solve society's biggest problems such as climate change and the digital divide.

Missions and a new industrial strategy for the USA

The US faces unprecedented domestic and global challenges — from the dramatic impact of the pandemic on the society and economy, to climate change and rising tensions in global trade, technology competition and national security. The pandemic has also accelerated structural

1 Mazzucato, M and Dibb, G. (2019). Missions: A beginner's guide. UCL Institute for Innovation and Public Purpose, Policy Brief series (IIPP PB 09)

imbalances in the US and revealed several weaknesses threatening the country's overall resilience, social cohesiveness and economic competitiveness.

Industrial policy has been central in shaping the structure and direction of the US economy throughout its history, since Alexander Hamilton's *Report on Manufactures* in 1791 and the policies promoted by other Founding Fathers of the Federation[2] . Critically, at key historical conjunctures — from WWII to the Cold War and the most recent Great Recession, industrial policy has been called upon by the US Federal Administrations to lift the economy out of crisis and turn it into an opportunity for structural change. Today, industrial policy is back at the centre of the US policy agenda.

Throughout US history, industrial policy has been also functional in the development of public institutions, departments and agencies of the US *Entrepreneurial State*[3]. Under Roosevelt, the landmark report *Science - the Endless Frontier* set the foundational stones of the National Science Foundation in 1950. The following decades also opened the way to further institutional developments and the emergence of a networked-decentralised industrial policy model epitomised by DARPA. Several federal administrations have continued building and reforming research departments and technology agencies including the National Institutes of Health; introducing mission-oriented initiatives starting with the Apollo and more recently the genome and robotics initiatives; financing schemes such as the SBIR and STTR programmes in the 1980s[4]. Over the years, these institutions, programmes and networks have played a pivotal role in the development of the US innovation ecosystem. They have been key drivers of a century of US unchallenged global technology leadership.

US industrial policy has developed under different names and policy framing, the latter reflecting alternative economic paradigms and emphasis on different policy challenges and priorities[5]. For example — between 2000 and 2008 — the *American Competitiveness Initiative* under the Bush administration relied primarily on horizontal market-friendly reforms, regulation and fiscal incentives. The *American Recovery and Reinvestment Act* under the Obama administration focused on Science and Technology Policies, with a focus on green technologies and significant allocations to the Department of Energy and the establishment of ARPA-E. The importance of rebuilding the US productive economy was also emphasised under Obama with schemes promoting re-shoring, manufacturing extension services and intermediate technology institutes supporting commercialisation.

Most recently, industrial policy has been brought back into the US policy debate with legislations put forth by senators Elizabeth Warren[6] and Marco Rubio[7],[8]. These developments represent two emerging industrial policy propositions in the US debate. On the one hand, the Democrat senator frames industrial policy as an instrument to address domestic imbalances, stagnant wages, growing

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2 Chang, H-J. (2002). *Kicking Away the Ladder: Development Strategy in Historical Perspective*, Anthem Press; Cohen, S. and De Long, J.B. (2016). *Concrete Economics: The Hamilton Approach to Economic Growth and Policy*. Harvard Business Review Press; Sitaraman, G. (2020). *Industrial Revolutionaries.* Available from https://prospect.org/economy/industrial-revolutionaries-franklin-hamilton-madison-jackson/

3 Tassey, G. (2014). Competing in Advanced Manufacturing: The Need for Improved Growth Models and Policies. *Journal of Economic Perspectives*, 28(1), 27-48; Block, F. and Keller, M. (2011). *State of Innovation. The US Government's Role in Technology Development*. Paradigm. ; Mazzucato, M. (2013). *The Entrepreneurial State. Debunking Public vs. Private Sector Myths*. Anthem Press.

4 Mazzucato, M. (2021). *Mission Economy. A Moonshot Guide to Changing Capitalism*. Allen Lane.

5 Block and Keller (2011); Andreoni, A. (2016). 'Varieties of Industrial Policy: Models, Packages and Transformation Cycles' in: Noman, A. and J. Stiglitz (eds.) *Efficiency, Finance and Variety of Industrial Policy*. Columbia University Press; Chang, H-J. and Andreoni, A. (2020). Industrial Policy in the 21st Century. *Development and Change*, 51(2), 324-351.

6 See https://medium.com/@teamwarren/a-plan-for-economic-patriotism-13b879f4cfc7; https://medium.com/@teamwarren/my-green-manufacturing-plan-for-america-fc0ad53ab614

7 See https://www.rubio.senate.gov/public/index.cfm/press-releases?ID=BC6C0054-7C4E-4012-A1FD-26A24AE16C0D

8 Tucker, T. (2019). Industrial Policy and Planning: What It Is and How to Do It Better for a review of the US current national debate on industrial policy. Available from: https://rooseveltinstitute.org/publications/industrial-policy-and-planning/

inequality and sluggish economic growth. Several technology, skills and labour policies, alongside tax and corporate governance reforms addressing financialisation are advanced as building blocks of a sustainable and equitable social contract. On the other hand, the Republican senator has developed an industrial policy proposition centred on the competitiveness challenge posed by China and the need for rebuilding US leadership in the global technology race, its control over strategic supply chains (e.g. CHIPS for America Act) and a more mercantilist style of trade policy.

These two industrial policy propositions define a spectrum of potential policy interventions and call upon different US government departments and agencies for their implementation. In some areas along this spectrum, there are already signs of a transversal and aligned set of industrial policy targets, such as in the context of the *US Innovation and Competition Act* (formerly the *Endless Frontier Act*[9]) and Biden's Executive Order to ensure a 'diverse, and secure supply chains, […] economic prosperity and national security'[10]. The need for a High-Tech Policy response to the challenges and opportunities of globalisation is perhaps the industrial policy proposition with most transversal support, and the one more in line with the US industrial policy history[11]. This industrial policy proposition is aligned with Biden's belief in manufacturing industries and the middle-class as the backbones of the US economy. This proposition also resonates with Republicans' concerns about China's rising power and the need to re-build the US industrial power[12].

In Biden's first week in the White House, he re-opened the Science and Technology office that Trump had closed four years earlier. Senate Majority Leader, Chuck Schumer (D-NY) is set to accelerate the enactment of the bipartisan *Endless Frontier Act 2020* (now known as the *US Innovation and Competition Act*), which he co-sponsored with Senator Todd Young (R-IN), Representative Ro Khanna (D-CA) and Representative Mike Gallagher (R-WI). Introducing the bill, Senator Young has rightly observed that innovation will be key to maintaining the United States' leadership in global technological innovation: '… if America is to lead the world in the 21st century…we can learn and apply lessons from the Cold War…[and] must not simply contain a competitor but instead out-innovate and out-grow them.'

There are other more contested industrial policy areas (and instruments) that might define the perimeter of a potential new frontier of industrial policy in the US under the Biden administration. Four policy areas come to the fore, alongside the one mentioned above.

1. First, the need for a Green New Deal directing the US towards the complete restructuring of its energy system, infrastructures and a dramatic change on domestic patterns of production and consumption. The establishment of a dedicated funding vehicle — i.e. National Green Bank — to support hard-to-commercialise clean energy and carbon-cutting investments with federal funding, is getting bipartisan support

2. Second, the need to address the high level of financialisation of the US economy, and in particular the financialisation of publicly-listed companies. Increasing evidence suggests how corporate governance reforms are needed to shift from a 'shareholder-model' towards a 'stakeholder-model' of capitalism. Moving away from financialised practices means ensuring that the value created within business enterprises is retained and reinvested in innovation and jobs, instead of being diverted into stock-buybacks and excessive dividends[13].

3. Third, the need to rethink competition policy in the era of digital platforms. The governance of data and digital platforms pose new challenges to the Federal Administration.

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9 See https://www.congress.gov/bill/116th-congress/senate-bill/3832/text

10 See https://www.whitehouse.gov/briefing-room/presidential-actions/2021/02/24/executive-order-on-americas-supply-chains/

11 See Dertouzos, et al. (1989) *Made in America. Regaining the Productive Edge*. MIT Press.; Berger, S. (2013) *Making in America: From Innovation to Market.* MIT Press. 0

12 Ahmed, S. et al. (2020) Making US Foreign Policy Work Better for the Middle Class. Available from: https://carnegieendowment.org/2020/09/23/making-u.s.-foreign-policy-work-better-for-middle-class-pub-82728

13 Lazonick, W. (2014). Profits Without Prosperity. *Harvard Business Review*, September

Network effects and 'algorithmic rents'[14] give a few digital platforms enormous power and opportunities for rents capture, with potential negative impact on the innovation and competition along several sectoral value chains in the rest of the economy. The distributional impact of these new digital platform business models and their use of powerful technologies also call for new forms of regulation.

4. Fourth, the current pandemic has highlighted once again the central role that a well-funded and resilient health system can play in assuring social cohesiveness and economic resilience. An industrial policy that invests in health, raises questions about the extent to which risks and rewards from innovation are distributed and shared[15]. Publicly funded institutions and research programmes in bioscience and pharma have created the conditions for innovation in the health sector, de-risked and crowded in private investments. However these public investments have not been rewarded.

Following in the footsteps of Roosevelt in 1944, on January 15, 2021, President Biden wrote a letter to Dr Eric Lander — director of the Office of Science and Technology Policy (OSTP) — asking five specific questions on how the NSF and other federal agencies can help in addressing the most pressing social and economic challenges in the US and beyond. President Biden is on a quest for 'general strategies, specific actions, and new structures'. The department and agencies of the US Entrepreneurial State are today asked to re-think their role, missions, organisational models and structures in light of the new mutated domestic and global environment. Understanding this process, learning from design solutions, institutional forms and functions, and their directionality, is central to the US new industrial policy frontier. It is also central in rethinking the relationship between the state and the market[16]. The pandemic, increasing inequalities and climate change have highlighted the limitations of the dominant economic paradigm and called for a paradigmatic shift. Industrial policy is central in this process, exactly because these policies define the terms and conditions of a new social and economic contract.

An invitation to explore this agenda in collaboration

Since its launch in 2017 and with the generous support of the Rockefeller Foundation, the Institute for Innovation and Public Purpose has nurtured a growing global Mission-Oriented Innovation Network (MOIN) of government agencies who seek to drive innovation through industrial policy and set missions for economic and societal transformation. With the generous support of the William and Flora Hewlett Foundation, IIPP is now extending an exclusive invitation to US policy makers to be part of our US-based MOIN network of public agencies who can engage with us in co-shaping a mission-oriented innovation policy tool kit. We call this research and co-creation 'practice-based theorising' and it is a process that explores and develops further IIPP's policy framework which we call ROAR[17].

Biden's letter to Dr Eric Lander set out an agenda for mission-oriented innovation and a new market shaping role of the State. We are hoping to engage with policy makers through MOIN USA as pioneering practitioners at the intersection of government and technological innovation, to join us to consider his questions through the lens of the ROAR framework and understand missions in the context of their institutions. We invite these policy makers to set the agenda with us for a three-year program of research and learning with fellow practitioners and a leading academic network.

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14 Mazzucato, M., Entsminger, J. and R. Kattel (2020). Public Value and Platform Governance. WP9, Beyond 4.0.

15 Lazonick, W. and Mazzucato, M. (2013). The risk-reward nexus in the innovation-inequality relationship: who takes the risks? Who gets the rewards?. I*ndustrial and Corporate Change*, 22(4), 1093-1128; Laplane, A. and Mazzucato, M. (2020). Socializing the risks and rewards of public investments: Economic, policy, and legal issues. *Research Policy*, Vol 2, Dec.

16 Kramer, L. (2018). Beyond Neoliberalism: Rethinking Political Economy. Available from: https://hewlett.org/library/beyond-neoliberalism-rethinking-political-economy/

17 ROAR is developed in Mazzucato, M. (2018). Mission Oriented Innovation Policy: Challenges and Opportunities. *Industrial and Corporate Change*, 27 (5): 803–815; see also, Mazzucato, M. (2016). From Market Fixing to Market-Creating: A new framework for innovation policy. *Industry and Innovation*, 23(2), 140-156.

The aim of MOIN USA will be to develop a research and policy paradigm that presents a new understanding of the political economy in the US with concrete implications for the practice of the public sector. To drive significant theoretical advances, we will work closely with US policy organisations to engage in a new type of interaction between policy making, policy implementation and research. Below we illustrate what the ROAR Framework stands for and consider it in the context of the pressing questions that President Biden has set out for the NSF and by implication the wider innovation community:

Table 1: The ROAR framework

	Biden's challenge
R is for routes: the directionality of policy which tilts the economy in particular ways	*"How can the United States ensure that it is the world leader in the technologies and industries of the future that will be critical to our economic prosperity and national security, especially in competition with China?"* **We should consider which missions will set the purpose and direction for this global leadership.**
O is for organisations: the organisational competencies needed for exploration and experimentation	*"What can we learn from the pandemic about what is possible — or what ought to be possible — to address the widest range of needs related to our public health?"* **We must reflect on the dynamic learning capability of our institutions.**
A is for assessment: the new forms of dynamic assessments for capturing market making and shaping that are needed	*"How can breakthroughs in science and technology create powerful new solutions to address climate change—propelling market-driven change, jump-starting economic growth, improving health, and growing jobs, especially in communities that have been left behind?"* **There is an implicit request to design new governance and evaluation tools.**
R is for risk and rewards: the concrete instruments to guide how growth can be better shared between all actors in an economy	*"How can we guarantee that the fruits of science and technology are fully shared across America and among all Americans?"* **The question of the nature of shared risk and prosperity follows.**

In summary

Over the next three years, the US Mission-Oriented Innovation Network (MOIN USA), aims to work with US public agencies and academics to build a research and policy agenda for shaping and co-creating markets, focusing on public value. The long-term aim will be to build new dynamic capabilities inside public institutions and to form concrete tools to address societal challenges — especially through industrial and innovation policy. This network will be supported by a collaboration with US academics focused on bringing the market co-creation and shaping agenda to the center of political economy.

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The UCL Institute for Innovation and Public Purpose (IIPP) is a department within University College London (UCL) – founded in 1826 to solve grand challenges – and part of The Bartlett faculty, known internationally for its radical thinking about space, design and sustainability. We apply our critical thinking to research and thought leadership; teaching and training; influencing public policy; and engaging the broader public.

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