Rethinking Innovation

The State, Markets and Society in Times of Upheaval

24-26 September 2021

A conference for early career researchers, hosted by INET-YSI and UCL Institute for Innovation and Public Purpose.

UCL IIPP

Young Scholars Initiative

Event summary

There was no blueprint for responding to the Covid-19 pandemic. In the face of a tragically deadly virus and the threat of unparalleled economic collapse, states around the world embarked on a variety of measures to protect citizens - wielding novel financial, industrial, and regulatory instruments, and steering markets to develop digital technologies and pharmaceutical interventions in rapid time. As we write, there are few obvious lessons from the crisis that shook the world in 2020 and laid clear the fault lines in our economies, but one thing is clear: innovation is not only critical for addressing collective challenges - it is also political.

This conference will bring in new voices and identify underdeveloped areas of research around key pillars of innovation policy. Our paper sessions, where young scholars will present, each address elements of innovation processes: state capacity; finance; governance; industrial capacity; structural change; and governance. We also have four exciting panels with leading scholars exploring how we decolonise technological progress, navigate serendipity in the digital realm, harness state capacity, and democratise innovation policy. We will also be joined for two keynote events - a welcome event with Mariana Mazzucato, and a discussion between Dr Antonio Andreoni and Professor Hochstetler on the green transition and innovation policy. Advancing new research in these areas will help to develop the next generation of inclusive and transformative innovation policies.

Owing to the ongoing pandemic situation, the event has been moved to an online format. Information about how to join the sessions is included in this document.

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Special thanks

The conference coordinators wish to thank, in particular, Antonio Andreoni for his ongoing support as Academic Advisor in developing the conference programme and publication and coordinating the Scientific Committee. We also wish to thank Drs Olga Mikheeva and Giorgos Gouzoulis for serving as members of the Scientific Committee. We are grateful to all who submitted papers, and to our speakers and discussants for joining us for what we anticipate will be a fantastic event.

Conference coordinators

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List of speakers and discussants

Name	Affiliation
Dr Antonio Andreoni	UCL IIPP
Dr Cecilia Rikap	CONICET, University of Paris
Dr Danilo Spinola	Birmingham City University
Dr Evgeny Morozov	Independent
Dr Kate Roll	UCL IIPP
Dr Olga Mikheeva	UCL IIPP
Dr Simone Ahuja	Blood Orange, MIT
Prof Andrew Stirling	SPRU, University of Sussex
Prof Carolina Alves	University of Cambridge
Prof Erika Kraemer-Mbula	University of Johannesburg, South Africa

Prof Iris Wanzenböck	Utrecht University
Prof Jaideep Prabhu	University of Cambridge
Prof Mariana Mazzucato	UCL IIPP
Prof Michiko Iizuka	National Graduate Institute for Policy Studies (GRIPS), Japan
Prof Rainer Kattel	IIPP
Prof Everisto Benyera	University of South Africa
Prof Bill Lazonick	Academic-Industry Network
Prof Kathryn Hochstetler	LSE Department of International Development
Prof Rainer Kattel	UCL IIPP

List of presenters and co-authors

Name	**Affiliation**	**Paper session**
Alessandro Piperno	LUISS	Governance
Alexander Copestake	University of Oxford	Structural Change
Alice Dartevelle	Sciences Po Law School	Finance
Ashley Pople	University of Oxford	Structural Change
Asker Voldsgaard	UCL IIPP	Finance
Blerim Morina	University of Prishtina	Governance
Chandra Shekar Katna	Centre or Development Studies	Inclusive Innovation
Christian Iaione	LUISS	Governance
Dena Kirpalani	IHEID	Finance
Diego Borges de Souza Arruda	State University of Campinas (Unicamp)	Governance
Diogo R. Coutinho	Georgetown University/University of Sao Paulo	State Capacity
Eduardo Spanó	University of Campinas	State Capacity

Efefiom Kofon	School of Oriental and African Studies (SOAS)	Finance
Elena De Nictolis	Luiss University. Rome	Governance
Elton Freitas	Universidade Federal de Minas Gerais	Structural Change
Fabrício Silveira	Fiocruz	Structural Change
Fabrício Silveira	University of Cambridge	Structural Change
Germán Zamorano	Universidade Federal do Rio de Janeiro	Structural Change
Iacopo Gronchi	Sant'Anna School of Advanced Studies	Governance
Jefferson R. B. Galetti	University of Johannesburg	Industrial Capabilities
João Prates Romero	UFMG	Structural Change
Katherine Stapleton	The World Bank	Structural Change
Laura Victoria Rodríguez-Zaragoza	Estudiante	Inclusive Innovation
Leila Mucarsel	Centro de Estudios para la Innovación Institucional , UNCuyo-CONICET	Inclusive Innovation
Lorenzo Cresti	Institute of Economics, Sant'Anna School of Advanced Studies	Industrial Capabilities
Ludwig Miguel Berdejo	FGV Ebape	State Capacity
Luis Godoy Rueda	Ministry of Economy, Mexico	State Capacity
Maria Carolina Foss	Faculty of Law at University of Sao Paulo	State Capacity
Maria Enrica Virgillito	Institute of Economics, Sant'Anna School of Advanced Studies	Industrial Capabilities
Martina Ayoub	Grenoble Alpes university and NEOMA Business School	Industrial Capabilities

Mateus Labrunie	University of Cambridge	Structural Change
Milene Tessarin	University of Johannesburg	Industrial Capabilities
Nadya Wells	IHEID	Finance
Nils Rochowicz	University of Oxford	Governance
Paulo C. Morceiro	University of São Paulo	Industrial Capabilities
Riley Livingstone	University of Strathclyde	State Capacity
Roberta Fischli	University of St. Gallen	Inclusive Innovation
Roy William Cobby Avaria	Department of Digital Humanities, King's College London	Inclusive Innovation
Shadwa Zaher	SOAS, University of London	Industrial Capabilities
Sofía Bosch Gómez	Carnegie Mellon University	State Capacity
Sofia Patsali	Université Côte d'Azur (GREDEG)	Structural Change
Travis Whitfill	UCL IIPP	Finance

Overview of all the sessions

Friday 24 September

All session times are stated in British Summer Time (BST)

All sessions on this day will be held via the following Zoom link:

https://youngscholarsinitiative.zoom.us/j/2843063080?pwd=OVAydHpiUktTTFBxQU5PMEhUMmxCQT09

Registration & Welcome with the Coordinators

Time: 12.30-13.00

Description: Welcome to *Rethinking Innovation: The State, Markets and Society in Times of Upheaval.* In this first session, all participants will have the opportunity to introduce themselves and get to meet the conference coordinators. We will have a few icebreaking activities to get to know each other.

Keynote with Professor Mariana Mazzucato

Time: 13.00-13.30

Description: Join Professor Mariana Mazzucato for an introduction to the conference's core themes and one of our host institutions, UCL IIPP.

Mariana Mazzucato (PhD) is Professor in the Economics of Innovation and Public Value at University College London (UCL), where she is Founding Director of the UCL Institute for Innovation & Public Purpose (IIPP). She received her BA from Tufts University and her MA and PhD in Economics from the Graduate Faculty of the New School for Social Research. Her previous posts include the RM Phillips Professorial Chair at the Science Policy Research Unit (SPRU) at Sussex University. She is a selected fellow of the UK's Academy of Social Sciences (FAcSS) and of the Italian National Science Academy (Lincei).

She is the author of three highly-acclaimed books: The Entrepreneurial State: Debunking Public vs. Private Sector Myths (2013), The Value of Everything: Making and Taking in the Global Economy (2018) and the newly released, Mission Economy: A Moonshot Guide to Changing Capitalism (2021).

She advises policy makers around the world on innovation-led inclusive and sustainable growth. Her current roles include:

- Chair of the World Health Organization's Council on the Economics of Health for All
- Member of the Scottish Government's Council of Economic Advisors
- Member of the South African President's Economic Advisory Council

- Member of the OECD Secretary General's Advisory Group on a New Growth Narrative

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Panel: Decolonising Innovation: Inclusive, pluriversal, and liberatory approaches to Innovation

Time: 14.00-16.00

Speakers:
- Dr. Simone Ahuja (Blood Orange)
- Professor Carolina Alves (University of Cambridge)
- Professor Everisto Benyera (University of South Africa)
- Professor Jaideep Prabhu (University of Cambridge)

Description: Within and outside of academia, there has been a call for the critical exploration of the systems, structures, and regimes of knowledge that undergird and shape academia and our society. Just as knowledge is situated in a sociohistorical, geopolitical, and temporal context, so too is our understanding of innovation. As people begin to question what is lost through the positioning of the Global North as the only locus of enunciation on innovation discourse, others are applying a decolonizing lens to innovation to look at what can be regained through inclusive, pluriversal and more liberatory understandings of innovation.

The panelists include the following:

- Professor Carolina Cristina Alves, the Joan Robinson Research Fellow in Heterodox Economics at Girton College at the University of Cambridge, a co-founder of Diversifying and Decolonising Economics D-Econ, and an editor of the Developing Economics blog.

- Dr. Simone Ahuja is the founder of Blood Orange, a global innovation and strategy firm which has provided innovation advisory services to several fortune 100 companies. Dr. Ahuja serves as an advisor to MIT's Practical Impact Alliance, and her thought leadership has been featured by the World Economic Forum and Harvard Business Review.

- Professor Jaideep Prabhu is the Jawaharlal Nehru professor of business and enterprise at the Judge Business School at the University of Cambridge and associate editor of BMJ Innovations. Professor Prabhu's research focuses on the cross-national issues concerning the antecedents and consequences of

radical innovation in high-technology contexts, multinational firms' organization of innovation activities worldwide, and innovation in emerging markets.

- Professor Everisto Benyera is an Associate Professor of African Politics in the Department of Political Sciences. He holds a Ph.D. in African Politics from Unisa and an MSc in International Relations from the University of Zimbabwe. Recently, Benyera published a book titled, "The Fourth Industrial Revolution and the Recolonisation of Africa: The Coloniality of Data, which examines the political economy of data through three analytical pillars of coloniality: power, knowledge, and being.

Social

Time: 16.00-17.00

Saturday 25 September

All session times are stated in British Summer Time (BST).

The Zoom link for today's sessions will be included in the event description.

Paper Session 1: Finance

Link:
https://youngscholarsinitiative.zoom.us/j/2843063080?pwd=OVAydHpiUktTTFBxQU5PMEhUMmxCQT09

Time: 12.00-13.30

Discussant: Professor Bill Lazonick, AIR-NET

Papers:

1. Asker Voldsgaard, The catalysing role of state-owned investment banks and enterprises: A temporal network analysis of global offshore wind finance
2. Dena Kirpalani and Nadya Wells, Rethinking 'Big Pharma' as Systemically Important: Empowering the State through Lessons from the Global Financial Crisis
3. Efefiom Kofon, The challenges of the Central Bank of Nigeria Intervention Fund to the pharmaceutical industry: A political settlement approach.
4. Alice Dartevelle, Turning pharmaceutical innovation into a virtuous circle
5. Travis Whitfill, The Financialization of Biopharma: The Impact of Financial Strategies and Financialization on Innovation

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Paper Session 2: Governance

Link:
https://youngscholarsinitiative.zoom.us/j/6091128720?pwd=dzZreCtzbEVmTUgyVVZBSFJLNzVOZz09

Meeting ID: 609 112 8720
Passcode: Innovation

Time: 12.00-13.30

Discussant: Professor Rainer Kattel, UCL IIPP

Papers:

1. Blerim Morina, The Role of Innovation and Entrepreneurship in the Economic Development of Kosovo
2. Diego Borges de Souza Arruda, Perpetuating or ceasing technological dependence? The characteristics of science and innovation foreign official development assistance programmes in Brazil
3. Elena De Nictolis, Alessandro Piperno and Christian Iaione, The principle of sustainable innovation according to the EU 2021-2027 financial framework: co-governance as a key dimension, cities as laboratories of experimentation. Challenges of public law and urban law and policy
4. Iacopo Gronchi, Rethinking embedded autonomy: State structures and innovation governance in Finland
5. Nils Rochowicz, Democratizing Innovation Policy: The Role of Technology Prediction Methods

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Paper Session 3: Structural Change

Link:
https://youngscholarsinitiative.zoom.us/j/2843063080?pwd=OVAydHpiUktTTFBxQU5PMEhUMmxCQT09

Time: 14.00-15.30

Discussant: Dr Danilo Spinola, Birmingham City University

Papers:

1. Fabrício Silveira, João P. Romero and Elton Freitas, Choosing battles: applying economic complexity for developing the health industrial complex in Brazil
2. Germán Zamorano, Structural change, BOP constraint and technology trap: limitations for developing countries' green transition.
3. Mateus Labrunie, Technological unemployment in the 4th Industrial Revolution: why not to fear it, and how to manage it
4. Sofia Patsali, University procurement-led innovation
5. Alexander Copestake, Katherine Stapleton and Ashley Pople, AI, firms and wages: Evidence from India

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Paper Session 4: State Capacity

Link:
https://youngscholarsinitiative.zoom.us/j/6091128720?pwd=dzZreCtzbEVmTUgyVVZBSFJLNzVOZz09

Meeting ID: 609 112 8720
Passcode: Innovation

Time: 14.00-15.30

Discussant: Dr Olga Mikheeva

Papers:

1. Ludwig Miguel Berdejo, The role of learning processes in the innovation capability building in public sector organizations in developing economies: evidence from local government organizations in Brazil
2. Maria Carolina Foss, Diogo R. Coutinho, Legal Innovation for Public Health: procurement contracts to COVID-19 vaccines in Brazil
3. Riley Livingstone, Relational factors in collaborative innovation and the workplace in health and social care
4. Sofía Bosch Gómez, Luis Godoy Rueda, Data and Design Capacity for State Innovation
5. Eduardo Spanó, Legal-institutional design and dynamic capabilities of innovation agencies: the case of a Brazilian agency

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Panel: Innovation Policy in an Age of Digital Rents and Uncertainty

Link:
https://youngscholarsinitiative.zoom.us/j/2843063080?pwd=OVAydHpiUktTTFBxQU5PMEhUMmxCQT09

Time: 16.00-17.00

Speakers:
Dr Evgeny Morozov

Prof Rainer Kattel
Dr Cecilia Rikap

Description:

Innovation is increasingly championed as a panacea for societal and economic demands. In a world where innovation is increasingly the purview of tech-forward corporations, how can innovation policy makers better navigate the potential for innovation to address social challenges without either falling into the trap of solutionism or improving the ability for existing tech giants to improve rent extractive capabilities. In this panel, our speakers will discuss potential paths forward for policymakers in such an increasingly digital-centric and precarious world.

Post-Keynote Discussion

Link:
https://youngscholarsinitiative.zoom.us/j/2843063080?pwd=OVAydHpiUktTTFBxQU5PMEhUMmxCQT09

Time: 17.00-17.30

Description:

Bring a drink of your choosing (tea, beer, water, coffee!) for this informal discussion, moderated by Josh Entsminger, to discuss the issues raised in the panel on the Future of Innovation Policy.

Sunday 26 September

All session times are stated in British Summer Time (BST).

The Zoom link for today's sessions will be included in the event description.

Keynote: The Green Transition and Innovation Policy: towards a new agenda

Link:
https://youngscholarsinitiative.zoom.us/j/2843063080?pwd=OVAydHpiUktTTFBxQU5PMEhUMmxCQT09

Time: 11.00-12.30

Speakers: Dr Antonio Andreoni (IIPP UCL) & Professor Kathryn Hochstetler (LSE)

Description:

In recent decades, the tension between economic growth and environmental sustainability has become increasingly evident. On the one hand, most of the countries implement different industrial and innovation policies (IIP) in order to catch up, with the aim of improving the material well-being of their populations. On the other hand, this economic development has an undeniable ecological impact, which compromises the sustainability of different ecosystems. Recent perspectives on IIP have taken this tension into account, and have tried to align technological development with the resolution of grand societal challenges, such as the problem of global warming. These kinds of proposals are more or less explicitly taken into account in different national plans, and their importance is rapidly growing.

In this panel, leading academics will discuss different IIP alternatives, their potential, the contexts in which they are most effective, and their limitations. We will try to find out what "green" industrial policies should look like in the future, what kind of challenges they imply and what (social, economic or political) constraints they face.

Paper Session 5: Inclusive Innovation

Link:
https://youngscholarsinitiative.zoom.us/j/2843063080?pwd=OVAydHpiUktTTFBxQU5PMEhUMmxCQT09

Time: 13.00-14.30

Discussant: Dr Kate Roll

Papers:

1. Chandra Shekar Katna, Interactive Learning and Innovation in Informal Manufacturing Enterprises in India: The Determinants
2. Laura Victoria Rodríguez-Zaragoza, The Labour Situation in the Telecommunications Industry of Jalisco: An Investigation from a Feminist Economics Perspective
3. Leila Mucarsel, The case for gender as a Grand Societal Challenge to be targeted by Mission-Oriented Innovation in the Global South: insights from Argentina
4. Roberta Fischli, Citizen Empowerment through Data Ownership? Proposing a Data-Owning Democracy
5. Roy William Cobby Avaria, A Global Digital Public Goods agenda: Building platforms for international development and innovation

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Paper Session 6: Industrial Capabilities

Link:

https://youngscholarsinitiative.zoom.us/j/6091128720?pwd=dzZreCtzbEVmTUgyVVZBSFJLNzVOZz09

Meeting ID: 609 112 8720
Passcode: Innovation

Time: 13.00-14.30

Discussant: Dr Antonio Andreoni

Papers:

1. Shadwa Zaher, Governance and learning in Global, Regional and Local value chains: A comparative analysis of SMEs in Egypt, Rwanda and Uganda
2. Lorenzo Cresti and Maria Enrica Virgillito, Strategic and essential jobs: a new sectoral taxonomy based on employment multipliers
3. Martina Ayoub, Knowledge complementarity and green innovation development: empirical analysis using RD expenditures
4. Milene Tessarin, Jefferson R.B. Galetti and Paulo C. Morceiro, Skill-relatedness and innovation: an approach for developing country and unequal regions

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Panel: State capacity leading towards innovation

Link:
https://youngscholarsinitiative.zoom.us/j/2843063080?pwd=OVAydHpiUktTTFBxQU5PMEhUMmxCQT09

Time: 15.00-16.30

Speakers: Prof. Rainer Kattel (IIPP/UCL); Prof. Michiko Iizuka (GRIPS, Japan); Prof. Erika Kraemer-Mbula (University of Johannesburg).

Description: The State capacity to lead towards innovation is the central theme of the panel. The public sector is responsible for the long-term resilience and stability of societies by developing and nurturing long-term capabilities and for responsively and agilely adapting to changing environments through dynamic capabilities. Moreover, a dynamic public sector is required to shape the directionality of innovation and market creation effectively. In this sense, the panellist will discuss how the State builds the skills, capabilities and resources needed to implement innovation policies and shape the direction of technological progress.

Democratising Mission-Driven Innovation Policy

Link:
https://youngscholarsinitiative.zoom.us/j/2843063080?pwd=OVAydHpiUktTTFBxQU5PMEhUMmxCQT09

Time: 17.00-18.00

Speakers:

Prof. Iris Wanzenböck (Utrecht University) & Prof. Andrew Stirling (SPRU, University of Sussex)

Description:

This panel's central theme is how to democratize mission-driven innovation policy, asking the question: Who decides missions, and how?

Negotiating the different goals, values, and interests involved in shaping the direction of technological progress is a notoriously difficult, indeed 'wicked' problem, as our first speaker, Prof. Iris Wanzenböck (Utrecht University) has described. As such, deciding on a mission is complex, uncertain, and contested, and navigating such a social process is a formidable task for policy makers, and for academics studying innovation. Furthermore, Prof. Wanzenböck has done substantial work on the subsidiarity principle in innovation policy, and how different levels of government (and society) can interact to create solutions. We are looking forward to her talk on “Governance challenges of a new problem orientation in Innovation Policy”!

Our second speaker is a pioneer in the field of innovation studies, Prof. Andrew Stirling from the Science Policy Research Unit (SPRU) at the University of Sussex. Having worked on a wealth of topics in innovation governance, his talk will focus particularly on rigorously analysing the implications of directionality in innovation governance. Exploring the challenges of deciding the directionality in a thoroughly democratic way goes to the very core of the conference, and we are looking forward to this lecture on “Missions and Murmurations: challenges of directionality for innovation democracy”

Paper Abstracts

Paper Session 1: Finance

1. Asker Voldsgaard, The catalysing role of state-owned investment banks and enterprises: A temporal network analysis of global offshore wind finance

Over the past two decades, the costs of renewable energy technologies (RET) have unexpectedly fallen tremendously to the point where RET is in a position to enable decarbonisation of not just electricity sectors but also a range of other sectors through electrification and shifts to electro-based fuels (IRENA, 2020). In this period, RET have displayed impressive learning curves reflecting the endogenous co-evolution of cost reductions and increased deployment. Scholars have described this development as the emergence of a green 'techno-economic paradigm' due to its ramifications in terms of future structural transformation of production and consumption systems (Mathews, 2020, 2013; Perez, 2019). While much attention has been granted to the impact of supporting policies, such as feed-in-tariffs, recent years have seen increasing focus on the role of financial systems in co-shaping the decarbonisation of electricity systems (Egli et al., 2018; Geddes and Schmidt, 2020; Hall et al., 2017). The key reasons behind this concern are the capital-intensive nature of RET and the historically risky investment outlook due to technological and political uncertainty. The high ratio of capital expenditure to operating expenditure causes the cost of RET to be more sensitive to financing conditions than fossil fuel technologies that rely more on ongoing fuel cost. A bourgeoning literature is therefore studying how heterogeneity in the cost of capital across technologies and regions affect technological evolution and national decarbonisation trajectories (Egli et al., 2019, 2018; Schmidt et al., 2019) and the underlying causes found in the heterogeneity of financial system structures and appetite for risk of particular types of actors (Hall et al., 2016; Mazzucato and Semieniuk, 2018).

This study contributes to this literature on the non-neutrality of finance by applying temporal network analysis to a particular RET: offshore wind. Offshore wind is extraordinarily capital-intensive due to additional capital equipment required to install wind turbines at sea compared to land. Maturation of offshore wind technology has therefore been a hard test for how to induce innovation through market creation and learning-in-production (Chang and Andreoni, 2020; Voldsgaard and Rüdiger, 2021). While demand-side policies incl. feed-in-tariffs have been essential policy mechanisms, the large capital-intensive projects have been dependent on the availability of patient,

risk-embracing financiers and investors to avoid prohibitive levelised cost of electricity. It is examined to what extent state investment banks and state-owned enterprises have been decisive enablers of the offshore wind industry and how they have interacted with private sources of finance.

The network analysis charts how offshore wind installations have been financed between 2004 and 2017 and how the low-carbon finance networks consisting of financiers and installations have evolved globally. The selected methodology makes it tangible to systematically study the dynamics of a complex evolving system (Arthur, 2014; Beinhocker, 2007). The temporality of the analysis enables identification of actors who have played decisive roles as risk-takers, investment catalysers and know-how disseminators in the evolving low-carbon finance networks. Based on the literatures of low-carbon finance and socio-technical system transitions it is expected to see public investment banks figure predominantly in this entrepreneurial role (Geddes et al., 2018). In addition, heterogeneity in the composition of private financial actors could reveal certain institutional configurations more disposed to assume short-termist or risk-embracing investment behavior (Ameli et al., 2019; Mazzucato and Wray, 2019). In this regard, Danish labour market pension funds were key financiers of some of the early large scale offshore wind farms that significantly advanced the industry and generated financial innovations that were subsequently adopted elsewhere in the low-carbon finance business (Voldsgaard and Rüdiger, 2021). While economist Hyman Minsky (1989) worried that “Capitalism may require state intervention to remain technologically dynamic in an era of managed money capitalism”, the network analysis indicates that a ‘variety of money manager capitalism’ perspective could nuance this skepticism. Such heterogeneous patterns may carry significant implications for the availability of patient capital for investment in scaling up new sustainable technologies. Consequently, this study contains potential lessons for how to develop green finance networks that support the next generation of capital-intensive sustainable technologies such as hydrogen production, floating wind farms, large-scale energy storage and carbon capture technology. Finally, this study raises questions about how particular forms of social embeddedness of finance can be advantageous to financing mission-oriented investment programmes and affect the distribution of the resulting rewards to contribute to a just transition (Lazonick and Mazzucato, 2013; Mazzucato, 2018).

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2. Dena Kirpalani and Nadya Wells, Rethinking ‘Big Pharma’ as Systemically Important: Empowering the State through Lessons from the Global Financial Crisis

As the Global Financial Crisis (GFC) sent shocks through the financial system, COVID-19 has sent shocks through health systems and the global economy. However, unlike during the GFC, where banks were nationalised and conditions on lending, balance sheet leverage and executive pay were attached, during the current COVID-19 crisis, public money was pumped into pharmaceutical companies without commensurate conditionality (Mazzucato 2020). The economic and human costs of these interventions and the associated moral hazard suggest that additional measures are needed for future resilience. Borrowing the notion of ‘systemically important’, we rethink the pharmaceutical sector landscape, applying lessons from post-GFC regulatory reform to the development, manufacturing, and distribution of medicines.

The GFC exposed the systemic failure of financial sector supervision, leading to a paradigm shift which created an opportunity for States to enact change. Significant deficiencies in the operation and regulation of the financial sector were recognised(BCBS 2010). Some institutions were deemed either “too big to fail” or “too interconnected to fail” (Cecchetti 2011). The financial stability board (FSB) and Basel Committee on Banking Supervision (BCBS) adopted criteria for determining systemically important financial institutions (SIFIs) (BCBS 2013). SIFIs are subject to higher levels of scrutiny because they are deemed critical to the global market, institutions whose failure would put the overall system at risk due to their interconnectedness (Bongini, Nieri, and Pelagatti 2015).

The pharmaceutical sector is similarly dominated by a small number of large players(Tulum and Lazonick 2018), that like key financial institutions are interdependent and not easily substitutable in their global reach, complexity, and the critical services and infrastructures they provide. Pharmaceutical companies have a variety of business models and product offerings and can hegemonise both global or local markets. This is reflected in their ability to control essential products (through regulatory specialisation and patent protection), supply chains and distribution, and their ability to finance consolidation. The pharmaceutical sector is not “too big to fail” but “too essential to fail”, not requiring bailouts to prevent collapse, but able to demand further investment from the State to ensure continued development and delivery of public goods. While the pandemic related injections of cash into the pharmaceutical industry were not labelled ‘state aid’ or ‘bailouts’; they were in effect public monies provided to rectify a situation where the market had failed to anticipate and prepare for a known risk (Bezruki and Moon 2021).

The crucial question this poses is why States appear reluctant to occupy their market shaping role more forcefully despite acknowledging the systemic importance of having a robust pipeline for medical innovation, manufacturing, and distribution. The moral question remains as to why States fail to make commensurate demands when they inject capital, while the sector continues to be permitted to exploit its monopoly power while unprepared to deliver pandemic products on a global scale, without first receiving additional cash injections and promises from States. Further, even during the pandemic, States have allowed the pharmaceutical sector to continue to extract and declare massive profits (Kollewe 2020), and compensate senior management exorbitantly (Respaut 2020) without stipulating measures to prioritise and deliver on the well-being demanded in the social contract.

COVID-19 has empowered the pharmaceutical sector through State funding, regulatory forbearance (cutting of red tape), and the business opportunities presented by the crisis, now highly valued by their investors. States meanwhile are on the back foot having had to spend to prop up economies. (Re)-regulating the financial sector pre-GFC seemed unthinkable, but the ensuing global contagion allowed a paradigm shift in the relationship between the State and financial markets. Given the large injections of public funds into the pharmaceutical industry precipitated by the pandemic(Bezruki and Moon 2021), this is an opportunity to empower governments to similarly shift the paradigm in their stewardship of pharmaceutical innovation, to reconsider and improve regulation and conditionality. This paper therefore explores the hypothesis that if we identify and treat large pharmaceutical firms as similarly systemically important, States could enact measures to improve the delivery of medicines for societal health. Applying lessons of post-GFC reform, we outline criteria for defining systemically important pharmaceutical firms, and additional measures enabling scrutiny and re-regulation to empower the public sector to shape sustainable markets that address gaps in pharmaceutical access and development.

Proposed additional measures include: i) applying the lessons of directed lending post-GFC, requiring conditionality and financial oversight related to the allocation of State investment in pharmaceutical innovation, ensuring a more equitable distribution of risk and reward between private and public actors; ii) borrowing the concept of differentiated regulatory capital requirements, create incentives for the prioritisation of investment areas critical to global health which are overlooked in the current regime e.g. novel antibiotics, vaccine production, diagnostics; iii) mandating disclosures of systemic operational risks to improve global preparedness e.g. active pharmaceutical ingredient (API) sourcing, and manufacturing and supply chain logistics; iv) introducing buffers, akin to macroprudential tools introduced post-GFC, to address bottlenecks, requiring the development of additional capacity to facilitate emergency response and supply of critical medicines e.g. last-line antibiotics; v) implementing pay arrangements, in line

with FSB principles for sound compensation practices, that align individual benefit towards long-term delivery of global health public goods, including deferred vesting periods for share-option plans and clawbacks.

We suggest in this paper that considering the financialisation of the sector, large pharmaceutical companies act akin to financial entities, and should therefore be more strictly regulated, both in their role as financier to other parts of the sector (research and development, manufacturing and distribution), and as entities entrusted to deliver public goods, underwritten with public monies. States have generally shied away from adequately stewarding public funding injected into the pharmaceutical sector, in part due to arguments that this would stifle innovation. However, the post-GFC re-regulation of the financial sector provides precedent, and lessons for finding a new equilibrium between public and private spheres. Improving how we invest in, and value health will be critical to improving resilience while delivering innovation.

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3. Efefiom Kofon, The challenges of the Central Bank of Nigeria Intervention Fund to the pharmaceutical industry: A political settlement approach

When the Central Bank of Nigeria (CBN) in response to the impact of the Coronavirus pandemic announced an intervention fund for the expansion of the productive capacity of indigenous pharmaceutical manufacturers no one questioned why the fund did not target specific medicines or impose any production outcomes. Nevertheless, pharmaceutical manufacturers praised the Bank's quick response in mitigating the impact of the pandemic on productive activities. Several major manufacturers indicated that the fund will enable them to build new plants and acquire machineries for new production processes which will lead to increased output. In considering the absence of specific production outcomes as a condition for policy support, this paper examines the context in which the intervention fund was formulated. Using the political settlements framework as an analytical tool, the paper suggests that the distribution of organisational power and capabilities across organisations within the pharmaceutical industry has important implications on the immediate performance of the fund, and capability development in the long term.

Two interrelated factors are explored as likely responsible for the particular design of the intervention fund, and together they both present an established pattern of industrial policy formulation in most developing countries. First, the vague and indiscriminatory nature of the allocative rules may suggest some complicity on the part of the CBN and indigenous firms (regardless of technological capabilities, firms need only be involved in some form of pharmaceutical production). The failure of the fund to identify conditions

that have to be fulfilled to gain or lose rents points to the rent management or governance capabilities of the CBN. Second, the intervention fund has seemingly not fully taken into account the technological learning needs of indigenous firms and the process of learning involved in technological accumulation. This implicitly suggests an oversimplified and misleading assumption that the acquisition of machineries will automatically lead to production efficiency without the requisite cost, time and intensity of effort involved in developing new skills and knowledge to master the tacit elements of the machineries and various aspects of the production process.

There is a strong correlation between the rent management capabilities of the state and the intensity of effort that firms have to put into production activities that cumulatively increase productivity and quality improvements. Developing countries that successfully industrialised followed a similar pattern of state support for increased opportunities for indigenous firms to learn best practices from advanced economies. The state provided policy support that not only changed the incentives and compulsions of indigenous firms, but also disciplined them when feasible performance standards were not attained.

The most important question to ask when examining a policy is, how are indigenous firms affected by a particular policy likely to respond, given their interest and capabilities relative to that of the state. A simple way of looking at this is, if the potential benefits from a particular policy is not aligned with the distribution of organisational power and capabilities then there is a likelihood that it will be contested or partially enforced. Conversely, policy can also be designed in ways that are favourable to certain individuals or firms. This is because regardless of the enforcement capabilities state agencies their actual power is determined by the political settlement of which they are a part of. The interdependence of power and policies forms the basis of the political settlement framework.

Deciding on the exact capabilities needed in particular contexts or the likelihood of a policy achieving its desired outcome requires an analysis of several interrelated and non-linear variables. The analytical tool for unpacking this is based on an analysis of the interface of three variable; (a) the financing instruments or particular rents applied in policy response, (b) the governance capabilities, and (c) the firm structure and productive capabilities of organisations involved. Analysing these variables requires a process that combines the historical analysis of firms, their productive capabilities relative to their proximity to powerful political organisations or state officials, and their bargaining powers relative to the technical capabilities of state agencies to monitor rent conditions and withdraw rents.

I will now turn to examine the political settlement in Nigeria's pharmaceutical industry. First, without identifying a particular set of capabilities generating advanced medicines and providing conditional learning finance based on the initial base of capabilities and stock of knowledge, the CBN intervention fund will do little to increase indigenous technological capabilities. Secondly, given the low production capabilities of firms and the failure of policies to identify market failures and design rent conditions in accordance to the market failures, indigenous firms have relied on rent seeking strategies to influence policies that have done little to help develop their capabilities, while protecting their rents. A historical examination of policies in Nigeria's pharmaceutical industry implies a combination of weak governance capabilities and a seeming ignorance or disregard for the process of learning and technological accumulation. For instance, the import prohibition policy of 2005 effectually gave domestic market protection for certain medicines without any conditions that would have compelled them to put in any technological effort to increase their technological capabilities. The allocative rules of the policy were so vague that both indigenous manufacturers and importers reclassified some finished medicines as raw materials. Again, pointing to the context in which it was designed.

If the CBN intervention fund or the import prohibition policy of 2005 had attached conditions that targeted productive activities in identified complex medicines, there is a strong likelihood that the policy would have been contested or only partially enforced. Given that productive activities in advanced medicines can potentially lead to the development of new skills and knowledge and a shift in the production structure of the industry from concentrating in the low end of simple and matured medicines to complex medicines, without associated policy response addressing the specific market failures constraining capability development, it is possible that the policy may be resisted by indigenous firms. This is because of the costly, risky and uncertain process of investing in learning and unlearning, and a complete overhaul of organisational structure of indigenous firms.

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4. Alice Dartevelle, Turning pharmaceutical innovation into a virtuous circle

"Among the many inequalities and injustices brought to light by the magnifying glass effect of the Covid-19 pandemic lies the severe distortions that have been observed in vaccine allocation across countries. During the first months following regulatory approval by healthcare authorities, high-income countries got the lion's share of vaccine doses because of their ability to pay, making them more attractive and therefore higher priority clients than middle- or low-income countries. The demonstrably unjust and inefficient allocation of Covid-19 vaccines is only one illustration of the fact that this hegemonic model for rewarding innovation does not necessarily align with society's interest in public health at large. Within this context, patents, the absolute cornerstone of our current model for rewarding innovation, are once again put at the center of the debate around severe inequalities in access to healthcare between countries. They are used to reward innovation by granting exclusive rights over inventions for a limited period of time. Because of the specificities of the pharmaceutical research and development model (considerable delays between invention and actual commercialization and scientifical uncertainties surrounding drug development), drug developers are incentivized to seek "supra-competitive pricing" during this monopoly period to recoup investments made and maximize profits. They thus concentrate their research and development efforts into the health needs of high-income countries, which have the capacity to bear higher prices. Beyond leading to exacerbated medicine prices that create a heavy burden on healthcare systems, this model also tends to shape the direction of pharmaceutical research and development priorities in ways that respond to shareholder interests, instead of privileging the overall health impact of the innovation. More resources are therefore attributed towards therapeutic areas that bear the highest profit-maximizing potential at the expense of diseases that do not have the potential to become "growth markets" as they predominantly touch poor individuals living in low-income countries. Among under-researched areas of potential pharmaceutical innovation are antibiotics and treatment for so-called neglected diseases, such as leishmaniasis, onchocerciasis or chagas disease. In a more general way, research efforts tend to focus on treatments for chronic diseases rather than on treatments for disease prevention or vaccines.

The current circumstances command us to question this model and to put forward alternatives that would allow for a more virtuous circle. This paper will focus exclusively on this observed distortion of research and development efforts and examine how the directionality of pharmaceutical innovation could be influenced by a change of paradigm in our current model for rewarding innovation in order to better serve the realization of the right to health. It will first briefly explain how the time-limited monopoly power model currently in force at the global level, which results from the adoption in 1994 of the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS)

championed by the United States has shaped pharmaceutical innovation in ways that do not necessarily appropriately serve public health at the global level and actually led to what some have qualified as a “broken innovation model”. Then, this paper will explore different tools that have already been used to influence the directionality of pharmaceutical innovation towards the fulfillment of unmet medical needs in low-income countries. Finally, the main part of this paper will present how an alternative incentive model, complementary to the one based on patents, such as the Health Impact Fund, would have the potential to re-align corporate incentives with public health goals. The Health Impact Fund is a proposal put forward by researchers in social sciences that seeks to correct the failing of our current pharmaceutical innovation incentive model by rewarding any new medicine on the basis of its global health impact. This pay-for-performance mechanism, optional and therefore complementary to the current patent system, would be paired with a commitment by firms to commercialize their product worldwide on the basis of generic pricing in order to increase accessibility. The Health Impact Fund would thus exploit the market forces currently at play by shifting profit maximization incentives towards innovations that have a real and concrete health value.

At this breaking point in our current pharmaceutical innovation model, this paper will therefore aim at presenting the different options that would allow turning pharmaceutical innovation into a more virtuous circle by influencing its direction.

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5. Travis Whitfill, The Financialization of Biopharma: The Impact of Financial Strategies and Financialization on Innovation

Background:

The biopharmaceutical industry is a particularly financialized industry with significant share repurchases, rises in drug pricing, and a focus on delivering returns to shareholders and venture capital, which is driven by short-term returns. These forces create an inevitable tension between innovation and return for shareholders, and a financialized biopharma model may have a number of negative consequences for society:

(1) Prioritizing shareholders may hinder the innovation process for delivering medicines to patients;

(2) manager-driven capitalism is often at odds to patients’ interests;

(3) rising drug costs benefit shareholders and may limit access to patients; and

(4) short-termism of capital that dominates biopharma often is at odds at the long-term horizon of drug development.

The goal of this working paper is three-fold: (1) to propose a working, cohesive definition of financialization in biopharma; (2) to characterize trends in financialization in biopharma over the last ten years and highlight how Covid-19 has exacerbated some of these trends; and (3) propose future directions to mission-oriented innovation instead of maximizing shareholder value.

Defining financialization in biopharma

There have been previous attempts at defining general financialization; however, there lacks a clear, consistent definition of financialization in biopharma. Previous definitions of financialization seem narrow and seem to only primarily focus on maximizing shareholder value ideology. William Lazonick is a key economist who has characterized corporate strategies and financialization in biopharma. He has largely focused his analyses of biopharma financialization on share repurchases, and pointed out that from 2005 to 2014, the top 18 pharmaceutical companies in the S&P 500 Index spent $226 billion repurchasing their own shares, which is the equivalent to 51% of their combined R&D expenditures during that period (Lazonick 2016). However, looking at dividends and share repurchases is a quite narrow empirical approach to studying financialization. Below, I offer a definition for financialization in biopharma:

Financialization in biopharma is the strategy of prioritizing financial accumulation over technical innovation, mediated by the influence of finance and shareholder-driven corporate governance, in order to benefit shareholders.

This definition includes the lens of innovation, which is an important context for studying financialization in a technological-based industry.

Characterizing financialization in biopharma

Share repurchases have risen since Lazonick published his analysis in 2014: share repurchases for the top 30 biopharma companies (defined by revenues in 2018) have dramatically risen since 2014 from $18.3 billion to $58 billion. In total, the top 30 biopharma companies spent ~$200 billion in share repurchases from 2014-2018. The ratio to R&D or revenue is also significantly rising: from 2009 to 2019, the ratio of share buybacks and dividends to R&D increased from about 0.7 to 1.3 ($r^2=0.577$, $p=0.007$). Meanwhile, the ratio of share buybacks and dividends to revenue rose significantly and showed a strong linear trend ($r^2=0.811$, $p=0.017$), although the linear trend was not as steep as the ratio to R&D.

M&A has led to a major consolidation in biopharma that is supportive of rising drug costs and monopolization of drug pricing and access. In 2018, total capital on M&A in biopharma was $290 billion compared to $172 billion on R&D costs. Significant M&A marked the start of 2019 with the mega acquisition of Celgene from Bristol-Meyers Squibb for $74 billion announced on the fourth day of the year. Takeda closed on the acquisition of Shire for $62 billion (Japan's biggest-ever foreign takeover). An analysis

of M&A since 2000 shows that the number of M&A deals per year has more than doubled.
Finally, corporate government practice has taken advantage of lower corporate tax rates that has resulted in profits over R&D funding. In 2017, the Tax Cuts and Jobs Act (TCJA) was passed with the claim that corporations would invest the savings and boost economic activity and create jobs. However, the TCJA has had great benefit to pharma companies (and their shareholders). Pfizer, for example—who reported a ~$10 billion benefit from the TCJA—repurchased $10 billion of its shares in 2018.

Covid-19 illustrates the need to capture value from public funding
The Covid-19 pandemic illustrates the need for regulation of biopharma companies to prevent them from prioritizing shareholders over patients – especially after receiving significant public funding. The underlying technology of mRNA has a long history of public funding for research; research behind the mRNA in COVID-19 vaccines can be traced back to NIH funding in the 1990s. Since then, several governments have invested billions of research funding into mRNA vaccines. For example, receiving $483M from the US government (BARDA) to develop a vaccine, Moderna's share prices have risen ~500% from the beginning of the pandemic. Additionally, in 2020, Moderna executives sold a whopping $500 million in shares, pocketing record compensation packages. It is critical that government programs be designed to meet the public health purpose to place much stronger emphasis on public health needs, broaden access to technology, lower pricing, enhance knowledge transfer, and connect procurement at an international level.

Conclusions and future directions:
Financialization has predominated the biopharmaceutical industry. The biopharma industry is financialized by: (1) a high degree of venture capital financing; (2) stock engineering practices both in private and public companies; (3) M&A comprises a high degree of financing in biopharma; (4) biopharma companies offer stock repurchases and dividends (absolute value); and (5) stock repurchases are higher than 1.0 as a ratio of stock repurchases and dividends to R&D expenditures.
Nearly all of these trends have increased from 2009 to 2019: (1) more venture capital financing has flowed into biopharma; (2) there is more evidence of stock engineering; (3) there are higher IPOs at higher valuations yet at earlier stages of clinical development; (4) there's more M&A activity at higher prices; (5) there's increased stock repurchases and dividends (absolute value); and (6) there are significant increases stock repurchases as a ratio of stock repurchases and dividends to R&D expenditures and revenue.

Stronger government regulations should be in place to ensure better access to publicly funded research and ensure better emphasis on public health needs. These regulations should prevent corporate managers from profiting excessively from public funding.

Paper Session 2: Governance

1. Blerim Morina, The Role of Innovation and Entrepreneurship in the Economic Development of Kosovo

Entrepreneurship is capability and willingness to develop, organize and manage a business venture along with any of its risks in order to make a profit. The most obvious example of entrepreneurship is the starting of new businesses. Entrepreneurship is a dynamic process of continuous change the economic structure and its effectiveness, in which individuals takes the risk to business outcomes. There are different definitions by different authors. Referring to Schumpeter entrepreneurship is defined as 'creative destruction', Drucker call as 'the entrepreneurial economy', etc. To be an entrepreneur means to be innovative and look for new opportunities and possibilities. In economics, entrepreneurship combined with land, labour, natural resources and capital can produce profit. Entrepreneurial spirit is characterized by innovation and risk-taking, and is an essential part of a nation's ability to succeed in an ever changing and increasingly competitive global marketplace. Innovation and entrepreneurship are considered key factors of growth and survival of modern economies. According to Schumpeter (1934), "carrying out innovations is the only function which is fundamental in history"". The review of recent studies reveals that high levels of newly growing up innovative firms are strongly related to economic growth (Stam, 2008). Given this context, the aim of this study is to explore the relation of Innovation and Entrepreneurship to economic growth and its role in economic development of Kosovo.

The performance of Kosovo's innovation system and will be used to guide the development of an innovation strategy for the period 2013-2020. The government sees innovation as having an important role in Kosovo's economic and social development. In this regard, the OECD Investment Compact for South East Europe (OECD IC) has been asked to provide assistance with the development of a first ever innovation strategy. The report was produced using a variety of sources including desk research, surveys of businesses, universities and research institutions as well as interviews and consultations with stakeholders in public administration, industry, research community and international organisations present in Kosovo. Kosovo as a country in transition is facing with problem of economic growth and development. Because these businesses are crucial to the overall process of economic development, the government must take measures to care and support the creation and development of small and medium enterprises (SMEs).

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2. **Diego Borges de Souza Arruda, Perpetuating or ceasing technological dependence? The characteristics of science and innovation foreign official development assistance programmes in Brazil**

I propose to investigate the role of international ODA (Official Development Assistance) cooperation in developing countries' catch-up process. I am keen to deep-dive into the dynamics of the current ODA international development cooperation frameworks in science and technology and examine whether this is an additional dimension in the process of kicking away the ladder from developing countries.
In 2019, ODA funding totalled USD 152.8 billion by member countries of the Development Assistance Committee (DAC). The DAC holds high-level meetings every two years whose participants are generally the Development Ministers of its thirty member countries, with investments representing 0.3% of their combined GNI (Joining the development, 2021).

My hypothesis is that developed countries' set of ODA programmes designed to improve social and economic indicators turned out to be an effective barrier for development. Thus, demonstrating that developed countries are not only recommending economic policies oppositely to what they have done in the past but have also been actively downplaying the development of technological and scientific capabilities from low and middle-countries through misleading ODA policies.

The ODA programmes drain low and middle-income countries' capacity to set their own development trajectories. At a strategic level, it sets out misleading priorities for the country's development. At the research and technical level of cooperation, it struggles to set effective knowledge transfer mechanisms which undermines technological emulation and development processes.

Jason Hickle made a significant contribution outlining some devastating implications of the structural adjustments and dynamics of aid flow in developing countries. He presents impressive figures showing the net flows departure from developing countries. For every dollar of aid that developing countries receive, they lose $24 in net outflows (HICKEL, 2017).

My proposed paper will outline the characteristics of two distinct technological assistance approaches to the same country. The aim would be to examine the history and attributes of the British and Chinese development towards Brazil to discuss aspects of each development framework and draw observations of their effectiveness in Brazil´s technological development.

From a heterodox economic perspective, the research will be carried out through a historical analysis coupled with secondary data research (LAWSON, 2006). From the observation and analysis of the past and present, it will be possible to gather information to discuss the role of development assistance frameworks vis-à-vis its impacts on low middle-income countries' catch-up process.

The work aims to contribute to development economics and economic history sub-fields within the economic discipline. These fields have witnessed a flourishing momentum over the past two decades outlining the developed countries' technological shortcuts and protectionists' economic policies and their rhetoric promoting post-Washington Consensus set of policies which they had not followed themselves (REINERT, 2007; SAAD-FILHO, 2005).

Moreover, the work should also draw from a branch of heterodox scholars articulating the Estate's crucial role behind R&D investment, industrial and innovation policies towards economic development (CHANG, 2002; MAZZUCATO, 2013). However, a small portion of studies are dedicated to discussing how the current international cooperation models for the development with low and middle-income countries could fit as an instrument to perpetuate their technical and scientific dependence undermining economic development.

Through the Latina American authors' lens behind the 1976 Bariloche Model, led by Prof Amilcar Herrera, I would discuss the technological development traps posed to low and middle-income countries. Herrera argued that the vast majority of research and development spend in the world takes place in developed countries whose purpose is to serve those societies' needs. Very little, he adds, is devoted to meeting the needs of the developing world (HERRERA, 1976). Herrera's central message for a feasible path and desirable future encompassed fundamental institutional changes and a transformation of the value systems that prevails (GALLOPIN, 2001). In this regard, my work will examine the economic assumptions on international development cooperation from the Chinese and British approaches in the light of the most suited to build capacity for developing countries.

Reinert (2007) stated that unrealistic assumptions forming its very bedrock had been the curse of abstract economic theory from David Ricardo’s trade theory to post-Second War general equilibrium theory. He underlines that all rich countries have become rich in exactly the same way, through policies steering them away from raw materials and diminishing returns activities into manufacturing. It is imperative to understand the economic drivers embedded into these development programmes and to what extent

they set low and middle-income countries on the right track of technological development.

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3. **Elena De Nictolis, Alessandro Piperno and Christian Iaione, The principle of sustainable innovation according to the EU 2021-2027 financial framework: co-governance as a key dimension, cities as laboratories of experimentation. Challenges of public law and urban law and policy**

"Law has been for long regarded as a reaction to social phenomena, a ‘social science’ that aims to ensure that technology does not endanger fundamental rights. While this safeguarding function remains crucial, the difficulty of law to keep up with innovation (organizational; social; technological) has become increasingly challenging. This is particularly evident in cities, where disruptive technological innovations are raising relevant challenges in terms of human and social rights.
Several scholars proposed the adoption of a future proofing-law approach to cope with innovation and technology. (Ranchordas and van ‘t Schip, 2020) This paper will address this scholarship on future-proofing law arguing that, to be applied in cities, it should be based on urban experimentalist governance/regulation. The paper will argue for a missions-oriented perception of future-proofing that embraces the efficiency gains of science and technology in the city, without disregarding the challenges presented by public law and IP law. The paper will investigate the concept of human-proofing public law as a way to implement a right to the city approach as a design principle to promote urban experiments.

The paper will ultimately contribute to investigate urban experimentalism as a way to rethink the working method and administrative functions of cities towards a mission-oriented (Mazzucato 2017) approach to urban policy making and the challenge it poses from an urban law and policy perspective. It will analyze in particular the emerging phenomena of city science diplomacy, with empirical manifestations such as “Science Hubs” and “Chief Science Offices” that would act as a missions-oriented unit within the City to enable tech innovation and experimental policy making. Cities are rethinking their organization to be able to experiment with regulatory approaches based on an experimentalist approach to solve complex urban challenges such as through the collaborative development of innovative solutions. Several authors discussed evolutions in the way urban authorities are issuing policies in a way that is suited to the changing nature of urban issues. (Ranchordas 2015; Voytenko 2016; Evans 2016). This was defined as “urban experimentalism” (Foster and Iaione, 2019). The paper will investigate how Science Hubs and CSOs can implement incremental models of policy making (Lindblom 1958; Morlino et al. 2017) with policy learning at its core (Dunlop 2017) through the implementation of processes designed as policy democratic

experiments (Ansell 2012; Howlett 2014) through which urban policy makers experiment with legal, economic, digital tools to promote forms of community-led sustainable economic development at the urban level.

The paper will draw empirical findings from the H2020 project ""Open Heritage"", with a case study on the City of Rome (Lazio, Italy). The case study is based in the Southern Eastern area of the City, in the heritage co-district of ACT, Alessandrino Centocelle and Torre Spaccata) where authors are experimenting with sustainable governance of cultural heritage through a heritage community and a neighborhood cooperative. It will also use a case study from the H2020 project ""EUARENAS"" with a case study on the city of Reggio Emilia (Emilia Romagna, Italy) that experimented with a community broadband network and a City Science Office to secure capacity building.

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4. Iacopo Gronchi, Rethinking embedded autonomy: State structures and innovation governance in Finland

In the last decades, the role of the state in the economy has been brought back to the forefront of the political debate. Key to this development has been a renewed interest in the capacity of states to shape the direction of technological innovation in collaboration with the private sector in order to tackle grand societal challenges (Mazzucato, 2018). However, while the academic debate has acknowledged the relevance of investigating state capacities as a key variable in point (Kattel & Mazzucato, 2018) and outlined a distinctive role for so-called «innovation bureaucracies» in the governance of public-private networks oriented towards this goal (Kattel et al., 2019) there has been only scant research about the «ability of state institutions to effectively implement official goals» (Hanson & Sigman, 2013, p.2) – an issue that concerns the ability both to «formulate and pursue goals that are not simply reflective of the demands or interests of social groups» and to «implement official goals, especially over […] opposition of […] social groups» (Skocpol, 1985, p.9).

Comparative historical sociologists provided in-depth analyses of the political, institutional, and organizational underpinnings of autonomous state action for the governance of economic systems (Johnson, 1982; Evans et al., 1985; Amsden, 1989; Chibber, 2002). Among them, the «embedded autonomy» hypothesis advanced by Evans (1995) has become a major source of inspiration for the further development of innovation policy theory (Whitford & Schrank, 2011) namely by arguing that «state structures» play a key role in creating «an affinity [or a mismatch] between the incentives facing state managers and the policies required for capitalist growth» (Evans, 1995, p.30). Following this insight, scholars hypothesized a link between the organizational design of innovation bureaucracies and their capacity to promote

innovation-based growth – for example, claiming that «peripheral development agencies» are best placed to achieve «embedded autonomy» as they can, «by operating below the radar, enjoy significant independence from short-term political pressures and large interest groups, without sacrificing the dense ties to private actors that underpin effective policy formulation and implementation» (Breznitz & Ornston, 2018, p.724).

While acknowledging the role of organizational design in achieving embedded autonomy, this paper departs from the assumption that one should not mistake embedded autonomy with political neutrality. Quite the opposite, this paper moves from the assumption that «bureaucratic autonomy is explicitly political» and hence that «bureaucracies gain a measure of autonomy when they are able to practice a politics of legitimacy» (Carpenter, 2001, p.113) whose dynamics are intertwined, but distinct from (any chosen) organizational design. In order to qualify this further hypothesis, this paper follows two objectives: (i) to shed light on the role played by the state in governing innovation through the lenses of the «embedded autonomy» hypothesis; and (ii) to qualify such hypothesis with respect to the politics of legitimacy that underpin the actions of innovation bureaucracies in different contexts – and, more specifically, to their «organizational reputation» (Carpenter, 2010). I do so through a comparative qualitative historical analysis of two major innovation bureaucracies: Finland's most relevant innovation fund (SITRA) and the United States' most relevant innovation agency (DARPA). Drawing on academic and grey literature, I briefly review the historical development of these two by focusing both on the organizational dimension (Egeberg & Trondal, 2018) and that of organizational reputation (Carpenter, 2001). By analyzing them from a comparative perspective, I, therefore, highlight how different sources of organizational reputation may have played a role – interacting along with their relative organizational dynamics – in enabling or, conversely, hindering the «embedded autonomy» of these two innovation bureaucracies. As a result, I aim to show that further research on this topic may lead to a better understanding of Evans (1995)' hypothesis by highlighting how the capacity of any given organizational design to secure embedded autonomy can be characterized in terms of the different sources of organizational reputation that can provide legitimacy to the action of innovation bureaucracies: a difference hereby labelled as «varieties of embedded autonomy».

The second section presents a literature review that defines the theoretical background and policy context for the paper's problématique. The third section identifies the analytical framework employed to organize data and the rationale for case selection. The fourth section presents the data and the analysis. Lastly, the fifth section concludes, points out the paper's main limitations, and hints at avenues for developing the argument through further research.

5. Nils Rochowicz, Democratizing Innovation Policy: The Role of Technology Prediction Methods

This paper contributes to the literature on the relation of technological foresight and participatory technological governance by examining recent advances in technology prediction methods, and how they relate to participatory discourse-based technology governance approaches.

Technological foresight methods are a key ingredient to technology governance, se e.g. Smith et al. (2005), Cuhls et al. (2015). While they traditionally focussed significantly on trend extrapolation to describe the features of a technology (Porter et al. 2011), the rise of scientometrics saw the increasing use of patent and publication (citation) data to identify important technologies early (e.g. Mariani et al. (2019)). In this combinatorial perspective of technological progress (Arthur 2009), where existing technologies get recombined to form new technologies, forecasting turns into a link prediction problem in complex networks. The combinatorial space of technologies is vast, and economic resources restrict how fast and efficiently we can explore this space (Weitzman 1998). Link prediction can help, without the input of specialized domain experts, to identify areas and possible combinations of technologies that have not yet been tried, but might yield promising technologies. Link prediction is a rapidly progressing field, andfurther advances in graph neural networks, mathematics of higher-order combinatorics, and efficient quantum search algorithms are likely to accelerate this even further. Another field that has received a lot of attention in technology prediction is Natural Language Processing (NLP). As with bibliometric data, the availability of machine-readable data has increased significantly in recent years, in particular for patents and scientific publications.

The advances in link prediction and in NLP together create qualitatively new possibilities of technology foresight, that raise questions about how they can be used and incorporated into participatory technology governance. Link prediction, if done well, can allow to predict the emergence of technological areas before the technology itself has been invented, allowing for much earlier anticipation of and intervention in technological development. NLP, through analysing the content of patent and scientific publications, can give earlier indications about what this technology is to be used for, without relying on expert opinion to the same extent.

While these advances lead to better possibilities in technology anticipation and foresight, their effect on the potential of democratizing technological choice is ambiguous. While better foresight methods can in principle elevate real-time technology

assessment (Guston and Sarewitz 2002), they might in effect lead to a 'closing down' (Stirling 2008) of participatory discourse. Besides problems with the data that these methods build on, they require significant funding and expertise to maintain, and their results are not easily interpretable without deep knowledge of the methods. In the context of narratives of technological rivalry between nations, link prediction will likely lead to attempts to 'accelerate' technological progress, instead of orienting it more towards public value. Thus they are prone to narrowing the set of persons who have the skillset to participate in technology governance, possibly favouring more technocratic approaches. This paper argues that to truly open up democratic potential, these methods need to be complemented by two critical components: The first critical component is a general causal understanding of link prediction in complex technological combinations. Broadly speaking, current link prediction methods take as input a set of combinations of different elements (technologies) that occurred, and give a likelihood score for which links between combinations will be observed in the future. However, the likelihood of success of a research programme critically depends on the level of resources provided as inputs. For resources to be allocated between different research programmes, understanding the influence of funding on the likelihood of success will be a critical factor: Between two research programmes with the same potential benefits, it is important to know which one can be achieved with fewer resources.

The second component is arguably more critical. Part of the argument of Mazzucato (2011, 2021) is that the (participatory) discourse on deciding between different research programmes should not be about the specific technology developed, but about the capabilities that the developed technology can provide. Currently, the mapping of technological features (what it is) to its functions (what it does) is done by aggregating expert opinion, and by carefully designed technology assessments ('roadmapping' as in Fleischer et al. (2005)). These, however, are time-intensive tasks which require financial resources and significant technological knowledge, and are thus inaccessible to the participatory discourse on choice of research programmes. On the other hand, the data should in principle allow this mapping: In patents, the claim explicitly state the functions that the patented technology is supposed to perform. Developing a dictionary of these functions, and mapping this dictionary onto a description of the goals that are supposed to be achieved with this technology, is in principle within the possibilities of current NLP. The critical question is whether this mapping can be meaningfully inverted: In this case, a function that is supposed to be performed can be mapped onto the set of technologies that could possibly perform this function. If this is possible also for technologies that have not yet been fully researched, then this mapping can be combined with the causal link prediction method to give an estimate for, given a certain level of investment, how likely it is that the function can be performed by the technology to be researched. With such a tool available, the choice of technological research programmes would be

substantially shifted to a choice on which functions and capabilities to develop further, which allows for rich debates in the political sphere and in participatory discourses. In essence, these two components together would allow a transformation of the technology prediction methods to a tool for policy analysis, disentangling the decision making from the scientific expertise, and thus allowing for a democratization of technology governance.

Paper Session 3: Structural Change

1. Fabrício Silveira, João P. Romero and Elton Freitas, Choosing battles: applying economic complexity for developing the health industrial complex in Brazil

Mission-oriented development strategies (Mazzucato, 2018) have gained considerable ground in the developed world in recent years. The most recent example of such initiatives is the European Green New Deal recovery plan, which will direct 1.8 trillion euros to build a green recovery following the pandemic. Following a similar strategy, in the United States, Biden's Plan will direct 2 trillion US dollars for infrastructure and green innovation.

The covid-19 pandemic created a very clear rout for mission-oriented policies where they are as needed as rare: in developing economies. Although the organization and assessment mechanisms might vary from country to country, the rewards of directing development policies towards strengthening public health care and the sectors related to it are extremely clear. Public health care provides an important contribution to reduce income inequality, as the public provision of this crucial service constitutes an indirect increase in the income of poor families. Furthermore, improvements in health helps also to increase the productivity. Moreover, productive industries and services related to health care tend to present high science and research intensity.

Economic development is inseparably connected to structural change. In the classical literature of economic development, this change is associated with increasing the share of manufacturing in the economy (Schumpeter, 1934; Prebisch, 1962; Furtado, 1964; Hirschman, 1958; Kaldor, 1966). Structural change involves leaning and mastering new economic activities. And as time went by, high-tech manufacturing industries became increasingly more heterogeneous, requiring specialized knowledge and interconnected production networks for competitive production.

Hence, directing structural change to the provision of heath care related services and industries like biochemistry, biomedicine and medical equipment is a clear association between mission oriented and productive diversification development strategies. Taking into account the resource constraints of underdeveloped economies, that vary according to the degree of underdevelopment, this calls for a smart specialization strategy focused on these sectors (Foray, 2018).

In the last few years, smart specialization policies benefited from an important input from the economic complexity literature. The pathbreaking work of Hidalgo et al. (2007)

explored fine-grained international trade data to build a network that connects products according to the probability of competitive co-production. This network, called Product Space, indicates the proximity of the productive knowledge required to produce each pair of goods. Moreover, it makes it clear that because of differences in accumulated knowledge between economies, development is heavily path dependent. In underdeveloped economies the level of productive knowledge reduces dramatically the options of development routes to be taken by these countries.

Hausmann et al. (2014) provided evidence that indicates that increasing economic complexity predicts considerably higher growth rates of income per capita in the future, even after controlling for a number of additional variables. Exploring the richness of disaggregate trade data, Hidalgo and Hausmann (2009) showed that the ubiquity of the competitive production of different goods varies markedly. Furthermore, they also showed that the level of diversification of each economy is associated with its level of income per capita. Combining these two raw measures, the authors created the indexes of complexity of products (PCI) and economies (ECI). The former indicates the amount of productive knowledge required to produce each good competitively. The latter indicates the amount of productive knowledge available in each economy. Moreover, Hartmann et al. (2017) and Romero and Gramkow (2021) showed that economic complexity predicts reductions in inequality and in greenhouse gas emissions per capita, strengthening the importance of this variable for sustainable development. Based on this body of work, recent studies have been seeking to use indicators based on the economic complexity methodology to guide the formulation of development policies. Hausmann and Chauvin (2015) and Hausmann, Santos and Obach (2017) used a series of indicators constructed based on economic complexity and on relatedness between products to identify promising sectors for the development of Rwanda and Panama, respectively. Balland et al. (2019) used patent data to measure local technological knowledge and to calculate economic complexity indicators to guide the formulation of regional smart specialization strategies.

This paper seeks to combine mission-oriented and complexity-based smart specialization policies to devise a diversification strategy focused on health-related products. In particular, the paper applies the methodology to evaluate the best route for Brazil, a country facing severe economic constraints but with important capacities already established in the health sector. Furthermore, by using the indexes proposed by Hartmann et al. (2017) and Romero and Gramkow (2021), we assess the contribution of these strategies to reduce income inequality and greenhouse gas emissions in the country.

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2. Germán Zamorano, Structural change, BOP constraint and technology trap: limitations for developing countries' green transition.

Keeping the rise in average global temperatures below 2° C requires significant transformations in the systems of production and consumption of energy, materials and food. There is a great interdependence between the production of goods and services and the consumption of energy, which determines that the emissions of pollutants and greenhouse gases, together with the consumption of natural resources, depend on the rate of economic growth and the capacity of technological progress to decouple this emissions and reduce the intensity of use of natural resources. The critical limits on greenhouse emissions can be expressed in terms of a maximum rate at which the world economy can grow without jeopardizing the stability of ecosystems, considering the evolution of greenhouse emissions per unit of GDP. The only way to increase this growth rate compatible with environmental restrictions is through technological progress and changes in production and consumption patterns, which allow decoupling production from greenhouse emissions and the consumption of natural resources.

In this sense, innovations, understood as the generation and diffusion of new ideas, products and processes, take on even greater relevance, since they not only constitute the main source of economic growth, but are also indispensable for the transition to greater environmental sustainability. In this way, technological development makes it possible to reconcile long-term economic growth with the transition to a global economy with less intensity of greenhouse emissions. The other option for converging to a cleaner environment would be to reduce the growth rate of world GDP, which would negatively affect other dimensions of development, such as poverty reduction and social inclusion.

The green transition depends on the development and diffusion of a set of new economic, social, behavioral and organizational technologies. Among others, these include energy production, distribution and storage, new techniques for exploiting natural resources, construction, transportation, water supply and treatment, waste management, and environmental remediation. Many of the necessary innovations in each of these sectors are already developed and need a greater diffusion and scale increase, which can be facilitated by the development of a set of innovations related to the so-called “Industry 4.0” or “Fourth Industrial Revolution”. However, the processes of generation, adoption and diffusion of innovations require accumulated technological capabilities, skilled workers, specific infrastructure and a specific institutional context. Thus, the adoption of the new technological paradigm is conditioned by the progress achieved in the previous paradigms.

At the same time, the need to build endogenous technological capacities is highlighted, since, although the effects of the degradation of the environment are manifested globally, the forms that this phenomenon takes and the strategies to mitigate it are often conditioned to the local surroundings, insofar as ecological systems are complex systems that require technological solutions that take into account the physical, economic and social specificities of each region, which demands both endogenous technological capabilities and local research to intervene effectively in these systems.

From this perspective, for countries to take advantage of the global transition to an economy with a smaller environmental footprint, it is necessary to reach a level of industrial, scientific and technological development, which stimulates innovation and improves systemic competitiveness, allowing the decoupling between emissions and the degradation of the environment from economic growth. In countries where the technological gap is reproduced or widened, a pattern of productive specialization of low technological dynamism is generated, based on “spurious” competitiveness, which results in the predatory exploitation of natural resources and use of unskilled labor, in a strategy of generating jobs and income without considering environmental and social costs.

In this way, the environmental dimension of the technology trap of developing countries is observed. Those countries that have failed to reach the international technological frontier and are specialized in products with low technological content, especially those intensive in natural resources and low-skilled labor, experience recurring balance of payments restrictions to economic growth that are generated as a consequence of the mismatch between between the income elasticity of the demand for exports and the income elasticity of the demand for imports. These balance of payments restrictions have as a counterpart the depreciation of domestic currencies, inflation, macroeconomic instability, recession, falling real wages, increased poverty and inequality. These phenomena, in turn, are harmful to industrial and technological development, constituting a vicious circle that makes up the technology trap of developing countries, which at the same time limits the capacity of these countries to generate and adopt the environmental innovations necessary to reduce the levels of greenhouse emissions and degradation of the environment, through greater energy efficiency, an increasing dematerialization of its production and a more efficient use of natural resources.

The objective of the present work is to identify the different factors that determine this technological trap and the causal relationships between these determinants and the limitations to advance on a green transition, through a review of: i) literature on productive structure, commercial specialization and technological development, especially from the structuralist and evolutionary approaches; ii) two versions of

post-Keynesian growth models for open economies that incorporate environmental sustainability as a variable; iii) empirical studies focusing on environmental innovations carried out by firms in Latin-american countries. In this sense, the main contribution of this article is the inclusion of environmental variables in the debate around developing countries´ technology trap.

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3. Mateus Labrunie, Technological unemployment in the 4th Industrial Revolution: why not to fear it, and how to manage it

The recent wave of innovations widely known as the 'Fourth Industrial Revolution' (4IR) has been spurring debates about its potential effects on labour. In these debates, views that stoke the fear of technological unemployment are starting to gain influence. Authors focused on developed countries such as Acemoglu (2021) have been vocal about the possibility of 'excessive automation' due to incentives created by tax systems, and thus of the reduction in the creation of good industrial jobs. Other authors and organisations focusing on developing countries, such as Rodrik (2021), Baldwin and Forslid (2019), and World Bank (2018), have expressed concerns that manufacturing industries are not generating employment growth at the level of previous industrialization experiences due to new labour-saving industrial technologies, raising doubts about the benefits of industrialization for developing countries today. On another line of research, some authors have pointed out that a large proportion of current jobs would be at high risk of automation in the near future (Frey and Osbourne, 2013, 2017; Bowles, 2014).

This paper intends, first, to show that the concerns expressed by these authors are neither a theoretical necessity nor an empirical regularity. Second, it proposes that the contradictory findings on the technology vs. labour debate seem to stem from the overly narrow focus of some recent works, which ignore the broader movements in the international division of labour. Once a broader approach is adopted, it becomes clear that industrial employment has not lost relevance, and that technology is the solution, not the problem for the creation of high-quality jobs. Thirdly, it analyses the expected impacts of 4IR technologies, and argues that substitution of labour is just one among a multiplicity of ways they can impact production. Lastly, it provides historical examples of successful labour policies during previous industrial revolutions, seeking to obtain lessons from them on how to manage labour in the current 4IR.

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4. Sofia Patsali, University procurement-led innovation

"This paper proposes a new view about the economic role of research by focusing on the impact of university procurement on firm innovation. We suggest that research universities do not act as mere customers or even lead users in the development of new technologies. They fundamentally shape their suppliers' innovation through their scientific programs. We highlight the presence of a so far neglected phenomenon concerning university-firm interactions, i.e. university procurement-led innovation, and we discuss its characteristics. Finally, we support our claims with evidence coming from a field study on a set of instrumental devices co-developed by the researchers of the University of Strasbourg together with equipment suppliers.

Our work is related to the rich body of contributions that have investigated the innovative impact of military and space programs together with Big Science procurement (Malerba 1985, Ruttan 2006, Mowery 2012). These studies have convincingly shown how defence procurement has played a great role in the emergence of technologies across many industries in the US and sometimes industries themselves. These include the machine tool industry (see Howard 1978, Stowsky 1992, Mazzoleni 1999); the commercial aircraft industry (Miller and Sawers, 1970); the computer and internet industry (Alic et al.1992, Mowery and Simcoe, 2002). These studies have also highlighted the major contribution to innovation delivered by research agencies, like the Pentagon's Defence Advanced Research Projects Agency (DARPA, see Abbate 1999, Fuchs 2010, Bonvillian 2018), the European Space Agency (ESA) and NASA (Petrou 2007, Mazzucato and Robinson 2019). They have also discussed the effect of procurement from Big Science centers (like CERN) on suppliers' technological performance (see Autio et al., 2004, Nilsen and Anelli 2016, Castelnovo et al. 2018, Florio et al. 2018).

In contrast to military and Big science, public research universities' procurement has received much less attention. The above-mentioned literature on innovative public procurement has mostly considered universities as a mere supporting institution of other public agencies, that were the real innovation drivers, and as a supplier of skilled labour force (Gross and Sampat, 2020). Nevertheless, high-quality research labs at universities have their own scientific programs as well. These programs do not just result in blue-sky research but involve also visions about how to develop novel technologies demanded through the procurement process, and these visions may guide the development of such technologies. Furthermore, the application domain of technologies developed as a result of the university procurement often goes well beyond the scientific community (Rosenberg 1992). Therefore, we suggest that university procurement of scientific equipment represents a highly relevant and yet unexplored channel through which public research universities contribute to innovation.

Our approach to the analysis of universities' contribution to innovation differs from the standard view about university-industry technology transfer. The latter does not explain the mechanisms through which industrial firms pick up university inventions and turn them into new products. On the contrary, in this paper we illustrate in detail how, based on their frontline research missions, universities are able to impose major technological requirements to manufacturers, and in such a way, influence them significantly in their evolution within a given technological paradigm. In other words, we highlight how universities do not just "transfer" technological knowledge to suppliers. Through procurement they act as a powerful agent in formulating technical aims and in focusing suppliers' attention upon those aims in a compelling way.

Our study is a first attempt to provide elements of a much larger picture still awaiting to be drawn. Its main ambition is to trigger a discussion towards a better understanding of the mechanisms which initiate and direct university procurement-led innovation processes with some important normative and empirical implications. Our main finding is that the emergence of procurement-led innovation depends on four key factors. First, university research labs must be able to supply high-quality and relevant scientific knowledge to manufacturers. Second, procurement-driven interactions between researchers and companies must enhance the transformation of scientific advances and discoveries into technologies. A third, and related, aspect is that procurement must provide a test-bed infrastructure for exploratory technological development by companies. Finally, through procurement, university research labs must operate as focusing devices for technological innovation. Importantly, we discuss how this focusing process is very much driven by the scientific missions set by university research activity.

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5. Alexander Copestake, Katherine Stapleton and Ashley Pople, AI, firms and wages: Evidence from India

We examine the impact of artificial intelligence on hiring and wages in the service sector using a novel dataset of 15 million vacancy posts from India's largest jobs website. We first document a rapid rise in demand for AI skills since 2016, particularly in the IT, financeand professional services industries. Vacancies demanding AI skills list substantially higher wages, but require more education and are highly concentrated in the largest firms and a small number of high-tech clusters. Exploiting plausibly exogenous variation in exposure to advances in AI technologies, we then examine the impacts of establishment demand for AI skills as a proxy for AI adoption. We find that growth in AI demand has a direct negative impact on the growth of non-AI and total job posts, and reduces the growth of wage offers across the distribution.

Paper Session 4: State Capacity

1. Ludwig Miguel Berdejo, The role of learning processes in the innovation capability building in public sector organizations in developing economies: evidence from local government organizations in Brazil

Based on the theoretical approach of the economics of innovation, this paper proposal aims to analyze the determinants of Brazilian animal experimentation policy. Sometimes in vivo experimentation procedures are devoted to scientific discoveries and at other times demanded by tests for the development of health technological innovations, whether addressed to human or animal health (preclinical or nonclinical tests). Therefore, animal experimentation is still a crucial stage to translate health innovations from bench to market. Despite this, Brazilian Science and Technology policies have neglected this knowledge field for decades. Studies about these organizations are scarce, although their contribution to the health innovation chain and, therefore, to the Health Economic-Industrial Complex (CEIS) is very significant. The regulatory lag between Brazil and the developed countries was reduced by the implementation of the law that regulates the scientific use of animals (L. 11794/2008, also known as Arouca Law). Nevertheless, there is a technological lag that may not only impact the quality of studies and innovations produced in Brazil, but also CEIS's credibility with the international market. This study highlights animal testing facilities and experimental laboratories´ role as a strategic stage crucial for CEIS development and, also for Health Innovation in Brazil.

Therefore, this study aims to analyze the Brazilian policy for structuring and strengthening laboratory animal facilities and preclinical experimentation laboratories, to suggest improvements for CEIS´s strengthening. As exploratory research, qualitative methodological procedures were employed. For documents and interview analysis, the content analysis approach was adopted. Observations made at events in the biomedical research field were also a data source.

The analyzed documents were related to the period preceding the sanction of the Arouca Law. These were listed through keyword searches in databases and institutional repositories. The interviews were conducted with professionals related to the field of animal experimentation: biomedical researchers, IACUC (Institutional Animal Care and Use Committee. Institutional Animal Care and Use Committees) members, academic leaders, and professionals working in animal facilities, laboratories, and the pharmaceutical industry.

The documental analysis emphasizes that the sector's previous configuration (before the legislation) and the obstacles to the approval of the legislation are indications of the sector´s vulnerability and lack of political capital. The preliminary analysis of the political context that gave rise to the sanction of the Arouca Law emphasizes the weaknesses of the animal experimentation sector as an influencer of public science and technology policies in Brazil.

Based on the analyses, it is expected to describe in detail the relationships between the actors of this policy and to explain the consequences for the health innovation sector in Brazil.

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2. Maria Carolina Foss, Diogo R. Coutinho, Legal Innovation for Public Health: procurement contracts to COVID-19 vaccines in Brazil

The health sector is a science, technology, and innovation demanding one (Proksch et al., 2019; Trindade, 2008). Its problems are complex, systemic, urgent - wicked - requiring insights and actions from different perspectives (Kattel et al., 2018; Mazzucato, 2017). Less obviously, nonetheless, they are also highly challenging in terms of legal innovation and implementation capacities. In Brazil, the health sector is anchored in the Public Health System (SUS, the Brazilian equivalent to NHS), which universally provides health care to citizens, often through large scale public procurements and public-private partnerships (parcerias para o desenvolvimento produtivo or PDPs – see Laplane, 2020; Silva; Elias, 2019; Sundfeld; Souza, 2013; Varrichio, 2017). During the Covid-19 pandemic, which triggered a worldwide emergency call to pursue new drugs and devices to treat and cure the disease, vaccine developments came in the mid-2020 as a promising weapon and shield (Azoulay; Jones, 2020; Da Silva et al., 2020). In 2020 the Brazilian government, through two public science, technology institutes Butantã and Fiocruz, signed contracts with foreign pharmaceutical companies whose scope is to purchase vaccines - at that time still under development (Rauen, 2020). Such contracts were based on a public procurement for innovation new type of instrument named technology procurement contracts (encomendas tecnológicas).

The paper analyzes how the Brazilian government technology procurement contracts for Covid-19 vaccines dealt with technology and institutional risks and uncertainties, and it also aims to describe how such agreements (and the legal apparatus behind them) relate to the Brazilian innovation system more broadly. Besides analyzing the contracts and official reports, laws, and the underlying regulatory framework, we interview managers and lawyers directly involved in the contractual negotiation and execution. The goal is to identify the roles – both constraining and facilitating – played by the law

(and legal actors and institutions) in fostering technology acquisition, and to propose a distinguished methodologic socio-legal approach to examine how public procurement can foster innovation through a case study.

The main research question is: besides mitigating uncertainty, how the legal framework for contracting science, technology, and innovation in the vaccines case may contribute to the transfer and incorporation of foreign technology in Brazil's health production system, compared to SUS's previous technology contracting tools? Related questions are: to what extent the employment of encomendas tecnológicas and its regulatory background rules can potentially strengthen the weak Brazilian subsystem of policy and regulation (characterized by overlapping responsibilities, competition for and nonstrategic use of resources, discontinuity of investments and programs, excessive bureaucracy, and control - auditing - of innovation policies and programs, including procurement, as described by Mazzucato & Penna, 2016)? What kind of learning and experimentation in contracting for innovation can be obtained?

Sadly enough, the vaccination pace in Brazil is moving slowly, and the virus contagiousness is increasingly high. This has been causing severe logistic and financial pressure on the public health system. Social distancing measures and the use of masks – precautions openly denied and undermined by president Bolsonaro – are not effective in containing the infection and mortality rates in the country.

Vaccines manufactured by the local science and technology institutes depend on the foreign active pharmaceutical ingredient (API). But delays in importing API and consequent constraints in the local production are seriously harming the vaccination program. Contractual mechanisms partly deal with such risks by stipulating penalties and liabilities to the infringing part. However, contracting innovative products add intricate layers of uncertainties to the traditional contract theory. An example: during the contract negotiation, the contracted object is not previously known once the innovative product, process, or technical solution is still being developed. An innovation-oriented theoretical approach to contracting for innovation is needed, as argued by Gilson, Sabel, and Scott (2021) and Jennejohn (2011). Encomenda tecnológica is a public procurement legal tool for innovation foreseen by the 2004 Brazilian Innovation Law, but still underused. Covid-19 vaccine contracts are the first actual test of this tool in the health sector. Despite the limitations of examining ongoing contracts (e.g., confidential information), we consider them valuable cases to bridge the gap between the contracting for innovation and the system of innovation literature.

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3. Riley Livingstone, Relational factors in collaborative innovation and the workplace in health and social care

1 Introduction

Policymakers acknowledge the need to drive innovation in health and social care, given the complex, 'wicked' problems that such services are tasked with solving. The concept of collaborative innovation is rooted in the idea that a diverse group of inter-organisational stakeholders working together have a collective capacity to develop solutions to wicked problems in public services. This research builds on prior studies of collaborative innovation through a case study of an intermediate care facility in Scotland. This collaborative initiative led to innovative change and demonstrated the power of collaborative innovation to address wicked problems, but the strength of the solution was diluted by the omission of front-line workers throughout the process. This paper contributes to the broader public administration literature by offering a critical lens to the need to account for and include power deficient actors, particularly those that work on the front lines directly with service users.

This paper employs the concept of collaborative innovation to analyse the case of the journey to implementing the Bellfield Centre – an intermediate, integrated health and social care facility in Stirling, UK. In this paper, the questions sought are as follows:

- What relational factors and workplace practices shape, facilitate, and constrain the processes of collaborative innovation?
- How effectively do collaborative innovation processes support innovative changes in organisations and services?

2 Methods

This research builds on prior studies of collaborative innovation through a case study of an intermediate care facility in Scotland. This study employed the case study method with a single block of fieldwork being conducted from September-December 2019. Semi-structured “key stakeholders” interviews were conducted with 27 individuals involved in the Bellfield Centre integrated intermediate care facility either in terms of either the planning of the project or employment relevant to its current implementation.

3 Findings and Argument

Although the power imbalance between collaborators was apparent, governance structures, processes and a common discourse were in place to try to continuously govern the venture collaboratively. Members of the workforce planning group particularly spoke about feeling that they felt heard and did not feel they had to hold back which then empowered them to innovate to the best of their ability. However, front line employees said they were not consulted about the project and this is problematic because arguably, those at the bottom are the ones actually carrying out the services

and are the ones who expressed the most discomfort with the current level of integration, and thus it speaks to reason that their inclusion might have led to a more seamless implementation. There is an implication that front-line workers will have bought into the aims of the innovation and actively implement the solution, but if they were omitted from the earlier phases of the project, this will prove challenging (Ansell et al., 2017). Another relevant finding was just how imposing of a barrier regulatory bodies could be to collaborative innovation, particularly in a case such as this when more than one public organisation is a stakeholder. While this has been seen before in collaborative innovation studies (Wagner and Fain, 2018; Sørensen and Torfing, 2011; Sherman et al., 2020), it is proposed that further discussion is warranted about how to address this barrier – particularly for regulatory bodies that are much larger than the size of the collaborative organisations involved, like in the national organisations seen here.

4 Conclusions

This research contributes to the growing theoretical literature that frames collaborative innovation as a means to address complex policy problems and provides a critical lens to the need to include and account for power asymmetries between stakeholders. As we have seen in the case of the Bellfield Centre, the use of collaboration as a means to innovation has the power to make progress in addressing wicked problems, more progress than any individual stakeholder could have made alone. This case study found that limitations in the involvement of front-line workers hindered the willingness and capacity of those workers to embrace change and limited the collective strength of the collaborative innovation. For large public organisations with tightly defined hierarchies and for overlooked and power-deficient professions like care workers, collaborative innovation without coproduction with staff at multiple levels does not seem entirely sufficient. Despite this limitation, this case is an example of stakeholders coming together to address a wicked policy problem by doing something different and through those actions were able to achieve better outcomes for people and streamline services more effectively than possible in isolation.

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4. Sofía Bosch Gómez, Luis Godoy Rueda, Data and Design Capacity for State Innovation

Data and design processes are key to understanding and expanding the state's innovation capacity. Through a historical overview, we argue that the way data and design have been methodologically devised to interact provide idiosyncratic ways to embolden public innovation.

The capacity of a state to promote innovation as well as social and economic development relies on the management of data, information and knowledge. Previous research has pointed out that informational capacity is key to gauge the ability of a government or its institutions to accomplish policy goals. Brambor, et al. (2020) claim that information is the most important resource a state utilizes when implementing policies. Thus, Lee & Zhang (2017) identify legibility as crucial for effective governance. The ability of the state to innovate depends on the collection and processing of data regarding governing territories and populations.

Today, there is agreement that data is an essential resource for economic growth and societal progress. Data facilitates the optimization of processes and decisions, innovation and helps in the prediction of future events. This holds enormous innovative potential in various fields, ranging from health, environment, and education.

However, there has been a dramatic change in the ownership and governance of data. While the public sector loses capacity in the data value chain, big tech has arisen as the holder and manager of data. Companies such as Apple, Microsoft, Amazon, and Alphabet, follow a data extraction model that can be understood as income derived from owning or controlling a scarce asset: data.The first data gathering procedures such as census, cadasters, and fiscal information collection were managed by the public sector, this allowed several states to allocate funds to planning for the delivery of public goods and services. Recent years have witnessed a shift in the management of similar forms and types of data and information now governed by technology companies.

This information asymmetry between the technology companies and the public sector has the potential to hinder the essential informational role in state administration. The equivalent has taken place with design-led innovation processes extrapolated from the private sector with the aim to be deployed in the public realm to do things differently.

Within that contextual framework, design processes have become popular vessels or mediums to trigger public and social innovation. It is not only about how we manage data collection and infrastructure but what we actually develop and do with it. That is where the intertwining of data management and design have the potential to spark new forms of public innovation. Data-driven design-informed processes have only been explored to a certain scale where qualitative, thick data, is vital. Nevertheless, with the management of larger amounts of information, design processes and decisions have the potential to be tailored to fulfill a role of facilitation when it comes to innovating.

Design has a pivotal role in these innovation processes. As Herbert Simon famously stated “Everyone designs who devises courses of action aimed at changing existing

situations into preferred ones" (1969). By that token, any design process that fosters transitional and transformative processes and outcomes could be equated to an innovation process: there is a recombination of elements in order to arrive at unfamiliar circumstances. However, the use of tangible design research and information in these processes was only introduced as part of the design thinking process developed in the 1980's, and which has evolved into other processes deriving from a systems approach and recognizing the importance of data-driven anticipatory governance (Maffei et al., 2020). Without a clear representation of the problem space depicted through data collection the design of public services, systems or policies will be, once again, blinded.

Through the study of different case studies, we argue the importance of developing a public data-management muscle. Thus, we also contend this cannot be done without design and expert designers (Manzini, 2015) who have the disciplinary capabilities to facilitate the process but also, the material taxonomy needed to manage information appropriately. From an intangible to a tangible perspective, we will analyze how woven data and design processes deliver the innovation results required to face this century's wicked problems (Rittel and Webber, 1973). From how mobility data ownership, in the face of Covid-19, shifted in the public interest –big tech companies published data in the midst of a the public health emergency for traffic management, urban planning, epidemic control, and allocation of funds during the pandemic–, to the role the filing cabinet has played in the development of a material taxonomy of data and therefore the veering of the decision making process.

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5. Eduardo Spanó, Legal-institutional design and dynamic capabilities of innovation agencies: the case of a Brazilian agency

There is a global rebirth of innovation and industrial policies among academics and practitioners to tackle grand challenges, such as massive unemployment, public health system crisis and the climate crisis (Mazzucato, 2021; Aiginger and Rodrik 2020). Every day it becomes clear that the present configuration of our economic system has not been able to solve these important challenges. As a response to that, on the policy dimension, we have seen industrialised (European Commission 2018) and emerging economies adopting mission-oriented innovation policies. The academic literature also expresses the concern of setting a direction to the economic structure, pointing to a certain convergence between, on the one side, the literature on industrial policies (Aiginger and Rodrik 2020) and, on the other, the innovation policy literature (Schot and Steinmueller 2018; Fagerberg 2018; Mazzucato and Kattel 2018).

However, there are few studies about the institutions needed to implement those policies that call for more directionality and a more entrepreneurial role for the State

(Mazzucato 2018), even if capability-building is often considered one of the biggest challenges ahead for policymakers (Edler and Fagerberg 2017, 17). A possible reason for that is the tendency of the industrial and innovation policy literature to approach public policy from a normative perspective - focusing on rationales rather than trying to understand hurdles or enablers for policy implementation (Borrás 2011, 725). Although more recently the mission-oriented innovation policy framework explicitly presents the need to develop and sustain public-sector dynamic capabilities (Mazzucato, Kattel, and Ryan-Collins 2020), this topic is still poorly developed (Kattel & Takala, 2021; Mazzucato et al., 2021; Mazzucato et al., 2021).

This paper aims at deepening the understanding of the implementation of mission-oriented innovation policies by innovation agencies. More specifically, it focuses on understanding how the legal and institutional design of innovation agencies can result in more effective and adaptive innovation agencies capable of facing the challenges of implementing these policies. This paper tries to answer the following question: how the legal and institutional design of innovation agencies affect the development and sustainability of their dynamic capabilities for the implementation of mission-oriented innovation policies?

In this paper, we argue that legal and institutional design strongly shape organisations and routines - such as innovation agencies' governance, organisational design, budget and finance, public procurement and human resources - that in turn affect the potential for development and sustainability of innovation agencies dynamic capabilities. The legal-institutional design practice expresses how the law in action (opposed to the law in books) can lead to dysfunctional routines that constrain the development of dynamic capabilities required for mission-oriented innovation policy implementation. On the other side, good design can facilitate the development of those capabilities, even if it is not a sufficient cause for that. This argument is aligned with the view that, like most structures in modern society (Deakin, 2017), strong innovation bureaucracies cannot be understood without comprehending their legal and institutional design (Coutinho, 2017).

This argument is based on the case study of an initiative from Financiadora de Estudos e Projetos (FINEP), the Brazilian main innovation agency, to fight the Zika fever epidemic in Brazil in 2015-16. The selection of FINEP is based on the amount of information available and the access of the researcher to present and past public managers of the institution. We used the Design Science Approach (Holmström et al., 2009) to design and build a framework in a problem-solving effort of research. In this sense, interviews and document analysis served as instruments to come up with a framework of dynamic capabilities that could support FINEP in implementing mission-oriented innovation policies.

The self-evaluation framework we propose is composed of high-order dynamic capabilities (Teece, 2007) – sense, seize and transform –, their respective measure in a group of low-order dynamic capabilities and their related legal dimension. Low-order dynamic capabilities are measured with a six-point Likert scale between two observable situations, a worst-case scenario and a best-case scenario. A similar artefact was built to evaluate dynamic capabilities for business model innovation in the private sector (Franco et al., 2021).

To exemplify our framework, let's take an example with "sense", the dynamic capability to monitor the environment. One proposed low-order dynamic capability associated with ""sense"" is strategic thinking of the top management team, which can be measured in a continuum between a worst-case and a best-case scenario. Finally, in this example, the legal antecedent of this low-order capability comprises elements of organizational design and human resources routines. Apart from this condensed example, the present form of our framework presents a few other low-order dynamic capabilities indicators for each high-order dynamic capability and a related qualitative assessment of their antecedent legal practice.

As findings, this paper supports the integration among theories of mission-oriented innovation policies, dynamic capabilities and legal institutionalism. First, it shows with more clarity the capabilities needed to design and implement mission-oriented innovation policies and at least one possible recipe of how they can be developed and nurtured. Second, it integrates legal institutionalism in the dynamic capabilities framework for the public sector. The legal structure is an important antecedent of dynamic capabilities in the public sector, and how to better design the legal regime is an important element to consider to avoid institutional hurdles.

Moreover, a practical contribution of this paper to policy is an initial framework for the analyses of dynamic capabilities for mission-oriented innovation policies in innovation agencies. This framework is still limited because based on only one case study, but it can serve as a starting point for further research and practice. We intend to keep refining this capabilities framework with future theory-building and theory-testing research to, taking into consideration context-specificity, inspire practitioners facing the challenge of (re)designing more effective innovation agencies to explore new legal and institutional experiments to implement mission-oriented innovation policies.

Paper Session 5: Inclusive Innovation

1. Chandra Shekar Katna, Interactive Learning and Innovation in Informal Manufacturing Enterprises in India: The Determinants

The informal sector has grown over the last few decades in developing countries especially, in India. Just like other Micro Small and Medium Enterprises (MSMEs), the informal sector enterprises always have a pressure to improve productivity and stay alive in competitive market. They are constantly battling for novelty and niche demand to stay afloat. In this regard, innovation is a very crucial aspect for growth and competitiveness of informal firms. Given their humongous share in employment and output, understanding the innovation activities of these enterprises may provide insight into evolution of innovations especially in the context of developing countries. Therefore, innovation activities of informal sector enterprises have also gained attention among academicians and policy makers in India.

The Informal manufacturing enterprises learn to organise and produce goods through cumulative and diverse processes. These deliberate learning processes are found in the literature to open up knowledge for the development of firm performance (Lall 2000, Malerba 1992), as well as to guide the technological and productive trajectory of the firms. (Oyelaran-Oyeyinka and Lal, 2006, Malerba, 1992). Learning is, therefore, at the heart of firm-level innovation. Recent case studies (Kraemer & Wamae, 2010; Kraemer & Wunsch, 2016) analyzing the innovation activities in informal firms reveal the prevalence of innovation, particularly in the context of developing countries. According to these studies, innovations in informal enterprises are largely incremental, defined by local demand and knowledge.

Therefore, to understand firm level innovations in India, it is imperative to understand innovations in informal manufacturing enterprises and institutions that support the learning, transfer and transformation of local knowledge and how these processes interact with formal enterprises. Micro-level data on how information is created and knowledge generated, valued through interactive learning processes in informal manufacturing enterprises can provide useful insights on how to change millions of lives in developing countries (Kraemer and Wamae, 2010). The paper aims to complement the existing literature on innovation studies by providing evidence at the micro level. This gap is addressed by using a unique informal manufacturing enterprise survey conducted by this study in NCT-Delhi, India.

The objective of the paper is as follows:

- To analyse the factors affecting the different types of innovations in informal manufacturing enterprises and to examine the relevance of interactive learning in determining those innovations.

Using the field survey data, this paper contributes to the innovation literature in conceptualization and empirical examining by analyzing the effect of interactive learning through both formal and informal interactions, on the job training, and entrepreneurial acumen on the innovation in informal manufacturing enterprises.
Firm's absorptive capacity and enhancement through interactive learning is expected to be critical in the innovation processes. By differentiating the informal and formal interaction modes and focusing on product, process as well as marketing innovations, the study contributes to analytical extensions to the existing literature related to innovation studies. The empirical analysis supports the significant relation between interactive learning modes and the innovation outputs. The results show formal and informal interactions on the one hand, and in-house training, learning by doing, on the other side, are positive and significant determinants of innovation in informal manufacturing enterprises. Decomposing formal interactions, we have shown that subcontracting linkages with formal enterprises and membership in industrial associations enhance the likelihood of innovations.

The result founds a relative importance of formal linkages such as subcontracting and membership in in industrial associations over the informal linkages in introducing marketing innovations. Our results also suggest that in-house training improves the technological capabilities of enterprises to create, adapt and transform knowledge into new or significantly improved product and processes. In particular, the need for informal and formal relations, from which these skills seem to emerge further, highlights the essential role of human resources and entrepreneurial expertise in informal manufacturing enterprises.

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2. Laura Victoria Rodríguez-Zaragoza, The Labour Situation in the Telecommunications Industry of Jalisco: An Investigation from a Feminist Economics Perspective

A translation of this abstract is forthcoming.

Este trabajo de investigación se analizan las condiciones laborales presentes en el segmento de Desarrollo de Software en Jalisco, en particular, se enfatiza en cómo se presentan tanto la División Sexual del Trabajo (DST) y Segregación Laboral por Género (SLG), así como la dinámica mediante la cual estas dos condiciones influyen en el

posicionamiento de las empresas en la Cadena Global de Valor (CGV) de las Tecnologías de la Información y Comunicación (TIC).

Puede empezarse por decir que, en la actualidad la economía funciona en un entorno globalizado (Sampedro, 2002; Sassen, 2007; Stiglitz, 2017); y esto ha intensificado desigualdades entre países y entre sus habitantes, excluyendo algunos sectores de la sociedad de los “beneficios” de la globalización (Sassen, 2015). Han sido las innovaciones tecnológicas, las que han posibilitado la comunicación e intercambio de bienes y servicios en el mundo, y esto se encuentra estrechamente relacionado con el sector de TIC, de ahí su importancia en este contexto globalizado y su creciente desarrollo y utilización.

Este aumento de la importancia de las TIC, implica que la demanda de su mercado laboral aumente también, requiriendo más preparación de sus trabajadores, una mayor demanda de conocimiento (Partida, 2007) y en general de todas las habilidades necesarias para participar en el mercado laboral (Wajcman & Lobb, 2007).
Además, para analizar el mercado en la globalización, se utiliza el marco analítico de las Cadenas Globales de Valor (CGV), que es la manera en que se ha posibilitado este funcionamiento global, cuyo análisis considera tanto las relaciones intra e inter empresariales, así como las implicaciones que tienen glocalmente, en el territorio en que las empresas se encuentran funcionando (Gereffi, 1995, 2001; Partida, 2002; Wallerstein, 1995).

Varios análisis realizados desde la metodología, o marco analítico de las CGV, abordan aspectos relativos a la oportunidad de los países en desarrollo por integrarse a la economía globalizada (Gereffi & Fernández-Stark, 2011) y en específico en lo que se refiere a economías latinoamericanas, se ha encontrado que los beneficios de hacerlo son de difícil determinación, pero resulta sumamente relevante para avanzar en esa comprensión, prestar atención a la manera en que las Empresas Multinacionales (EMN) líderes de las CGV más importantes actualmente han puesto su atención en estos países (Kosacoff et al., 2007). Como ya se mencionó, las TIC tienen un papel clave en el funcionamiento de la economía global, por lo cual, la CGV de TIC es una de las mas importantes y es resaltable que México, especialmente en el estado de Jalisco se encuentran ubicadas una gran parte de las EMN de esta cadena.

Y en esta dinámica del capitalismo global, se prioriza el crecimiento económico, la maximización de beneficios, la ganancia de las empresas, los intereses de los grandes capitales, que poco tienen que ver con la cuestión social, entendiéndola como las consecuencias sociales de estas acciones y decisiones.

De acuerdo con varios autores, en las últimas décadas la participación laboral de las mujeres ha ido en aumento (Messner, 2002; Peña et al., 2012), y ha aparecido un "nuevo estrato de mujeres profesionales" (Sassen, 2003, p. 77), que va más allá de las mujeres trabajadoras vistas como una mano de obra minuciosa, caracterizada por ser detallista y más barata, además de asociada cotidianamente con las empresas maquiladoras (Hualde, 2001) ; pero es muy importante resaltar que ese aumento de participación laboral femenina no se ha dado en la misma proporción en todos los sectores productivos o actividades. De acuerdo con CEPAL (2013) las mujeres se encuentran concentradas en el sector de servicios, y aun cuando las TIC son actividades consideradas en su mayoría como servicios (Brown & Domínguez, 2015; Hernández et al., 2017) tienen la particularidad de seguir siendo predominantemente masculinas (CEPAL, 2013, 2014; CEPAL & ELAC2015, 2011; Gurumurthy, 2004; Peña et al., 2012; Rodríguez, 2014).

Considerando lo anterior, se puede decir que estos grandes cambios tecnológicos y económicos creados con la globalización, la sociedad del conocimiento y las TIC, también tienen implicaciones sociales (Castells, 1996), por lo que ésta participación femenina en este tipo de industrias ha cobrado interés en diferentes esferas: como la gubernamental, la empresarial y la académica y se están llevando a cabo diferentes estrategias al respecto.

Sin embargo, aun cuando las empresas de software, inmersas en la dinámica de la CGV han estado llevando a cabo diversas acciones para modificar estas cifras diferenciadas entre hombres y mujeres como parte de su fuerza de trabajo, bajo la lógica de que, a mayor diversidad mayor productividad, y desde luego que mejoras en su posicionamiento dentro de la cadena; ésta visión es objeto de crítica por parte de la economía feminista, ya que es una visión de la situación de una manera tradicional (Ferber & Nelson, 1993) en la que el derecho de las mujeres a participar es solo visto como una forma de obtener beneficios capitalistas. Como si el solo hecho de que participen más mujeres fuese lo único que importa (Trejos, 2009) y no tomando en cuenta las condiciones en que esta participación se da.

La pregunta que rige la investigación es: ¿Cómo y para qué se presentan y aprovechan, la DST y SLG en CGV de TIC, específicamente, el eslabón de desarrollo de software presente glocalmente en Jalisco?

El objetivo general de la investigación consiste en analizar las formas y consecuencias del desarrollo de la DST y SLG en el segmento de Desarrollo de Software de la CGV de TIC presente en Jalisco.

Se utiliza el marco teórico de la economía feminista, que ha incluso comenzado a tomar fuerza en el análisis de las CGV, aunque dicha relevancia se ha dado en lo referente a cadenas de los sectores primarios principalmente, considerando en muchas ocasiones que las TIC posibilitan nuevos contextos en que la DST no se presenta y al contrario, que se ha disminuido, pero se busca precisamente demostrar que la dinámica de la economía capitalista que aprovecha dichas condiciones culturales y contextuales dadas, se ha mantenido e incluso intensificado.

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3. Leila Mucarsel, The case for gender as a Grand Societal Challenge to be targeted by Mission-Oriented Innovation in the Global South: insights from Argentina

Gender inequality, gender violence and discrimination are some of the most critical societal challenges of our time. With a deeply-rooted patriarchal culture, Latin America and the Caribbean (LAC) is one of the world regions most affected by these phenomena. This region has the highest rate of non-couples-related sexual violence globally and the second-highest rate of violence by partners or ex-partners (WHO, 2013). In terms of economic autonomy, 39% of women in the region do not have their own income, and while the average women's employment rate in LAC has risen from 41% in the early 90s to 52% in 2018, it remains 25% below men's. There are also significant care gaps, especially for women with lower incomes (ECLAC,2021).

Fortunately, recent years have seen the rise of a powerful social mobilization to change this reality. The 'feminist tide' has gained momentum in many Latin American countries, with young women and girls at the front of the fight for safer and more equal societies for women and gender minorities. While the Latin American feminist movement has a long history, during the last years it has gained wide support across the public. Gender equality, ending up with femicides, and legal abortion have become the flagship of a growing number of social, cultural, and political groups coming together from very diverse backgrounds. As a result, the gender agenda is increasingly gaining both visibility and a strong base of social legitimacy.

In this context, Argentina has been recently put in the spotlight by the United Nations as the country with the most gender-sensitive measures in response to COVID-19 in the world. It is argued that the high number of gender-sensitive policies makes Argentina's emergency response exemplary in the region and this is reflecting both the influence of feminists in key ministerial positions and a strong and multifaceted feminist movement. The UN records 44 measures taken by Argentina's government in response to COVID-19, of which 26 have been defined as gender-sensitive. Of these, 8 address

women's economic security, 5 target unpaid care work, and 13 address violence against women (Global COVID-19 Gender Response Tracker,2021).

Concomitantly, efforts have been put in place to ensure gender equality is mainstreamed within Science, Technology and Innovation (STI) policies, with the launch of the National Program for Gender Equality in STI and the incorporation of incentives for gender equality in the recently passed 'Law for the progressive finance of the National STI System'. Notably, Argentina had already enacted before the pandemic systematic policy changes to address issues such as gender bias in government, the care agenda, and gender-based violence in the country broadly. Nevertheless, in Argentina as globally, the current crisis is threatening to erase decades of progress for women and girls, exacerbating existing inequalities, economic and care crises, with disproportionate impacts on women as well as increasing domestic gender-based violence.

In this context, this article focuses on the case of Argentina, to try to answer the questions: How could the above-described gender momentum be capitalized in terms of the countries' development, industrial and innovation policy strategies? More specifically, can gender equality become the inspiration for a specific Mission-oriented Innovation Policy (MOIP) to tackle issues such as care deficits and gender violence in its different forms? What can be learnt in terms of opportunities and challenges from Argentina’s gender-sensitive response to COVID-19? How could this strategy become the basis for a more comprehensive approach that leads to the involvement of a diversity of sectors (i.e. from city planning to arts, from public bodies to grassroots organizations), scientific fields (from social sciences to health and biomedical sciences), industries and technologies (from care services to the IoT and AI) aiming at accelerating progress and transform systems towards UN’s SDG 5 (Achieve gender equality and empower all women and girl) targets? How should a gender-equality-oriented mission be crafted to have not only social impact but also become an economic driver and a political reinforcement for the gender agenda?

To these ends, the article starts by briefly characterizing gender inequality as a ubiquitous and wicked policy issue worldwide. Then, we illustrate why Latin America's current scenario could be a fertile ground for a Mission-Oriented approach to gender issues, to then focus on the case study: Argentina’s gender-sensitive response to COVID-19, in the context of a broader policy to mainstream gender in government that started in 2020. The opportunities and challenges for gender to become the basis of a MOIP in this scenario are assessed through the lenses of key lessons of the MOIP and Grand Societal Challenges literature (Fagerberg & Hutschenreiter, 2020; Kuhlmann & Rip, 2014; Mazzucato, 2018; Nelson, 1977, among others) on the one hand, and STI

policies for inclusive development in the Global South on the other hand (such as Cassiolato et al., 2013; Dagnino et al., 2004; Dutrénit & Sutz, 2013). The methodology is based on an in-depth document analysis of secondary sources such as opinion pieces, public policy documents, as well as interviews with stakeholders including feminist activists, policymakers, and researchers. Drawing on these insights, the paper finishes by outlining potential innovation pathways and which could be the crucial public sector dynamic capabilities (Kattel & Mazzucato, 2018) that such a strategy would require, as well as what are the learning processes that targeting gender equality through a specific mission can trigger in public sector capabilities for the multilevel governance of innovation policies aiming for inclusive growth. While there is a growing body of literature around MOIP, gender policies, and how to reduce the under-representation of women in STI ecosystems, STEM fields, etc., we argue that there is a profound lack of studies on social challenges in general and gender in particular as potential challenges to be tackled by MOIP, as well as its implications for 21st-century policy-making and the capabilities required to advance in such directions, particularly in the Global South.

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4. Roberta Fischli, Citizen Empowerment through Data Ownership? Proposing a Data-Owning Democracy

"How can we ensure that citizens have a say in how they are governed and what direction technological innovation takes? This paper starts out by observing that in today's digital economy , most of us are simultaneously data users and data producers. But despite our participation in the data ecosystem, we are rarely rewarded with a share of the profits we help generate. A possible explanation is that current data regimes largely focus on negative aspects of freedom. Under the liberal paradigm that continues to inform both law and economic regulation (Benthall & Goldenfein, 2020), individual freedom is largely understood as freedom from interference, or the right to be left alone. Consequently, the emphasis of law is on the protection from unwarranted interference, or more broadly, harm. But this narrow focus fails to acknowledge the economic dimension of the digital transformation and its potential for citizen empowerment.

I argue that if we want an inclusive technological future, we need to expand how we think about freedom in the digital sphere and include positive rights into the equation. Therefore, I set aside questions concerning privacy and protection, and focus on a more positive aspect of digital freedom: citizen empowerment through data ownership. Furthermore, I argue that political theory can be particularly useful when it comes to sketching an economic regime with citizen empowerment at its core. This approach takes seriously the observation that there is currently a lack of consensus about what goals and social models technological regulation should pursue (Cornils, 2020: 14).

Unless we clarify what values new solutions should promote, these efforts are at risk of being uncoordinated, inadequate, ineffective, or, at worst, counterproductive. Bearing this in mind, I propose we turn to neo-republican theory, which is a particularly valuable framework to think about citizen empowerment in the digital sphere. This is due to two features. First, republicans tend to devote considerable attention to questions of economic equality, because they consider great economic disparities to be potentially hurtful for political equality. Republican theory therefore helps us establish the connection between economic and political power, and the dangers that arise when power asymmetries become too large (Fischli, 2020). Second, republicans associate capital ownership with a range of beneficial 'educational' effects, such as fostering prudence, material autonomy and political self-determination (Thomas, 2017). If our goal is to promote an inclusive technological future and a society in which citizens have a say what direction technological progress takes, these insights are useful.

The paper is structured as follows. The first part argues that data qualify as capital in today's digital economy and discusses the different roles they can assume. The second elaborates the connection between capital and two core republican values, political equality and non-domination. The third introduces "property-owning democracy", an economic system characterized by the wide diffusion of capital in society. The fourth adapts the concept to the digital economy to discuss what a "data-owning democracy" would look like and what goals it would pursue. To do so, I draw on real-world examples that provide insights into questions around data ownership and discuss what we may learn from them. The sixth part evaluates how a data-owning democracy could empower citizens and what challenges need to be addressed.

The economic regime I propose here is characterized by a dual structure. The first layer consists of a "digital public sphere", enabled by a digitally run, and democratically controlled, infrastructure in which citizens are the primary data producers and therefore enjoy collective ownership rights over their data. Its purpose is to promote the common good and political self-determination. This is secured by allowing citizens to decide what data they want to share, with whom and for what purpose. The second layer is complementary to the first and characterized by individual data flows. Here, individuals enjoy data ownership rights over the secondary use of their data, allowing them to use data flows about them to gain insights, pool them with others, or directly sell them to third parties.

To conclude, the data-owning democracy I propose here is an economic regime characterized by citizen empowerment on a collective and individual level. Its dual structure acknowledges people's dual role in the digital economy: they are citizens on the one hand, individuals on the other. Finally, it also draws inspiration from real-world

examples on how to foster citizen empowerment via data-driven means, to ensure its implementation is both desirable and feasible.

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5. Roy William Cobby Avaria, A Global Digital Public Goods agenda: Building platforms for international development and innovation

Half a decade has passed after the influential Digital Dividends (World Bank, 2016) report, which highlighted increased connectivity as a pathway to sustainable economic growth in developing countries. The COVID-19 pandemic has accelerated these dynamics, creating a context for e-commerce to grow, and become an essential element for millions across the world (UNCTAD, 2021). Thus, public (Bogdan-Martin, 2020), private (Roese, 2021) and mixed (Alliance for Affordable Internet, 2020) global governance bodies are increasingly interested in promoting connectivity. This paper will argue, nevertheless, that a more concerted effort is necessary: A Global Digital Public Goods agenda. This is because digitalisation is not a neutral roll-out of a general-purpose technology, but a process of cross-sector change with noticeable distributional consequences worldwide. Indeed, governments aware of these economic dynamics are already responding unilaterally (Cartwright, 2020). To allow low-income nations to benefit from innovation (Andreoni et al., 2021), and prevent the great power conflict visible in this tendency towards “splinternet” (Ciuriak and Ptashkina, 2018), it is fundamental to promote a multilateral mechanism that guarantees an equitable global cyberspace.

First, the last decade has substantially altered the political economy of the digital sector, with an increased market concentration for tech leaders in the United States and China (UNCTAD, 2019). This concentration arguably corresponds with recent developments in global value chains, by which control over intangible assets would result in a general tendency towards rent capture by a limited number of firms (Durand and Milberg, 2020, Lasinio and Meliciani, 2019), which some have linked to secular stagnation (Schwartz, 2021). In the digital sector, the question of unequal value creation and capture has been recently brought to light, as digital leaders have been able to accumulate mega-profits during the COVID-19 pandemic (Westbrook, 2020).

This is partly because of the way the key firm in the digital transformation, the platform, operates. Current digital platforms aim to create markets that are sticky, aided by their verticalisation, with detrimental effects for competition, innovation, and consumer welfare (US House, 2020). However, more than market power, what is distinctive about these firms is their ability to become the default intermediaries for certain digital transactions and infrastructures (Mazzucato et al., 2020a:5-6). These generate two types of rent, or profits in excess of the contributions of these applications to value

creation (Mazzucato et al., 2020b:3). First, network rents emerge from the monopolistic and oligopolistic control over a particular segment of a market (Mazzucato et al., 2020a:8). Second, algorithmic rents, whereby intermediary platforms with control over a market can design pricing mechanisms (Mazzucato et al., 2020a:9). In both cases, human behaviour and public data are fundamental, but this dual contribution is not recognised in current value allocations (Mazzucato et al., 2020a:10).

While cloud and business service platforms have cheapened access to key technologies for many firms, it is worrying that the oligopolistic nature of these markets could result in additional extraction of rents from firms relying on their services (Mazzucato et al., 2020b:5), and the generalisation of platform-dependent entrepreneurs (Cutolo and Kenney, 2020). For consumers, this can mean a gradual decrease in quality as platforms, empowered by network effects, lose incentives to invest in innovation and functionalities like privacy (Mazzucato et al., 2020b:14). It should be stressed that these platforms also operate in an ecosystem which has been shaped by public investment in infrastructures, both those facilitating Internet access and other enabling tools, such as GPS (Mazzucato et al., 2020a, 2020:3). Today, in a position of entrepreneurial capture, lead firms' business model rests on strategies to prevent knowledge sharing in chains (Baglioni et al., 2020, Rikap and Lundvall, 2020). In short, these platforms have grown exponentially from the personal and business data (Zuboff, 2019, Rikap, 2020) and institutional contexts provided by billions of citizens across the world and their governments; while exclusively operating key infrastructures, such as cloud computing or machine learning, necessary for the tackling of global challenges like the pandemic (Taddeo, 2020).

These corrections to digital optimism have already been noticed by ethnographies and on-the-ground studies which attest to the "thintegration" of developing country firms (Carmody, 2013, Graham, 2014, 2019). That is, their adverse connectivity under competitive pressures from incumbents operating in digital markets. In these circumstances, the advantages of investing in these capabilities become uncertain in developing countries (Halperin and Viecens, 2017). And yet, ending the digital divide by building capacities and spreading literacy remains urgent (Hernandez and Roberts, 2018). There is a solution: to build on the blueprint of previous experiences with Global Public Goods (Kaul,2019), and the starting point provided by existing multilateral initiatives in the digital sphere (Sahay, 2019, Guterres, 2020). As an alternative to this privatised, fragmented and problematic provision of global Internet access, this paper will propose the creation of three types of Global Digital Public Goods: governance platforms; regulatory standards; and data infrastructures. The first one will expand ongoing efforts to increase accountability and representation in existing institutions like ICANN (Becker, 2019, Haugen, 2020), aiming to institutionalise multi-stakeholder

discussions on the future of Internet access, and on specific issues such as market concentration in the digital sector. Second, partly through the discussions in these governance platforms, an agenda of regulatory benchmarks will be developed in pressing issues such as gig economy labour regulations (Bonina et al., 2021), or “thintegration” and knowledge transfer in value chains (Foster, 2017, Friedrici and Graham, 2018). The final Global Digital Public Good will be a global data infrastructure, providing participating countries the framework to build procurement and other tools for public and private use, while adhering to the highest privacy and human rights standards (cf. Andrejevic, 2013 Russpatrick, 2020). Without overextending its boundaries, this Global Digital Public Goods agenda should complement existing efforts to address issues of competition and data ownership across the world. This paper seeks to unify those efforts, with Global Digital Public Goods providing the building blocks for a transformative economic recovery in line with the Sustainable Development Goals.

Paper Session 6: Industrial Capabilities

1. Shadwa Zaher, Governance and learning in Global, Regional and Local value chains: A comparative analysis of SMEs in Egypt, Rwanda and Uganda

Over the last decade, the Information, Communication and Technology (ICT) sector is becoming one of the major drivers of economic growth in Africa. East Africa alone is said to be growing at an average of 40% (Infodev, 2020). The ICT sector growth is advanced largely by multinational corporations and local enterprises. Despite the challenges faced by the small and medium enterprises (SMEs), they are alleged to play a vital role in the next industrial growth. However, one of the major challenges facing developing countries is the feedback process associated to the value chain. The question of how domestic companies “link- up” to global value chains and “link back” to domestic suppliers has always been puzzling (Andreoni & Tregenna, 2020). The fact that multinational corporations seek offshore investment either through offshore subsidiaries or offshore outsourcing; is justified for reasons of lowering cost or seeking efficiency gains. This have given rise to value chains of services especially those businesses that use information technology (IT) in their delivery. The IT-enabled industry has grown exponentially in the past two decades, with developing countries offering attractive incentive packages to companies to promote their territory as a services export platform (Bamber, Fernandez-Stark, Gereffi, & Guinn, 2014).

Global value chains are considered important to the development of less-developed countries not just in terms of job creation, but also in their essence of increasing competitiveness through learning. The global value chain literature largely focused on the role played by lead firms (global buyers) in supporting the local producer’s learning and innovation process in less developed countries. However, in many instances the literature overlooked the fact that many domestic firms -especially small and medium enterprises (SMEs)- do not usually integrate into Global Value Chains (GVC). SMEs are perhaps likely to integrate into local value chains (LVCs) or regional value chains (RVCs); as it represents a stepping-stone for the involvement in GVCs (Keijser, Goedhuys, & Micheline, 2021). However, the question remains does the LVC and RVC proved to have a positive impact on capability building as compared to the proven fruits of the GVC. Moreover, to what extent “Trust” plays an important role in enhancing the different types of value chains.

The paper argues that the innovation system (represented in the educational system, legal framework, institutional technology and financial system) is key to enhance the governance for innovation and enabling firms to source knowledge externally. Moreover, we emphasize that capability building is affected largely by the value chain governance-

defined as the power dynamics between the global supplier and the local firm. The analysis focuses specifically on the effects of three key indicators; control-based versus trust governance, the innovation system within each case; and firm size. We explore the effects of these indicators on the capability building and institutional innovation; using case studies from Egypt, Uganda and Rwanda. We analysed economic coordination and governance within certain institutions; specifically, ITWorx in Egypt, Billbrain technologies in Uganda; and Creative Eye in Rwanda. Initial results suggest that in the case where the firm is globally integrated the control played by the client to ensure a certain level of quality standards plays the major role in enhancing learning. While in the case of LVCs and RVCs a partnership model between the client and the supplier that involves trust and long-term commitment is key to the learning process. These findings are crucial since it shows that GVC is not the only way to achieve client learning, learning in LVC and RVC is detected. Finally, it draws on alternative channels to capability building and innovation in developing countries, something that many development practitioners are involved with.

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2. Lorenzo Cresti and Maria Enrica Virgillito, Strategic and essential jobs: a new sectoral taxonomy based on employment multipliers

This work develops a new sectoral taxonomy based on employment multipliers by leveraging on the input-output structure of sectoral interdependencies. The approach allows to study how interrelations among productive structures are able to generate jobs in industries and in their supply chains.

Production activities are characterized by deep economic interconnections even more manifested in the Covid-19 induced crisis. Less attention has been devoted to the increasing international division of labour ensuing from productive fragmentation. Indeed, producing a commodity in one sector in one country requires labour also from other branches of the economy, both domestically and globally. These productive activities are thus vertically integrated, or in other terms, participate to a value chain in terms of labour requirements.

In this work, we intersect existing contributions on the employment impact of global value chain participation (Timmer et al., 2014; Foster-McGregor, 2016; Pahl and Timmer, 2019) with the analysis of employment multipliers matrices put forward by Bivens (2019) and Calì et al. (2016). The latter approach, based on the exploitation of the Leontief inverse (Leontief, 1951; Miller and Blair, 2009), enables to measure the amount of jobs multiplied globally in the supply chains of final goods industries.

Employing the World Input-Output Database (Timmer et al., 2015), we extend Bivens' domestic analysis of US multipliers to a global dimension characterized by 43 countries and 56 two-digit sectors. In short, we build a global employment multipliers matrix for every year from 2000 to 2014 (WIOD 2016 Release). We then compute indicators on forward and backward employment multipliers.

The time pattern of employment multipliers of some selected countries (Italy, Germany, US, China), aggregated in technological classes (Pavitt, 1984; Bogliacino and Pianta, 2010), are investigated in terms of their capacity to generate employment both directly and indirectly, both internally and domestically. Understanding the actual employment generation capacity is a key issue in order to define targeted industrial policies. In addition, such multipliers also inform about the degree of externalization across domestic sectors and integration with external value chains. Finally, integrating the role of the effective components of final demand, by means of the algorithm of vertically integrated sectors (Pasinetti, 1973; Momigliano and Siniscalco, 1982), we are able to understand not only the potential technical employment capacity but also actual activations of jobs in the period under study and thus the real structure of needs, both material and immaterial.

By ranking sectors according to their employment multipliers (potential and effective), some of our results can be summarised as follows: (i) a massive and generalised delocalization of scale intensive manufacturing processes, (ii) country-specific patterns of science based manufacturing relocation in terms to backward and forward participation, (iii) a new and currently underestimated role of the caring sector, including health and social assistance, household activities and education, which represents the bulk of domestic employment generation. A companion result entails a new taxonomy of sectors based on their ability to generate jobs, with a novel characterization of service industries mainly distinguished in care works, transport and logistics, support to firms (so-called KIBS) and financial activities.

Eventually, we outline an industrial policy strategy encompassing both so called strategic but also essential jobs as a urgent direction of policy intervention in this pandemic phase. In particular, we propose a novel way to assess which sectors of the economy should be targeted by an industrial strategy in which technological content is just one part of the picture, the other being the ability to generate jobs in the economy. As said, this leads to appreciate the role of essentiality of jobs (for instance in terms of the massive need for care works) besides the more beaten route of strategic knowledge intensive sectors.

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3. Martina Ayoub, Knowledge complementarity and green innovation development: empirical analysis using RD expenditures

Half a decade has passed after the influential Digital Dividends (World Bank, 2016) report, which highlighted increased connectivity as a pathway to sustainable economic growth in developing countries. The COVID-19 pandemic has accelerated these dynamics, creating a context for e-commerce to grow, and become an essential element for millions across the world (UNCTAD, 2021). Thus, public (Bogdan-Martin, 2020), private (Roese, 2021) and mixed (Alliance for Affordable Internet, 2020) global governance bodies are increasingly interested in promoting connectivity. This paper will argue, nevertheless, that a more concerted effort is necessary: A Global Digital Public Goods agenda. This is because digitalisation is not a neutral roll-out of a general-purpose technology, but a process of cross-sector change with noticeable distributional consequences worldwide. Indeed, governments aware of these economic dynamics are already responding unilaterally (Cartwright, 2020). To allow low-income nations to benefit from innovation (Andreoni et al., 2021), and prevent the great power conflict visible in this tendency towards “splinternet” (Ciuriak and Ptashkina, 2018), it is fundamental to promote a multilateral mechanism that guarantees an equitable global cyberspace.

First, the last decade has substantially altered the political economy of the digital sector, with an increased market concentration for tech leaders in the United States and China (UNCTAD, 2019). This concentration arguably corresponds with recent developments in global value chains, by which control over intangible assets would result in a general tendency towards rent capture by a limited number of firms (Durand and Milberg, 2020, Lasinio and Meliciani, 2019), which some have linked to secular stagnation (Schwartz, 2021). In the digital sector, the question of unequal value creation and capture has been recently brought to light, as digital leaders have been able to accumulate mega-profits during the COVID-19 pandemic (Westbrook, 2020).

This is partly because of the way the key firm in the digital transformation, the platform, operates. Current digital platforms aim to create markets that are sticky, aided by their verticalisation, with detrimental effects for competition, innovation, and consumer welfare (US House, 2020). However, more than market power, what is distinctive about these firms is their ability to become the default intermediaries for certain digital transactions and infrastructures (Mazzucato et al., 2020a:5-6). These generate two types of rent, or profits in excess of the contributions of these applications to value creation (Mazzucato et al., 2020b:3). First, network rents emerge from the monopolistic and oligopolistic control over a particular segment of a market (Mazzucato et al.,

2020a:8). Second, algorithmic rents, whereby intermediary platforms with control over a market can design pricing mechanisms (Mazzucato et al., 2020a:9). In both cases, human behaviour and public data are fundamental, but this dual contribution is not recognised in current value allocations (Mazzucato et al., 2020a:10).

While cloud and business service platforms have cheapened access to key technologies for many firms, it is worrying that the oligopolistic nature of these markets could result in additional extraction of rents from firms relying on their services (Mazzucato et al., 2020b:5), and the generalisation of platform-dependent entrepreneurs (Cutolo and Kenney, 2020). For consumers, this can mean a gradual decrease in quality as platforms, empowered by network effects, lose incentives to invest in innovation and functionalities like privacy (Mazzucato et al., 2020b:14). It should be stressed that these platforms also operate in an ecosystem which has been shaped by public investment in infrastructures, both those facilitating Internet access and other enabling tools, such as GPS (Mazzucato et al., 2020a, 2020:3). Today, in a position of entrepreneurial capture, lead firms' business model rests on strategies to prevent knowledge sharing in chains (Baglioni et al., 2020, Rikap and Lundvall, 2020). In short, these platforms have grown exponentially from the personal and business data (Zuboff, 2019, Rikap, 2020) and institutional contexts provided by billions of citizens across the world and their governments; while exclusively operating key infrastructures, such as cloud computing or machine learning, necessary for the tackling of global challenges like the pandemic (Taddeo, 2020).

These corrections to digital optimism have already been noticed by ethnographies and on-the-ground studies which attest to the "thintegration" of developing country firms (Carmody, 2013, Graham, 2014, 2019). That is, their adverse connectivity under competitive pressures from incumbents operating in digital markets. In these circumstances, the advantages of investing in these capabilities become uncertain in developing countries (Halperin and Viecens, 2017). And yet, ending the digital divide by building capacities and spreading literacy remains urgent (Hernandez and Roberts, 2018). There is a solution: to build on the blueprint of previous experiences with Global Public Goods (Kaul,2019), and the starting point provided by existing multilateral initiatives in the digital sphere (Sahay, 2019, Guterres, 2020). As an alternative to this privatised, fragmented and problematic provision of global Internet access, this paper will propose the creation of three types of Global Digital Public Goods: governance platforms; regulatory standards; and data infrastructures. The first one will expand ongoing efforts to increase accountability and representation in existing institutions like ICANN (Becker, 2019, Haugen, 2020), aiming to institutionalise multi-stakeholder discussions on the future of Internet access, and on specific issues such as market concentration in the digital sector. Second, partly through the discussions in these

governance platforms, an agenda of regulatory benchmarks will be developed in pressing issues such as gig economy labour regulations (Bonina et al., 2021), or “thintegration” and knowledge transfer in value chains (Foster, 2017, Friedrici and Graham, 2018). The final Global Digital Public Good will be a global data infrastructure, providing participating countries the framework to build procurement and other tools for public and private use, while adhering to the highest privacy and human rights standards (cf. Andrejevic, 2013 Russpatrick, 2020). Without overextending its boundaries, this Global Digital Public Goods agenda should complement existing efforts to address issues of competition and data ownership across the world. This paper seeks to unify those efforts, with Global Digital Public Goods providing the building blocks for a transformative economic recovery in line with the Sustainable Development Goals.

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4. Milene Tessarin, Jefferson R.B. Galetti and Paulo C. Morceiro, Skill-relatedness and innovation: an approach for developing country and unequal regions

Some studies have identified the relationship between technological proximity and technological change essentially for developed countries and using patent registrations (Balland et al., 2019; Castaldi; Frenken; Los, 2015; Kogler; Rigby; Tucker, 2013; Rigby, 2015). Relatedness elucidates in a simplified way that changes in the structure - be it productive or technological - are related to pre-existing conditions, which can define its future development. Therefore, it allows us to show with empirical evidence that path-dependence matters, both to promote and to hinder development paths (Boschma, 2017; Hidalgo, 2021; Whittle; Kogler, 2019). These studies show assessments for well-developed regions that have a sufficiently large knowledge base and technological inputs. However, they offer very limited analysis possibilities for peripheral regions, with low knowledge density (which makes spillovers and information exchange difficult), lack of diversification of industrial structure, and lack of organizations and actors to sustain the innovation systems.

We have not found studies that address technological relatedness for developing countries. This difference is relevant because it is widely recognized that the innovative process of developing countries is different from that of advanced countries, which demands an approach oriented to their challenges (Mazzucato, 2018). According to the Oslo Manual (OECD, 2005), innovation in developing countries occurs via diffusion, incremental and organizational changes, in addition to being in particular environments with deficient physical infrastructure, institutional fragility, and immature innovation systems. In addition, developing countries have very intense regional inequalities, where few regions concentrate on productive and technological development; in contrast, the rest of the country retains productive activities that promote little local

dynamism. Thus, public policies in these countries must be distinct from those designed for advanced countries (Chang; Andreoni, 2020; Andreoni; Tregenna, 2020).
To contribute to this literature, we propose, first, to assess the effect of relatedness on innovation considering an indicator different from the one traditionally adopted by the literature focused on advanced countries - which use patents. We intend to contribute with an adequate way of capturing the innovation carried out in regions far from the technological frontier. Second, to include developing regions in this lively debate on cognitive proximity, we suggest evaluating the regions of Brazil as a reference for a developing country.

Brazil has a relatively diversified productive structure, being one of the five developing countries that are part of the UNIDO list of 15 leading countries in manufacturing added value. It is a large country in terms of territory (137 mesoregions) and retains significant regional income and population disparities. According to the National Innovation Survey (PINTEC), about a third of the companies are innovative – they mainly carry out process innovations and product improvements and acquire machines and equipment to contribute to the innovative activity. In addition, the presence of marked internal regional inequalities and regional innovation systems allows us to analyze different regional contexts.

Our objective will be to assess whether there is a positive association between innovative-skill relatedness and innovative intensity in different regional contexts. This means that the innovative capacities (measured by innovative-skills relatedness) accumulated in period t are influencing innovative performance in the future period. We want to understand whether unequal regions – for example, in terms of development (or income level), with different innovation systems (from the most structured to the weakest), and with a more or less intensive production structure in technological industries – present marked differences in the role relatedness over innovative intensity. We intend to obtain robust results that shed light on innovation policies in unequal regions in developing countries.

To achieve our goal, we propose to measure innovative activity using an indicator of the intensity of workers who contribute to innovation (instead of patents). We will use a restricted group of professionals as a good proxy for R&D and innovative activities following a study done by researchers from the Brazilian Government Institute of Applied Economic Research (Araújo; Cavalcante; Alves, 2009). We will adopt the share of these workers in relation to total employment by mesoregion.

Additionally, to capture the proximity between professionals who promote innovative activity, we suggest a second metric based on the workers' innovative skills. It captures

a broader group of professionals who – in addition to working in R&D laboratories – also develop incremental innovations in the assembly lines, promote operational adjustments or adaptations in projects, characteristic of regions with immature innovation systems. Following the literature (Acemoglu; Autor, 2010; Autor; Dorn, 2013; Bacolod; Blum; Strange, 2009), we will select skills that refer to requirements that contribute to developing innovative activities in regions with immature innovation systems. After that, we will follow the procedures indicated by Hidalgo et al. (2007) to calculate what we will call innovative skill-relatedness density.

We hypothesize that innovative-skills relatedness density positively correlates with the mesoregion's innovative intensity in the future. However, it is expected that this association will be more significant in mesoregions that have relatively more developed innovation systems and more technological activities.

We understand that this article can contribute in three ways: first, by presenting an acceptable way to measure innovative relatedness in the context of a country far from the technological frontier. Second, when assessing in detail the effect of innovative skills relatedness on the innovative potential of unequal regions (advanced and lagged). Third, for providing conditions for elaborating public policies aimed explicitly at reducing gaps of innovative potential among regions in developing countries.

Knowing the disparities and recognizing that relatedness correlates in different ways with the innovative intensity of the regions is a requirement to develop more focused strategies with a greater chance of success. We believe that this study contributes to a better understanding of local challenges and supports policies aimed at the innovative and technological development of lagging regions. In addition, this study may lead to more research since it is not yet clear how regions can overcome path-dependence and create their trajectories towards better innovative performance with productive and technological diversification.

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