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INTRODUCTION

Power, Knowledge and Technology in a Finite World

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ABSTRACT
This introduction to our special issue on "Intellectual Monopoly and the Reconfiguration of Corporate Power" provides an overview of the contributions and situates them within a broader analysis of the current global capitalist juncture. It focuses on the role of knowledge amid the ecological crisis and how intellectual monopolisation is detrimental not only to the future but also to the present of our societies. The papers in this issue examine the frontiers of intellectual monopolisation and its effects on communities, workers and the ecology. The expansion of knowledge capture and monetisation by a few corporate giants reflects their growing capacity to exert control beyond ownership. Such a transformation of capitalism could not have occurred without the complicit role of core states. The entanglement of political and corporate power is, therefore, another critical dimension explored in both this introduction and the special issue. Taken together, the papers offer an original and comprehensive depiction of the global political economy and underscore, as we argue at the end of this introduction, the urgent need to terminate knowledge enclosures.

KEYWORDS
Intellectual monopolies; big data; genetically modified seeds; green-digital assets; deskilling; control; military technology

JEL CODES
O3; P1; F5

1. Planetary Forecasting Against Present Changes

The science historian Jean-Baptiste Fressoz (2024) puts forward in his latest book the thesis that the narrative of the ecological transition, crafted among others by oil companies' executives and researchers, is in part responsible for postponing the necessary actions for ending the climate crisis. The idea of a transition is presented as a continuation of the history of transitions in which humanity went from wood to coal and from coal to oil. His research documents that, in fact, we never had any of those transitions. For instance, the massive use of coal expanded the use of wood and oil, meaning that addition rather than substitution is the rule.

The narratives of the future that somehow distract us from the necessary changes of the present do not end there. The idea of the future of labour, grounded in countless econometric studies and predictions of what tasks will disappear as new technologies are introduced also distracts from the present of labour, where not only replacement matters but also the increase in informality and control in the workplace. Informality

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was, among others, fuelled by digital technologies. The gig economy and micro workers that clean and tag datasets are two cases in point. Meanwhile, control is conducted by the implementation of digital technologies, usually described under the label algorithmic management, in those and other segments of an increasingly larger number of value chains.

It is precisely at the intersection of the digital and the ecological that another carefully crafted narrative of the future obscures our view of the present: the notion of a twin transition — where digital technologies are seen as enablers of the green transition — has gained significant traction in both public discourse and academic research, giving rise to a form of techno-ecological optimism (Bag et al. 2020; Bibri 2019; Bonaglia et al. 2024; Eropean Commission 2019; Ortega-Gras et al. 2021; Perez and Lema 2023; Pinkse, Demirel, and Marino 2024; Yadav et al. 2020). In the words of Bonaglia et al. (2024, p. 184) combining both transitions 'will enhance resilience and sustainability, and create business opportunities'.

This narrative serves — at least — two purposes. First, it diverts attention from the urgent need to reduce fossil fuel consumption — implying that, ultimately, digital technologies will unlock the transition, and therefore there is less cause for concern in the present. Second, it portrays digital technologies as the remedy to the worst planetary crisis of our time and thus reinforces the discourse of tech producers — a.k.a. Big Tech companies and their allies — as our saviours. The same promise of technological solutionism is extended all around (Morozov 2013). Hunger will be eradicated once the potential of digital technologies — such as precision agriculture and other applications — is fully realized. Likewise, governments will become 'fit for purpose,' mirroring companies in their pursuit of greater efficiency and reduced costs by applying digital technologies across the entire spectrum of public administration.

As if the exaggerated promises about the benefits of technological — in particular digital — transformations were not enough, all the latter can be inscribed within a yet bolder future promise: growth, which — for some with the right distributive policies — is supposed to bring prosperity and progress. But over the years growth went from a means to become the end. And, either way, the imperative of growth has found in technological change its perfect ally at least since the linear model of innovation became dominant. In a process that took place between the 1920s and 1960s and that culminated with Bush's report 'Science the endless frontier' — which, by the way, is another futurologist narrative — the policy recipe for innovation became a set of linear stages that go from basic to applied science and from there to experimental design and finally diffusion, which brings an increase in productivity and thus growth (Godin 2006).

Growth remains the main economic goal all around the world, despite becoming more elusive as core countries have been facing secular stagnation (Gordon 2015; Hein 2016; Kotz and Basu 2019; Summers 2015) and regardless of mounting evidence of its ecological limits (Hickel and Kallis 2020). Some came to emphasize that not all technologies boost productivity, which could be the case of many current digital technologies, including AI (Acemoglu and Johnson 2023), while others disagree (Brynjolfsson, Li, and Raymond 2023).

Why does it matter to move away from all this futurology and focus more on the present? Although strategizing the future could be a path to enhance public deliberation, speculating about the future as if it was alien to human agency contributes to defusing away

the responsibility incumbent of our time and to wrongly naturalize ecological and technological dynamics. Going back to the classics, what is needed is to unravel the web of power relations underlying the development of new technologies, so to identify the structural elements most likely to influence economic, social, and political dynamics.

Focusing on the present, what is sure is that the diffusion of radical innovations, particularly in the digital sector (e.g., AI), is contributing to an unprecedented concentration of techno-economic power. Big Tech is a paradigmatic case, in this respect (Coveri, Cozza, and Guarascio 2022). Their market value is now larger than the GDP of major economies such as Germany or Japan. They control a substantial share of global R&D and patents in domains that are crucial for both the civilian and the military sphere. By controlling vital infrastructures, including social media (e.g., Facebook or X) or the cloud, their capacity to influence State actors to their advantage is far superior to what the multinationals of the past were able to do (Rahman and Thelen 2019). In such a context, the design, diffusion, and impact of new technologies, including their structural and long-term effects, are fundamentally linked to power relations and the ability to control technology itself.

This Special Issue (SI) moves away from futurology and from approaches that conceptualize technology as either an exogenous shock or a neutral phenomenon. Instead, it centers on how knowledge — understood as the foundational driver of technological and socio-economic change — is produced today, for what purposes, and who profits from it. As state capacities weaken, leading corporations increasingly assume the role of economic steersmen, fuelling a downward spiral of social, economic, and ecological hardship, alongside democratic disarticulation. In what follows, we outline these themes by presenting the main arguments advanced by the articles in this SI, which collectively illuminate the dynamics of power concentration and their far-reaching consequences particularly on labour and nature, among other domains.

2. The Political Economy of Science and Technology Amid Intellectual Monopolization

Although, in principle, knowledge could be a non-rival good, more than a century of contributions, starting with Schumpeter, has convincingly argued that this is not the case. Different absorptive capacities engender different degrees and types of knowledge uptake and, while science-based knowledge is usually codified and explicit, tacit knowledge in the workplace cannot be easily diffused and depends on firm-specific routines that are not easily replicable (Cohen and Levinthal 1990; Penrose 2009). Further obstacles to knowledge circulation have been erected in the last decades as a hardened intellectual property rights regime spread from the US to the rest of the world through multilateral and bilateral treaties (Abbott, Correa, and Drahos 2013; Coriat and Orsi 2002; Guo 2016; Sell 2010; Shadlen 2017). Solidifying and expanding the gap between knowledge production and diffusion, contributed to crisis and stagnation tendencies (Pagano 2014; Pagano and Rossi 2009; Schwartz 2016). Yet, intellectual monopoly dynamics arise from a process of knowledge appropriation that goes beyond intellectual property rights, including asymmetric research networks, control over value chain information structure and data centralization (Durand and Milberg 2020; Rikap 2020, 2021).

The contribution of Almendra Cremaschi and Anabel Marin (2025) give an example of these dynamics of knowledge enclosure, showing the resulting economic

polarization and impoverishment through standardization. Focusing on Argentina, they examine the historical transformation of seed systems through the lens of socio-technical regimes identifying two phases: seeds as commons and seeds as commodities, with colonization marking the shift toward commodification. This transition was reinforced by technological advancements, market forces and legal mechanisms leading to corporate dominance and reduced seed diversity. Lock-in mechanisms, driven by multinational corporations and global policies, have limited farmers' autonomy and access to resilient seed varieties.

Erica Borg and Amedeo Policante (2024) also explore this very process of intellectual monopolization in their contribution. Focusing on CRISPR-Cas9, a revolutionary gene-editing tool, they establish how enclosure and monetization were achieved through a complex web of patents, licencing deals and corporate alliances, transforming publicly funded research into private financial assets. They highlight the ongoing legal disputes over CRISPR patents, particularly between the University of California and the Broad Institute, and how these conflicts shape the global biotech industry. The paper also emphasizes how the privatization of CRISPR technologies reinforces global inequalities, with rents flowing predominantly to the Global North.

Both papers explore the privatization and commodification of biological resources — seeds in Cremaschi and Marin's paper and CRISPR technologies in Borg and Policante's work. They highlight how powerful actors, particularly from developed nations, have shaped global systems through intellectual property rights, in particular patents, and corporate control, leading to reduced diversity and increased inequality. Both papers also discuss the socio-technical and institutional lock-in mechanisms that reinforce these systems, making it difficult to transition to more sustainable alternatives.

All the knowledge encapsulated by intellectual monopolies — from seed patents to seeds as described in these contributions but also encompassing control over the structure of value chain information and data centralization — is mobilized for capturing value. What look like market exchanges become, in fact, planning relations that span beyond capital ownership (Bensussan, Durand, and Rikap 2025). Intellectual monopolies use knowledge appropriated from a portion of the economy to subordinate companies and actors that are part of those industries or value chains (Rikap 2024).

This is precisely what Lea Schneidemesser and Florian Butollo (2025) emphasize in their contribution to this SI. To explore the role of data in consolidating power within GVCs, Schneidemesser and Butollo propose an innovative theoretical framework that incorporates data into discussions on power, knowledge and governance in GVCs. Their analysis, based on qualitative case studies of data usage by selected companies, reveals variations in knowledge monopolization, value distribution, upgrading possibilities and governance. These differences are shaped by the type of data utilized — which the authors classify as transaction, product or process data — as well as by the way intangibles are produced. In this context, Schneidemesser and Butollo examine how data is leveraged in the production of intangibles within so-called traditional industries, where intangible assets are deeply intertwined with physical products and processes. Their findings shed light on how these dynamics ultimately shape inter-firm relationships and industry structures.

In this context, the appropriation of value by Big Tech is relentless and continuously looks for new opportunities. As we mention in the introduction, the twin transition

narrative that tech giants themselves contribute to crafting becomes a path to further knowledge and economic power concentration. The contribution of Silvia Weko (2024) to this SI illustrates this point by showing that the shift to renewable energy systems increases the importance of intangible assets like data and artificial intelligence (AI), which can be monopolized by Big Tech firms. Unlike fossil fuels, renewable energy resources are geographically widespread, but their management relies heavily on digital infrastructures controlled by companies like Amazon.

3. The Present of Labour: Displacement, Deskilling, Control and Informality

The increasing relevance of intangible assets, ultimately derived from creative work, combined with the automatization of both cognitive and physical tasks place labour at the forefront. Some authors announce the *Rise of the Robots* (Ford 2015), whereas others question that technological improvement would suffice to overcome, in the near future, the economic hurdle of the mass deployment of labour-saving devices (Benanav 2020). While the lack of widespread productivity gains supports the view of the 'techno-pessimist' side of the debate, such empirics cannot completely close the theoretical argument of the 'techno-optimist' side, which ultimately relies on the complex interaction between costs and institutional structure and heterogenous dynamics across sectors and organizations (Calvino and Virgillito 2018; Staccioli and Virgillito 2021).

A more nuanced and detailed account of the impact of new digital and automation technologies on labour shows heterogeneous paths, depending on the specific tasks that can be eventually replaced. Previous (mainly qualitative) research highlighted that automation as full substitution of work is very complex to achieve even for low-value-added phases (Cirillo, Rinaldini, and Virgillito 2025).

The contribution of Cirillo et al. (2024) in this SI shows that the current wave of automation does not point toward workplaces entirely devoid of human workers, where robots fully replace human activity. Instead, it is aimed toward introducing digital devices intentionally designed to augment human tasks — enabling people to perform more efficiently, in a robotic-like manner.

The rallying cry 'We are not robots' (Sainato 2019) shouted by Amazon workers during a workplace unionization campaign in the U.S., vividly underscores the conflictual process of shaping human-machine interaction. The use of digital technologies for control, including putting more pressure on workers and the expansion of algorithmic management techniques to increase productivity beyond healthy limits is a concern as valid as the potential for job replacement.

The integration of AI and other digital technologies — through organizational practices and routines that govern work processes — should not be seen as a given. It is rather a socio-historical process arising out of the confrontation, at the firm level, of management strategies and workers' resistance within a broader macroeconomic and competitive context.

In a nutshell, technological trajectories are embedded in socioeconomic relations, with the speed of technological adoption shaped by a complex interplay of factors that, in turn, impact work and working conditions. Aligned with this perspective, Cirillo and co-authors' qualitative research show such a trend of standardization and codification of

human activities along with an intensification of interfacing between workers and automated machines. For instance, in one of their case studies concerning the introduction of Kiva, a new generation of AI-powered robots in an Amazon's fulfilment centre in Passo Corese (Italy), they show that workers that serve AI-powered robots have been *deskilled*, as machines have taken over their knowledge, transforming workers into mere executants subjected to invasive 'algorithmic' management.

Therefore, rather than focusing solely on predictions about the future of work, a more productive discussion should centre on the ongoing processes of standardization and segmentation of labour. These are contributing to what has been termed a new phase of 'digital Taylorism' (Dosi and Virgillito 2019) and a new international division of labour (Casilli and Posada 2019). In this context, Cirillo and colleagues found that trade unions are frequently excluded from discussions and decisions regarding workplace technologies. Their work invites to broadening the discussion about the centrality of labour inputs in technologies to unleash their emancipatory potential. In their absence, as they show, current trends of digitalization of the workplace only reinforce dehumanizing tendencies arising from capitalism's drive toward reification (Löwy 2020; Lukàcs 1960).

4. States' Digital Twins

Digitalization has not only transformed capitalism inside the shopfloor. It has also radically transformed the way corporations and markets operate, leading to an unprecedented concentration of economic power (Rikap and Lundvall 2021) that, according to proponents of techno-feudalism, entails some regressive dynamics reminiscent of pre-capitalist relations of production dominated by dependence, predatory rents and the indistinction between the sphere of politics and the economy (Durand 2024).

A vast literature has documented the role of increasing returns, network effects and winner-takes-all mechanisms as key drivers of such concentration (Kenney and Zysman 2016). In this context, the emergence of business models based on the control and manipulation of large amounts of information — i.e., models underlying the operation of digital monopolies, known as 'Big Tech', and cornerstone of what Zuboff (Zuboff 2015) called 'surveillance capitalism' — marked a significant discontinuity, expanding the spaces for commodification (e.g., countless aspects of private life becoming accumulation sources through social media platforms); and making consumers (Jacobides, Cennamo, and Gawer 2024), businesses (Cutolo and Kenney 2021), as well as nation-states increasingly dependent on large digital platforms (Coveri, Cozza, and Guarascio 2022). Rentiership thus became one of the main concerns regarding the rise of digital economic processes (Birch and Cochrane 2022; Durand and Milberg 2020).

As Big Tech strengthen their grip on the global economy, the State-corporation boundaries become ever more 'blurred'. Academic and policy discussions concerning Big Tech's monopolistic power allowed for the exchange of sophisticated competing arguments (Khan 2017; Moore and Tambini 2022; Parker, Petropoulos, and Van Alstyne 2020; Petit and Teece 2021; Sharon and Gellert 2024; Teachout 2020; Wright et al. 2018) that led, in the early twenties, to more assertive inquiries by competition authorities on both sides of the Atlantic. However, with the complete alignment of the

Trump second administration, this move came to a halt before a major reshuffling of the competitive landscape had taken place.

Beyond competition policy, the State is trapped in a relationship of 'mutual dependency' (Coveri, Cozza, and Guarascio 2022) which makes digital monopolies even more powerful and difficult to undermine (Kenney, Bearson, and Zysman 2021). On the one hand, a growing share of public services rely on infrastructure (e.g., data centres, submarine cables, cloud infrastructures), technologies (e.g., AI models) and competences (Gjesvik 2022; Rikap and Lundvall 2022) held by digital platforms. In a way, this pushes forward the (neoliberal) process of privatization and externalization which, since the 1990s, has seen big consultancy firms (e.g., McKinsey) taking over the State in pursuing key public services (Mazzucato and Collington 2023).

Moreover, platforms are key orchestrators of digital innovation ecosystems, mobilizing, coordinating (and often appropriating) the innovative efforts of start-ups, thus playing a pivotal role in keeping the economy at the forefront of digital innovation (Gawer 2022). As a result, these corporations become partners that it is beneficial for the State to flatter, if not directly support, in their expansive strategies, both domestically and internationally.

On the other hand, Big Tech may need government help — the US government concerning the GAFAM (Google, Apple, Facebook, Amazon and Microsoft), the Chinese Communist Party when it comes to platforms such as Alibaba, Tencent or JD — to ensure access to private information, help entering foreign markets, provide public resources for R&D or the management of key infrastructures. Such an intricate (and not free from contradictions) State-Big Tech mutual dependence represents another key driver of concentration, with thorny implications in terms of sovereignty for other countries than the US and China (Bria 2025; Rikap et al. 2024).

In their contribution to this SI, Coveri, Cozza, and Guarascio (2024) document how the State-Big Tech mutual dependency is to a significant extent related to the dual nature of digital technologies and, hence, to the emergence of a new 'digital-military industrial complex' (Guarascio and Pianta 2025). Their analysis vindicates almost forgotten theoretical contributions, like those of Hobson (1902) Hilferding (1910) and Lenin (1917), who were among the first to focus on the *crasis* between oligopolistic cartels and State imperialistic strategies; or Baran and Sweezy, laying the foundations of the *Monopoly Capital* theory (1966).

Three key factors forge the military-digital complex. First, a more than 50-years old 'originary linkage', connecting the advent of Big Tech with government-led military R&D efforts (O'Mara 2020). Second, the critical infrastructures and technologies controlled by digital platforms, the majority of which are essential to prevail on contemporary battlefields. Third, the active role that digital monopolies are playing in current wars, as the Ukrainian and Palestinian cases testify. Relying on several data sources, Coveri and colleagues show that the number of public procurement contracts awarded to Big Tech from the US Department of Defence and other federal security agencies increased substantially in recent years. A large share of such contracts concerns the direct management of critical data-related infrastructures (e.g., the DoD cloud infrastructure). This is an element that can further increase the relative power of Big Tech within the military-digital complex.

The prominence that Big Tech has assumed in the new Trump administration[1] could be considered a confirmation of the theses proposed by Coveri, Cozza, and Guarascio (2024), suggesting that, if anything, the State-Big Tech mutual dependency is becoming even stronger. Considering the European Union (EU)'s economies dependency on US Tech platforms for most essential digital services, it is not clear how the EU's intention to increase military spending (Chassany, Tamma, and Fleming 2025) could not strengthen the US-based military-digital complex.

5. No Time to Wait! Building a Different Future Starts Today

While the discourses of open futures can discourage action or simply postpone it, there is no time to wait once we acknowledge that we are in a finite world unless we significantly transform the roots of environmental appropriation and destruction. Against this backdrop, knowledge should be shared widely and put at the service of the search of collective solutions that should be made widely available rather than enclosed by intellectual monopolists. Beyond the very necessity to democratize technologies for the green transition, what is at stake is the fundamental reshuffling of how knowledge is produced and used in society, from the workplace to global innovation networks.

What type of knowledge is produced equally matters. Instead of seeing knowledge production as a remedy of already spread disease, knowledge should be developed for prevention. Indeed, we are speaking here of healthcare but also of the planetary, social and economic malaise. Knowledge appropriation capabilities have dangerously shifted in favour of the most powerful private corporations in history, with pervasive and all-encompassing consequences such as those explored in this SI. As an example of a counter-movement against these trends, the paper of Marin and Cremaschi presents the Open-Source Seed Movement that advocates for an alternative system that promotes accessibility, sustainability and shared innovation to countervail corporate control and restrictive intellectual property frameworks.

Although this SI does not explore the contours of an alternative digital-ecological order, the contributions gathered stress the urging need for a new kind of industrial policy to overcome the problem of knowledge arising from the loss of mastery of the human-nature metabolism (Durand 2025; Kapp 1970, p. 23) and to steer digital technologies in favour of peoples and the planet (Rikap et al. 2024). This cannot be done by those that put profits ahead of people and the planet. It needs to be done via public forms of control over critical knowledge infrastructures, curation of data according to commons' principles and support to socially and ecologically driven innovation processes.

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[1]A paradigmatic example is that of Elon Musk, CEO of key corporations such as X and Space-X, which is not only officially part of the new administration but who has also joined Donald Trump in his discussions with Ukraine's President Volodymir Zelensky (https://www.nytimes.com/2024/11/08/us/politics/trump-musk-zelensky.html) and Israel's Prime Minister Benjamin Netanyahu (https://www.haaretz.com/israel-news/2025-02-04/ty-article/.premium/netanyahu-confirms-meeting-with-elon-musk-despite-alarm-among-u-s-jewish-groups/00000194-cdca-d8dd-a3b7-edfe6c4a0000).

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