



TECHNO-SOCIAL INNOVATION IN THE COLLABORATIVE ECONOMY

FINAL REPORT

Deliverable 10

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1. Executive Summary

1.1. Project rationale and overall objectives

The project sought to examine the role of open-source technologies and the digital commons in the creation of a collaborative economy. It aimed to highlight the techno-social innovation of commons-based peer production in the introduction of novel technologies, organizational models, products, jobs and services. In doing so, the project investigated Internet-enabled grassroots organisational models such as platform cooperatives, open cooperatives and Distributed Autonomous Organisations (DAOs) on Blockchain. It explored commons-based organizations and cooperatives in Greece and abroad through a multiple case study that aimed to reveal cross-cutting limiting and success factors, the cross-examination of which would help raise public awareness over the commons and potentially contribute to the long-term sustainability of commons-based peer production. The project further engaged in the discussion over the commons, which are poised to bootstrap novel organizational models such as platform and open cooperatives, cosmopolitanism and distributed ledgers.

The project developed, through extensive bibliographical research and workshop activities, a critical theorisation of commons-based peer production, identifying main theoretical approaches and conceptual schemes, key issues, commonalities, differences, convergencies and divergencies in the literature. The project elaborated a conceptual matrix of broaching key research questions, theoretical frames and methodological guidelines.

Based on literature review, the project conducted a multiple case study on platform cooperativism, the commons, the Design Global-Manufacture Local (DG-ML) model and Blockchain technology. It produced four scientific papers on P2P Lab/Tzoumakers (Greece), Open Food Network (Australia), CoopCycle (France) and Circles UBI (Germany). P2P Lab is a research collective that launched the project of Tzoumakers, which is a community that uses open-source software/hardware to manufacture mid-tech small-scale agricultural tools on demand. Open Food Network deploys the digital commons to launch local short food supply chains that cut out the middlemen in food distribution. CoopCycle is a federation of bike delivery coops that deploy the digital commons in

the food delivery sector to combat the current hegemony of the gig economy. Circles UBI deploys the Blockchain technology to issue tokens of Universal Basic Income for all.

The project situated its theoretical insights and empirical findings in international and interdisciplinary research contexts by participating in international conferences and scientific meetings, by developing the website of the project <http://CollabEcon.net>, by organising a workshop for disseminating research findings. Eventually, research built on the normative and empirical conditions of the commons to advance the scientific understanding of commoning, all the while broadening the international network of commoning with the aim to further commons-based peer production.

1.2. Overall deliverables/milestones of the project

Deliverable Number	Deliverable Name	WP	Due Date (in months)	Completed (Yes/Not/Partially)	Document attached (Yes/No/Not applicable)
D1	Methodological Report	1	3	Yes	Yes
D2	Training Seminar	1	8	Yes	Yes
D3	The Digital Commons, Cosmolocalism and Open Cooperativism: the cases of P2P Lab and Tzoumakers. <i>Organization</i> 0 (0) https://doi.org/10.1177/13505084231156268	3	12	Yes	Yes

D4	Prefiguring the counter-hegemony of open cooperativism: The case of Open Food Network, Journal of Rural Studies 101(1):103067, DOI:10.1016/j.jrurstud.2023.103067	3	18	Yes	Yes
D5	The Transformative Potential of Platform Cooperativism: The Case of CoopCycle, tripleC Communication Capitalism & Critique Open Access Journal for a Global Sustainable Information Society 22(1):1-24, DOI:10.31269/triplec.v22i1.1418	R	24	Yes	Yes
D6	The website	4	3	Yes	Yes
D7	One (1) International Workshop	4	28	Yes	Yes
D8	One (1) volume of the Workshop proceedings	4	29	Yes	Yes
D9	One extended report based on the case studies	4	32	Yes	Yes
D10	Final report	5	32	Yes	Yes
D11	Universal Basic Income on Blockchain: the case of Circles UBI, Front. Blockchain 7:1362939. doi: 10.3389/fbloc.2024.1362939	3	30	Yes	Yes

Mile-stone Number	Milestone Name	WP	Due Date (in months)	Completed (Yes/Not/Partially)	Document attached (Yes/No/Not applicable)
M1	Methodological Report	W1	3	Yes	Yes
M2	Primary Data Gathering	W2	9	Yes	N/A
M3	Published Papers	W3	30	Yes	Yes
M4	Workshop	W4	28	Yes	Yes
M5	Extended Report	W4	32	Yes	Yes
M6	Final Report	W5	32	Yes	Yes

1.3. Summary of project outcomes

The project engaged in an extensive literature review on platform cooperatives, the digital commons, open cooperatives and Distributed Autonomous Organisations (DAOs) on Blockchain. It explored key research concepts such as “technological change”, “innovation”, “cooperativism”, “the digital commons”, “post-capitalism” and “hegemony” (see section 2 on Literature Review). As such, it adopted a multi-disciplinary approach that combined scientific fields as diverse as political theory, political economy, technology studies and sustainability science. In short, the project delved deep into the techno-politics and economics of the collaborative economy.

From a normative angle, the project built on the thin theoretical and empirical foundations of the model of open cooperativism to provide a more cogent and elaborate conceptualisation of the model of open cooperativism. The model of open cooperativism lacks both political and analytical depth. To address this issue, the project engaged in theory building. It employed Ernesto Laclau and Chantal Mouffe’s discourse theory of hegemony to give a political edge to the model of open cooperativism. Laclau and Mouffe’s discourse

theory of hegemony helps give a counter-hegemonic spin to the model of open cooperativism inasmuch as it aspires to transform capitalism into the post-capitalism of a commons-based ethical and sustainable economy. The project further offered a detailed analysis of the key components of the model of open cooperativism: (1) civil society; (2) ethical market entities; and (3) a partner state. The analysis serves to render the model of open cooperativism more comprehensible to the academia and the general public as well as to facilitate future applications in politics and the economy.

From an empirical angle, the project tested its theoretical assumptions on concrete case studies to explore success and limiting factors of Internet-enabled grassroots organisational models such as platform cooperatives (CoopCycle), open cooperatives (Tzoumakers, Open Food Network) and Blockchain-based initiatives (Circles UBI) (see section 3 on Case Studies). The project documented the research findings into nine publications (four deliverables, three additional papers and two books).

1. Papadimitropoulos V. 2022. The Digital Commons, Cosmolocalism and Open Cooperativism: the cases of P2P Lab and Tzoumakers. *Organization* 0 (0) <https://doi.org/10.1177/13505084231156268> **(D3)**
2. Papadimitropoulos V. and Malamidis H. 2023. Prefiguring the counter-hegemony of open cooperativism: The case of Open Food Network, *Journal of Rural Studies* 101(1):103067, DOI:10.1016/j.jrurstud.2023.103067 **(D4)**
3. Papadimitropoulos V. and Malamidis H. 2023. The Transformative Potential of Platform Cooperativism: The Case of CoopCycle, *tripleC Communication Capitalism & Critique Open Access Journal for a Global Sustainable Information Society* 22(1):1-24, DOI:10.31269/triplec.v22i1.1418 **(D5)**
4. Papadimitropoulos V. and Perperidis G. 2024. Universal Basic Income on Blockchain: the case of Circles UBI, *Front. Blockchain* 7:1362939.doi: 10.3389/fbloc.2024.1362939 **(D11)**
5. Papadimitropoulos V. and Perperidis G. The Transformative Potential of the Digital Commons: Glimpses from the Field. Special Issue on Digital Commons, Social Order and Education (Forthcoming).
6. Papadimitropoulos V. and Perperidis G. On the Foundations of Open Cooperativism. Routledge Hanbook on Cooperative Economics (Forthcoming).
7. Papadimitropoulos V. Transformative Tech for the Cooperative Economy. A Multi-Case Study. Special Issue on Solidarity Tech, *Journal of Cooperative Management* (Forthcoming).

8. Papadimitropoulos V. 2022. Blockchain and the Commons. Routledge Editions.
9. Παπαδημητρόπουλος Βαγγέλης. Το Blockchain στην Κοινωνία και στην Οικονομία. Δυνατότητες και Προκλήσεις. Εκδόσεις Oasis (Επερχόμενο).

Finally, the project disseminated the research results into 16 conferences and workshops in seven countries (Greece, Austria, Germany, France, Italy, Czech Republic, The Netherlands, see section 1.6).

1.4. Key takeaways and research highlights

- The project elaborated on an extensive literature review to construct the theoretical framework for empirical research. It went on to provide a conceptual refinement of the model of open cooperativism, which still rests on thin theoretical and empirical foundations. In particular, the project read the model of open cooperativism through the lens of Ernesto Laclau and Chantal Mouffe's discourse theory of hegemony to accentuate its political edge. The project further tested its theoretical assumptions in empirical settings through a multi-case study approach.
- The project reviewed P2P Lab/Tzoumakers (Greece), CoopCycle (France), Open Food Network (Australia) and Circles UBI (Germany) as illustrative case studies of Internet-enabled grassroots organisational models such as the digital commons, platform cooperatives, open cooperatives and Distributed Autonomous Organisations (DAOs) on Blockchain. P2P Lab engages in open science and commons-based peer production. P2P Lab is the incubator of Tzoumakers, which is a community of farmers that combines the digital commons with computer numerical machines to produce small-scale agricultural tools on demand. CoopCycle deploys the digital commons to launch bike delivery coops. Open Food Network deploys the digital commons to launch Short Food Supply Chains and cut out the middlemen in food distribution. Circles UBI deploys the digital commons of Blockchain to issue tokens of Universal Basic Income for all.
- The project documented the role of the copyfair license, as deployed by CoopCycle, to protect the digital commons from capitalist cooptation. Empirical research also brought to the fore the alignment of municipalities and ethical market entities with

commons-based peer production in the cases under examination, thereby confirming the three-zoned model of open cooperativism.

- In general, the case studies exhibit a weak counter-hegemony of open cooperativism vis-à-vis the capitalist incumbents in the relevant sectors of economic activity. Following Laclau and Mouffe's discourse theory of hegemony, the project stressed the need for further articulating a chain of equivalence between commons-based peer production, ethical market entities and a partner state in a mission to strengthen the counter-hegemony of the model of open cooperativism vis-à-vis the current hegemony of neoliberalism.
- Eventually, the project highlighted the innovation of open-source technologies and the digital commons in the introduction of novel politics, technologies and economics, including business models, modes of production, social relations, products, jobs and services.

1.5. Significant achievements

The project's achievements can be summarised in the nine publications and the 16 conference presentations of the research object, goals and findings over the 32 months of the project duration. During this period the PI was invited in three conferences (Germany Austria and Italy) and one workshop (Czech Republic) (see section 1.6) to speak about the commons and alternative organisational models.

During that period, the PI won two fellowships from the Institute for the Cooperative Digital Economy at The New School in New York City and from the Research Center for the Humanities in Athens, Greece. The goal of the fellowships is to help the PI further progress his research on platform cooperatives and the commons. In the context of the first fellowship, the PI will conduct a report on his work on platform cooperatives, while, in the context of the second fellowship, he will receive funding and assistance to form a broader research team and submit a research proposal to an Horizon call.

Lastly, the research project helped the PI gain a temporary position as an Adjunct Lecturer at the University of Patras, Department of Philosophy, where he taught Contemporary Political Philosophy in the spring semester of 2024.

1.6. Dissemination activities

Nature of communication	Title	Responsible Participant	Date	Target audience
1st Conference of Ph.D. and Post Doc researchers at Ioannina, Greece	Techno-Social Innovation in the Collaborative Economy	Vangelis Papadimitropoulos	May 2022	Scientific community
Crypto Commons Conference, Austria	A Post-Structural Analysis of the Collaborative Economy	Vangelis Papadimitropoulos	September 2022	Scientific community
5th INDL Conference: Features and Futures of Digital Labor, National and Kapodistri-an University of Athens, Greece	Techno-Social Innovation in the Collaborative Economy	Vangelis Papadimitropoulos	November 2022	Scientific community
Workshop on Strategic Framework Czech Republic 2030 (online)	The Commons and the Collaborative Economy	Vangelis Papadimitropoulos	November 2022	Scientific community, policy makers
Conference for the 22 Years of Geographies Journal, Harokopio University Athens, Greece	Techno-Social Innovation in the Collaborative Economy	Vangelis Papadimitropoulos	November 2022	Scientific community

Closing Open Conference, Berlin, Germany	Techno-Social Innovation in the Collaborative Economy	Vangelis Papadimitropoulos	February 2023	Scientific community
21st Annual STS Conference Graz, Austria	Prefiguring the Counter-Hegemony of Open Cooperativism: the case of Open Food Network	Vangelis Papadimitropoulos	May 2023	Scientific community
UOWM Greece (online)	Prefiguring the Counter-Hegemony of Open Cooperativism: the case of Open Food Network	Vangelis Papadimitropoulos	May 2023	Scientific community
Workshop and Conference in Florence, Italy Blockchain Constitutionalism: the Role of Legitimacy in Polycentric Systems	Exit to Community, The Model of Open Cooperativism	Vangelis Papadimitropoulos	June 2023	Scientific community
SCORAI-ER-SCP-WUR Conference: "Transforming Consumption-Production Systems Toward Just and Sustainable Futures", Wageningen, The Netherlands (online)	Prefiguring the Counter-Hegemony of Open Cooperativism: the case of Open Food Network	Vangelis Papadimitropoulos	July 2023	Scientific community

Politics of Technologies in the Digital Age: Philosophical and Interdisciplinary Perspectives, University of Ioannina, Greece	Techno-Social Innovation in the Collaborative Economy: the Model of Open Cooperativism	Vangelis Papadimitropoulos	October 2023	Scientific community
Politics of Technologies in the Digital Age: Philosophical and Interdisciplinary Perspectives, University of Ioannina, Greece	The Digital Commons	Giannis Perperidis	October 2023	Scientific community
Utopia(s) re-loaded: science, activism and the techno-eco-social transformation. Vienna, Austria	Philosophy, Politics and Economics: the Model of Open Cooperativism	Vangelis Papadimitropoulos	October 2023	Scientific community
20 International Interdisciplinary Conference for the Commons and Social and Solidarity Economy, 24-25 November 2023, Agricultural University of Athens	Techno-Social Innovation in the Collaborative Economy: Research Findings	Vangelis Papadimitropoulos	November 2023	Scientific community

Resistance and alternatives to platform capitalism, 12-13 February, Université Paris 8	The transformative potential of platform cooperativism: the case of Coopcycle	Vangelis Papadimitropoulos	February 2024	Scientific community
Workshop for the dissemination of research findings, Pantheon University, Athens, Greece	Final presentation on the project "Techno-Social Innovation in the Collaborative Economy"	Vangelis Papadimitropoulos	May 2024	Scientific community, the general public

1.7. Lessons learned and further opportunities for research

The research project helped the PI enrich his research skills by conducting both qualitative and quantitative research, including project management, the planning of the methodology and the case studies, literature review, fieldwork, interviews, data collection, data analysis, the writing up of scientific papers and dissemination of research findings in workshops and conferences.

The research project offered an outstanding opportunity for the post-doctoral researcher to:

- progress his 10-year post-doc research on Internet-enabled organisational models such as the digital commons, peer production, cosmopolitanism, platform cooperatives, open cooperatives and DAOs on Blockchain;
- crystallize his research into additional academic outcomes such as articles in peer-reviewed journals, conference presentations, international collaborations;
- develop new skills and techniques such as data management (data collection and analysis), project management, task coordination, budget allocation, research planning, exploitation and dissemination of research results;

- build his research profile, obtain novel competencies, strengthen his publications record and broaden his professional network by collaborating with researchers and institutions across the globe;
- secure additional research funding to continue his research on the digital commons;
- pursue an academic career or diversify into other fields or employment sectors in the collaborative economy as an advisor or chief thinker.

The research project has revealed novel avenues for future research such as further expanding on the political theorisation of the model of open cooperativism in a mission to come up with concrete policy proposals that would help launch sustainable commons-based business model in the cooperative economy. Eventually, the goal is to contribute to the transition towards a commons-based post-capitalist ethical and sustainable economy.

2. Literature Review

2.1. Mainstream vs non-mainstream approaches of technological change, economic growth and innovation

The relation of technological change to economic growth and innovation has long been examined in the literature and often described in inter-disciplinary terms criss-crossing economics, politics, philosophy and Science and Technology Studies, among others (Acemoglu 2009; Brynjolffson and McAfee 2014; Dosi et al. 1988; Rosenberg 1982; Barma and Vogel, 2008; Ziman, 1984). Beginning with classical economics and Karl Marx (1857/1858; 1867; 1981), technological change, as applied in the forces and relations of production, has been the driver of economic growth and innovation ever since capitalism launched as an economic model replacing feudalism in Europe. Machine automation has been the crucial component of industrial revolution, often heralded by techno-deterministic interpretations as the precursor of post-capitalist communism where machines will have eventually succumbed to the rational mastery of humans who could now enjoy their freedom from the capitalist strains of exploitation, alienation, toil and drudgery (Benanav 2020; Bimber 1990; Rosenberg 1974).

In neoclassical (exogenous) and contemporary (endogenous and evolutionary-institutional) economics, technological change is also considered a key driver of economic growth and innovation (Sredojević et al. 2016). Whereas in early neoclassical growth theory (Solow 1956) technology is an exogenous variable that lies outside the production sphere and is driven solely by state-funded research at universities, in more recent economic thinking (Arrow 1962a; Romer 1990; Grossman and Helpman 1991; Leydesdorff and Etzkowitz 1998) technology is an endogenous variable of production closely linked to investment in knowledge, human capital, research and development (R&D) as well as to organisational structures, education and national policies, all variously co-determining economic growth and innovation (Sredojević et al. 2016).

The linear, deterministic and causal model of innovation ruled by the law of diminishing returns on the basis of which economic agents reach a unique equilibrium that balances out economic growth has been challenged in the last decades. Proponents of a knowledge-driven economy advocate for positive externalities from knowledge diffusion, first-mover advantages, path dependencies, increasing returns and spillover effects of R&D and technological innovation circulating across the economy along with state selection dynamics, systems failures and creative destruction initiated by technological competition (Sredojević et al. 2016). Neoclassical economics has been criticised as simplistic and ideological by mainstream and heterodox accounts as diverse as Marxism, post-Marxism, evolutionary economics, behavioural economics, game theory and institutional economics (Biggiero 2022; Shaikh 2016).

When it comes particularly to the concept of innovation, Joseph Schumpeter (1934; 1939), influenced by Marx's crisis theory and Kondratiev's economic cycles, conceived of the economy as a dynamic system operating on conditions of uncertainty and disequilibrium tendencies driven by technological competition resulting in innovative products, services and organisational models, including the state-market institutional nexus. Innovation according to Schumpeter thus refers to the introduction of new products, services, modes of production and organisational models driven by technological competition under the initial conditions of creative destruction that generates "winners" and "losers" in the market.

Neo-Schumpeterians such as Carlota Perez (2002) and Marianna Mazzucato (2018) both advocate versions of post-Keynesian and neo-institutional economics to debunk the neoclassical myth of the market as a self-regulating system. The market is inherently fraught with failures, irrationalities and crises. They advance, instead, the concept of an *entrepreneurial state* with the ability to drive (or catalyze) a green industrial revolution. Compared to neoclassical economics that considers governments as substitutes that

“crowd out” private investment by using up savings, an entrepreneurial state turns from a “market fixer” reduced in regulating competition and correcting market failures into a “market shaper” and creator taking on high-risk investments to fund mission-oriented critical sectors in the economy and boost demand, employment and innovation (Mazzucato 2021). Economic growth is not to be assessed in terms of static allocative efficiency but rather in light of structural change propelling feedback loops of innovation between markets and technology, applications and science, institutions and regulation.

Neo-institutionalists inspired by Elinor Ostrom (1990) take a step further to bring to the fore the commons, and more recently the digital commons, as a critical factor of grass-roots techno-social innovation. Commons-based peer production (Benkler 2006) on the Internet and Blockchain (De Fillipi and Wright 2018; De Fillipi and Hassan 2018) adds to the stock of natural common-pool resources, which are self-managed by communities to make up a mixed polycentric economy establishing public-private-commons partnerships to cater for the maintenance and provision of the commons, ranging from forests, meadows, fisheries and irrigation fields to housing, culture, airwaves, scientific knowledge, information and software.

In neoclassical economics, capitalism (Braudel 1979) is considered the most optimal model for the allocation of scarce resources. A finite good is scarce and can be rivalrous if there are more users than available goods. The use of a scarce good by one person subtracts from the total available, thereby excluding others. There are three types of goods: private, public and commons (Table 1). Private goods are marked by high rivalry and exclusion, conditioned on private contract law, money and the law of supply and demand. To consume a book, one needs to own money to buy it in the market. Public goods, on the other hand, exhibit low rivalry and exclusion. All citizens can access public education, parks and highways.

Common goods often blur with public goods. Whereas public goods are managed by state governance, the commons are shared or distributed resources/infrastructures (natural resources, technology, knowledge, capital, culture) self-managed by user communities in accordance with collectively established rules and norms (Bollier and Helfrich 2015). Some common goods can be excludable and rivalrous, while others can be non-excludable and non-rivalrous (Benkler 2006; Kostakis and Bauwens 2014; Ostrom 1990). Grazing lands, fisheries and water can be rivalrous and excludable. Yet, nobody can be excluded from climbing a mountain, swimming in the sea, or breathing the air. Information, language and knowledge – when not ‘enclosed’ by intellectual property rights – are both

non-rivalrous and anti-rivalrous. While the production of a book or software may bear high fixed costs, the cost of reproducing an additional unit of an e-book or software is near zero and their use by more people increases its value exponentially (Metcalfe 1995). The anti-rivalry effects of information, knowledge and culture translate into “network effects” most prevalent on the Internet and digital platforms, but which have also been manifested elsewhere, such as with the spread of fax machines and telephones.

As such, the commons consist of three constitutive components: (1) a common property resource; (2) a community; and (3) a “commoning” activity (De Angelis 2017: 119). By commoning we refer here to the collective management of a commons. A commons can be, for example, a limited-access pasture or open-access software that can both be collectively managed by their users. Democracy, egalitarianism, consensus, openness, bottom-up social innovation, sustainability and value distribution, are all core principles of the commons. Research so far (Ostrom 1990) has demonstrated a vast diversity of public-private-commons partnerships and institutional arrangements spanning the globe with regard to the governance of common-pool resources.

	Rivalry		
		high	low
Exclusion	high	private goods	club goods
	low	common goods	public/common goods

Table 1. Types of goods

The digital commons, more specifically, refer to online information, culture and knowledge, which are propertyless and, thus, free and open to everyone within the community to access, use, modify and copy (Benkler 2006; Birkinbine 2020: 22). The digital commons are co-produced by the community in terms of commoning that reproduces in-

formation, culture and knowledge. Commoning in the case of the digital commons comes with a number of Internet affordances such as networked computing, lower costs, open sourcing and decentralization coupled with transparency, accountability, merit-based economies and inclusivity. The digital commons differ from the ecological commons of Ostrom (1990) in that they expand in space and time: they are global and thus not confined in a specific location; the Internet works 24/7 and its basic code is open-sourced (end-to-end principle, see Lessig 2001, 2004). The digital commons avoid the free-rider problem most prominent in the physical space, since information is by essence non-rivalrous and, beyond this, anti-rivalrous. One of the core attributes of information is that it “always wished to be free” (Wagner, 2003). An agent who transmits information can keep and consume the same information, granting a very low opportunity cost compared to the utility transferred to the receiver. Therefore, given the limits of saturation effects, a great number of agents can consume the same information simultaneously. One thus cannot easily create a market to sell information due to its near zero cost of reproduction (Arrow 1962b). Hence the creation of copyright and intellectual property rights turning the inherent abundance of information into artificial scarcity to be sold or rented in the market as a product or service.

On the flipside, open-sourcing was introduced with the creation of the GNU General Public License (“copyleft”) to combat various negative aspects of copyright. Copyleft allows the access, modification and distribution of software code on conditions that it remains under the same license (Raymond, 1999; Stallman, 2002; Weber, 2004). “Open-sourcing” has enabled the peer production of information, culture and knowledge, which co-emerges with network effects generated in digital platforms on the Internet (Bauwens et al., 2019; Benkler 2006). Yochai Benkler (2006) coined the term ‘commons-based peer production’ to describe a non-market sector of information, knowledge and cultural production, not treated as private property, but as an ethic of sharing, self-management and cooperation between peers who have free access to online platforms running on open-source software. Commons-based peer production simulates the physical (Ostrom 1990) into the digital space to bring about a particular institutional form of structuring the right to access, use and control resources, which differs significantly from managerial hierarchies and markets (Table 2). The distinctive features of the digital commons are: (1) decentralised self-governance through the utilisation of participatory, meritocratic (do-ocracy) and charismatic rather than proprietary or contractual models; (2) the centrality of non-monetary motivations; and (3) the permeation of state and firm boundaries (Benkler 2006). Commons-based peer production introduces new and radical forms of ownership, gover-

nance, operation and financialisation in a mission to empower communities against the pervasive economic inequalities and power asymmetries of neoliberalism.

The digital commons present an alternative to traditional models of intellectual property by promoting open access, collaborative innovation, and knowledge sharing. In doing so, they alleviate barriers to information, encourage community ownership, and contribute to knowledge democratization, fostering more inclusive, sustainable digital ecosystems. Commons-based peer production spins around the phygital - the symbiosis of the physical and the digital space - and the cosmological - the symbiosis of global/digital knowledge with local applications - to launch Internet-enabled grassroots organizational models such as platform cooperatives, open cooperatives and Distributed Autonomous Organizations (DAOs) on Blockchain.

Commons-based peer production retrofits material production to install a new mode of production in the model of *cosmologicalism*, which combines open-source software with hardware, 3D printers and computer numerical machines deployed in “fablabs” and makerspaces. What is “light” and easily transmissible (software, knowledge, design) is shared online globally and what is “heavy” (hardware) stays local. Hence, the digital commons connect to material production through hardware to democratise the means of production and sustain more ecological, equitable and fairer socio-economic models.

Neoclassical economics	Commons Economics
self-interest, individualism, utility maximization for firms and households	diversity of agents and motivations (altruism, hedonism, creativity)
perfect knowledge, privacy	open knowledge, sharing, holoptism (transparency)
perfect competition (zero-sum game)	cooperation (win-win game)
private property	bundle of rights (access, withdrawal, management, exclusion, alienation)
optimal allocation of resources on conditions of scarcity	scarcity (natural resources, hardware) combines with the abundance of the commons (knowledge, design, software)
supply and demand equilibrium based on price signals	open supply chains, circular economy, the gift economy
exchange value, commodities	use value, social needs
green growth, eco-efficiency	de-growth/post-growth, eco-sufficiency

Table 2. Neoclassical vs Commons Economics

Commons-based peer production plugs into the model of cosmocalism to introduce a simple yet radical idea: great improvements in production and management could be achieved by sharing resources, knowledge and power “glocally”. Meanwhile, strict intellectual property rights lead to underutilisation of information and an inefficient use of knowledge. Exclusive private property rights may, instead, combine with a bundle of common property rights such as access, withdrawal and co-management (Shlager and Ostrom 1992). Sharing, openness, transparency and self-management arguably result in a constantly improving collective repository of knowledge, best ideas, practices and resources from which a diverse set of agents can draw and contribute back according to their needs and capacities (Bauwens et al. 2019; Benkler 2006; Bollier and Helfrich 2015; Ostrom 1990). Market exchange value (scarcity) adds up on top of the use value of the commons (abundance) to satisfy social needs. Eventually, cosmocalism diffuses knowledge spillovers from anti-rivalrous effects, decreases costs, reduces waste and fosters resilience, resulting in higher levels of work quality, social innovation, inclusion and environmental sustainability. Thus, cosmocalism advances cooperation, openness, circular economies and post/degrowth (Kallis et al. 2018), as opposed to competition, privacy, planned obsolescence and green growth respectively.

However, immaterial and, in particular, material commons (hardware) incur considerable costs coupled with “market imperfections” most prominent in cases of public goods dilemmas. Commons-based peer production (Benkler 2006) is poised to address “market imperfections” but still suffers from corporate cooptation (Birkinbine 2020) and the lack of sustainable business models and protective mechanisms to safeguard the commons and provide livelihoods for user communities producing the commons.

2.2. Open-source hardware innovation

Mainstream economic theory holds that intellectual property rights provide an incentive for producer innovators to invest in R&D and protect their rents. However, economists have long emphasized the drawbacks of patents to information production, given the public goods nature of information (Arrow, 1962a). Strong intellectual property rights increase the costs of knowledge protection compared to the benefits of appropriating the value of their own contributions (Baldwin, 2008; Benkler, 2006; 38–39). Strong intellectual property rights lead to commercialization, concentration, and homogenization of information produc-

tion rights, thus creating a monopolistic renting economy that underutilizes information and stifles innovation (Benkler, 2002; Boyle, 1996; Farrell and Shapiro, 2004; Orsi and Coriat, 2006; Samuelson, 1990).

Ostrom's (1990) work on long-enduring limited-access commons, followed by the rise of the open-source software (Benkler, 2006; Raymond, 1999; Stallman, 2002; Weber, 2004) and hardware movement (Bonvoisin et al., 2016; Fjeldsted et al., 2012; Gershenfeld, 2005; Kostakis et al., 2013; Troxler and Wolf, 2016; von Hippel, 2005) have shown that openness has, under certain conditions, a number of advantages vis-à-vis closed business models, including innovation spillovers from anti-rival network effects, low-cost efficiency, improved work quality and environmental sustainability. Innovation is thus considered open when all or some information and/or resources related to the innovation are a commons (self-governed by communities) and/or a public good (governed by the state).

The expiration of the 3D printing patent in 2008 coupled with the development of computer numerical machines, microprocessors and sensors have expanded the scope of open-source software into hardware. Additive manufacturing technologies programed with open code interconnect the production of intangible goods such as design, information, and knowledge with tangible goods such as agricultural tools, windmills and prosthetics. Following the copyleft logic of open-source software (Stallman, 2002), open-source hardware production is built on the legal premise that designs, assembly instructions and bills of material are made publicly available for anyone to study, replicate, modify and sell, including the hardware created (Thomas, 2019: 35–36). The term “hardware” applies to any type of tangible artifact, including electronic, mechanical, or textile. Thus, open-source hardware can democratize the means of production. Eventually, commoning and open sourcing become mechanisms to scale the impact of eco-techno-social innovation. However, while the marginal cost of producing one unit in software nears zero, hardware incurs multiple costs (materials, machines, personnel, overhead, physical space, energy). Also, open-source hardware production may include long and often intertwined supply chains and sophisticated product certification (Thomas, 2019: 105). Therefore, open-source hardware production is more costly and complex compared to opensource software production.

The literature (Fuster et al., 2017; Thomas, 2019; Troxler and Wolf, 2016) has documented thus far a diversity of open-source hardware business models featuring a wide spectrum of value propositions, revenue streams, stakeholder interaction, incentives, and licenses. Value propositions vary from online brokerage and sales platforms to direct sale of objects via web shops, 3D printer retail, customized prototyping for industry or private

clients, the distributed enterprise model, research, and education activities. Revenue streams may include dual licensing (freemium- premium), charging for services (training, technical assistance, expertise), charging for licensing if the hardware is used for commercial purposes, selling the physical product and/or an accessory, donations, workshops, crowdfunding, memberships, subscriptions and third-party funding (state funding, grants, firms, organizations, foundations). Stakeholders interacting with fablabs/makerspaces may include universities, institutions, students, firms, experts, freelancers, and businesses. Incentives may vary considerably, from generating income or building human capital to the joy of participating in a common cause, altruism, peer-to-peer learning, sharing, socializing, and so on. The most common licenses used in open-source hardware production are the following: Creative Commons, GNU GPL, MIT, CERN Open Hardware License. However, no proper license has been created thus far to cover the distinction between patent law (hardware, industrial applications) and copyright (text, images, software, design, knowledge, information, art) (Thomas, 2019: 231). This bears certain ramifications with regards to the expansion of opensource hardware into the overall economy.

In short, Thomas (2019) has identified a three-tiered unit of analysis of open-source hardware production:

1. The community level that corresponds to communities gathering around fablabs to codesign and manufacture products from the bottom-up (e.g. Farm Hack, L' Atelier Paysan).
2. The inter-organizational level that corresponds to firms collaborating with communities (e.g. Renault, Volkswagen Local Motors, Kreatize).
3. The ecosystem level that corresponds to all stakeholder interactions including the state, municipalities, universities, organizations, start-ups (e.g. The Barcelona ecosystem). The Maker Movement has shifted from a DIY-bricolage phenomenon to a global ecosystem of over 1200 Fab Labs in more than a 100 countries.

Despite highlighting the role of commons-based peer production in open-source innovation, the literature often turns a blind eye to a private-collective model of innovation that subordinates the commons to the logic of the capitalist market regulated by the state. Thus, the literature often misreads the democratization of open-source innovation by disregarding drawbacks such as power and information asymmetries between communities and firms (Kioupkliolis, 2018), “green washing” (Bauwens et al., 2019) and the co-optation

of open-source software by platform capitalist firms such as Facebook and Google for the purposes of profit maximization (Birkinbine, 2020).

2.3. The merge: platform cooperativism, cosmologicalism and open cooperativism

The last decades are witnessing the rise of a digital economy, comprising various Internet-enabled organisational models such as platform capitalism, platform cooperativism, peer production and the digital commons. Internet affordances such as networked computing, decentralisation, open sourcing and cost reduction enable peer production and network effects on digital platforms at a global scale. Whereas platform capitalism builds on network effects on digital platforms to launch multi-sided markets, facilitate trade and capitalise on market exchange on the Internet, platform cooperativism combines the principles of traditional cooperatives with algorithmic design on the Internet to launch worker-owned cooperatives that operate on quite the opposite logic of platform capitalism (Scholz 2016; Scholz and Schneider 2016; Spier 2022; Zhu and Marjanovic 2021). Platform cooperatives apply collective ownership over the means of production and are run democratically on the basis of the “one member, one vote” principle. Platform cooperatives pursue social, ethical and ecological goals rather than strictly commercial ones. Their core principles extend to value distribution as opposed to profit maximization.

Trebor Scholz (2016) has coined the term “platform cooperativism” to describe an Internet-enabled model of production where digital platforms are communally shared and run by their members. A common definition of a platform cooperative is the following one:

“A platform cooperative, or platform co-op, is a cooperatively owned, democratically governed business that establishes a computing platform, and uses a website, mobile app or a protocol to facilitate the sale of goods and services” (Calzada 2020, 8).

Scholz et al. (2021, 15) define a platform cooperative as “worker co-ops, data co-ops, multi-stakeholder co-ops, and producer co-ops for whom their digital business is central to their operation”. Another plausible definition of a platform cooperative would describe “an enterprise that operates primarily through digital platforms for interaction or the

exchange of goods and/or services and is structured in line with the International Cooperative Alliance Statement on the Cooperative Identity” (Mayo 2019, 20).

The idea is to use the algorithmic design of profit-driven platforms such as Uber and Airbnb in the service of a cooperative business model based on community ownership, democratic governance, sustainability and fair distribution of value (Scholz 2016a; 2016b). Instead of workers earning meagre wages from precarious labour that makes investors rich, they would be able to design, manage and own the means of production themselves. Platform cooperativism works on the model of a multi-stakeholder synergy of consumers, investors, producers and users. It aims to reunite existing cooperatives and labour unions under digital self-governance.

Platform cooperatives have not escaped criticism. Not only do these Internet-enabled organisational models have to address the shortcomings of traditional cooperatives (De Lautour and Cortese 2016; Malta et al. 2020; Mohamad et al. 2013; Puri and Walsh 2018; Restakis 2010; Simon 2019), they also encounter the overall tendency of platform capitalism towards monopoly formation (Srnicek 2017). Platform cooperativism exhibits contradictions between politics and enterprise, democracy and the market, commons and commercialisation, as well as activism and entrepreneurship (Sandoval 2020).

“Platform cooperativism is proposing a bottom-up strategy of transforming platform capitalism. It seems promising as it offers an avenue for positive critique – a strategy of actively creating alternative realities instead of merely criticising existing ones. Such a bottom-up strategy is particularly appealing in times when many have lost confidence in neoliberal governments to regulate corporate power and support projects for social change. Many examples show that platform co-operatives can have positive impacts on their members and communities. However, thus far they have been unable to create large-scale structural change” (Sandoval 2020, 809).

Tensions and contradictions are detrimental to the overall transformative potential of the cooperative sector. Trebor Scholz (2016) himself oscillates between a moderate and a radical thesis when he contends that it is unrealistic to anticipate that platform co-ops will dominate capitalist markets, thus settling with a more diversified economy.

Overall, the literature has documented three basic normative approaches of the future of platform cooperativism vis-à-vis platform capitalism:

- The liberal regulation of platform capitalism towards an eco-friendly, social and human digital capitalism (Codagnone et al. 2016a, 2016b; Eurofound 2018; Frenken et al. 2020; Rani et al. 2021; UNCTAD 2019).
- The reformist regulation of platform capitalism through democratisation and/or nationalisation (Dufresne and Leterme 2021; Fuchs 2014; Graham and Shaw 2017; Huws et al. 2017; Morozov 2018; Srnicek 2017; Simon and Forde 2023; Varoufakis 2020).
- The radical bottom-up replacement of platform capitalism with grassroots commons-based post-capitalist organisational models aided or not by the state (Bauwens et al. 2019; Fuster et al. 2023; Gibson-Graham 1996, 2006; Muldoon 2022; Papadimitropoulos 2020, 2022; Scholz 2016; van Doorn 2017; Woodcock 2020). This tendency often comes in terms of a radical reformism that seeks to create public service Internet platforms and platform coop/public service Internet hybrids that challenge the power of digital capitalism and aim at replacing it (Fuchs 2021).

Michel Bauwens and Vasilis Kostakis (2014, 2019) are exploring the third scenario of transforming platform cooperativism into open cooperativism. They put a commons spin on platform cooperativism by seeking to instill platform cooperatives with the principles of peer production.

2.4. The politics of the commons

The economics of the commons has to be examined in tandem with the political framing of the commons. The literature has documented three main contemporary normative approaches of the commons (Papadimitropoulos 2020): liberal (Benkler, 2006; Lessig, 2001, 2004; Murdock 2013; Ostrom, 1990, 2000); reformist (Arvidsson and Peitersen, 2013; Bollier and Helfrich, 2012, 2015, 2019; Kostakis and Bauwens, 2014; Olin Wright, 2009; Rifkin, 2014; Rushkoff, 2016; Scholz, 2016; Scholz and Schneider, 2016); and anti-capitalist (Dardot and Laval, 2014; Dean, 2009, 2012; De Angelis, 2017; Dyer-Witheford, 1999, 2015; Federici, 2012; Gibson and Graham, 1996, 2006; Hardt and Negri, 2000, 2004, 2009; Kioupiolis, 2019; Mason, 2015; Söderberg, 2008; Žižek, 2008, 2010). The classification is overly schematic since arguments often intersect.

Liberal scholars conceive of the commons as an alternative mode of production that exists alongside liberal democracy and the capitalist market. The commons pertain to the

civil society that interacts both with privatisation and government regulation. Liberal scholars such as Elinor Ostrom (1990; 2000), Lawrence Lessig (2001; 2004) and Yochai Benkler (2006; 2013) envisage the future of the commons in tandem with the state-market operation. With the exceptions of some anarchistic and collectivist strands, the liberal commons by large do not intend to challenge the state-capitalism nexus but to coexist peacefully on the premises of civil society, the state and the capitalist market.

Reformist scholars approach the commons as an alternative organizational model of civil society, economy and politics, which does not necessarily oppose liberal democracy and the capitalist market, nor does it peacefully coexist with them. Reformists such as Bauwens and Kostakis (Bauwens et al. 2019), Bollier (2003; 2014), Rushkoff (2016) and Olin Wright (2009), among others, seek to transform the state-capitalism nexus by advancing the commons into a dominant mode of production that is increasingly less dependent on corporations and state intervention. The reformist approach of the commons combines liberal, social democratic, socialist and revolutionary elements in varying forms to foster a commons-based transition towards a post-capitalist ethical and sustainable economy.

Anti-capitalist thinkers champion the commons as an anti-capitalist terrain of production that clashes head-on with capitalism and the state. For anti-capitalists, the commons engages in a constant class struggle with capitalism (Papadimitropoulos, 2017: 572). Well-renowned scholars such as Ernesto Laclau and Chantal Mouffe (1985), Pierre Dardot and Christian Laval (2014; 2017), Massimo De Angelis (2017), George Caffentzis (2014), Silvia Federici (2004; 2012) and Alexandros Kioupiolis (2017; 2021) set out from a radical standpoint to confront neoliberal capitalism and render the commons autonomous vis-à-vis the state-capitalism nexus. All oppose the concept of a “liberal commons”, that is, a commons confined to civil society that operates at the fringes of market economy and the state.

Yet, the political essence of the commons lies on a deeper ontological level. The commons seek to reverse capitalism’s ontological foundations and socio-political values such as individualism, profit maximization, competition, strict intellectual property rights, hierarchical management, etc. They suggest a relational (Bollier 2014; Bollier and Helfrich, 2019) ontology which does not generate dualisms such as individual-community, private-common etc. The relational ontology of the commons implies that every living organism relates to one another not hierarchically but in terms of need: humans depend on nature to survive; resources need humans to thrive. The moving away of traditional modern ontology toward a new relational ontology is called “ontoshift” (Bollier and Helfrich, 2019). Digital

commons suggest an ontoshift through everyday practices that alter dominant social meanings, thus transforming the way humans, nature, things, resources, cities, information etc. are perceived.

Philosophers of technology such as Andrew Feenberg highlight the transformative potential of the digital commons. For Feenberg, alternative social values are being translated into differentiated technical artifacts that are biased towards diverse social interests (Feenberg, 1999; 2002). Technology is not a mere instrument that serves exogenous ends. It contains in-built values reflecting the interests of the actors participating in the design process of technical artefacts. In Feenberg (2010), the sum of the social values that are being translated into technical specifications creates a technical code that determines the technologies generated. Feenberg's theory aims at opening up the design process to include participants' values within the technical code in a manner that is not biased towards the interests of particular stakeholders, such as shareholders, managers, etc. In other words, he aims at democratizing technology and bringing about an alternative modernity through more inclusive technological infrastructures.

The digital commons echoes with Feenberg's aim of democratizing technology, since they generate values, meanings and innovative technologies that reflect the interests of commoners, that is, user communities that co-produce commons in accordance with collectively agreed upon rules and norms. Commons-based peer production (Bauwens et al., 2019) opens up the design space to include more people, interests and values, thus opposing the model of technological determinism, along with the monopolistic power of corporations to determine technological designs at their will (Feenberg, 2010).

Michel Bauwens and Vasilis Kostakis (2014, 2019) build on Feenberg's critical theory of technology to integrate commons-based peer production into the model of open cooperativism. They advocate for the transformation of platform cooperativism into the model of open cooperativism that places commons-based peer production at the center of collaboration between civil society organisations producing commons, ethical market entities adding exchange value on top of the use value of the commons and a partner state enabling commons-based peer production through funding, legislation, infrastructures, education, and so on. Bauwens and Kostakis call for the counter-hegemony of open cooperativism to transform capitalism into post-capitalism. However, the model of open cooperativism still rests on thin conceptual and empirical foundations.

The project reads the model of open cooperativism through the lens of Ernesto Laclau and Chantal Mouffe's (1985) discourse theory of hegemony to accentuate its political

edge. Discourse theory offers a matrix of theoretical categories such as floating signifiers, nodal points and discourses that help map complex social phenomena such as social movements, the different logics of collective action, the political construction of social identities, the form of hegemonic strategies, the making and unmaking of political institutions, the formulation and implementation of public policy as well as central topics of political science such as governance and decision-making, to mention just a few (Howarth et al., 2020). Laclau and Mouffe's discourse theory of hegemony is deemed particularly appropriate in explaining nascent fields of collective action and emergent organizational models such as commons-based peer production, cosmopolitanism, and open cooperativism, especially since the latter are poised to challenge the current hegemony of neoliberalism.

Laclau and Mouffe's discourse theory of hegemony introduces an ontology of the social that uproots any essentialist, deterministic, teleological, classist, statist, and technoeconomic ground by putting forward *the political* as the main driver of social change. Subjects, objects and systems are social constructs that undergo constant historical and social change as a result of political practices. *The political* is understood as the ontological essence of society that breeds on indeterminacy, contingency, heterogeneity, and difference to construct hegemonic power relations. *The political* does not only refer to politics in its institutionalized fashion but to any social activity that includes antagonism and the (un)fixing of power relations. Following Foucault, power is never foundational but relational. Power marks the hegemony of one discourse over others as well as the constant interrelational dislocation and re-articulation of elements floating around nodal points and discourses.

In Laclau and Mouffe's discourse theory, hegemony is the outcome of social antagonism playing out at the intersection of the logic of equivalence and the logic of difference (Laclau and Mouffe, 1985: pp.113-117). The logic of equivalence represents a simplification of the logic of difference that represents the heterogeneity inherent in the dislocation effects of *the social*. By dislocation Laclau refers to the ontological entropy of meaning, that is, the constant dissolution and re-articulation of meaning. The logic of equivalence condenses heterogeneity around two chains of meaning. Both chains articulate floating signifiers around a common discourse (nodal point) that opposes one another. For example, a chain of equivalence articulates the floating signifiers of "ecology", "democracy", "freedom" and "egalitarianism" around the common discourse of "communism", whereas the chain of equivalence of liberalism articulates the floating signifiers of "market forces", "freedom of choice", "individuality" and "ethical pluralism" around the common discourse of

“capitalism”. Communism and capitalism are discourses that encapsulate the concentration of floating signifiers around two opposing nodal points of meaning. Thus, the nodal point of communism opposes the nodal point of capitalism. Both communism and capitalism are unfinished projects of modernity that float around an empty signifier, which is yet to be fully realised either in its communist or capitalist sense. Similarly, the nodal points of conservatism and liberalism antagonise to hegemonise an empty/floating signifier (Figure 1).

Hegemony is the precarious fixing of the social space by a chain of equivalence on the socio-ontological conditions of contingency, difference, antagonism, power and the primacy of politics (Laclau and Mouffe, 1985:pp.120-131). Hegemony is the relation by which a chain of equivalence assumes the impossible task of a universal representation. This logic is designed to elucidate the practice of constructing political alliances and coalitions between differently positioned social actors. It captures the process by which actors link together a disparate set of particular demands in a common discourse so as to construct a more universal political project (Howarth, 2005:p.323). Hegemony identifies today with the discourse of neoliberalism that articulates floating signifiers such as “green growth”, “profit maximisation”, “homo economicus”, “privatisation” and “market fundamentalism” around the nodal point of state capitalism.

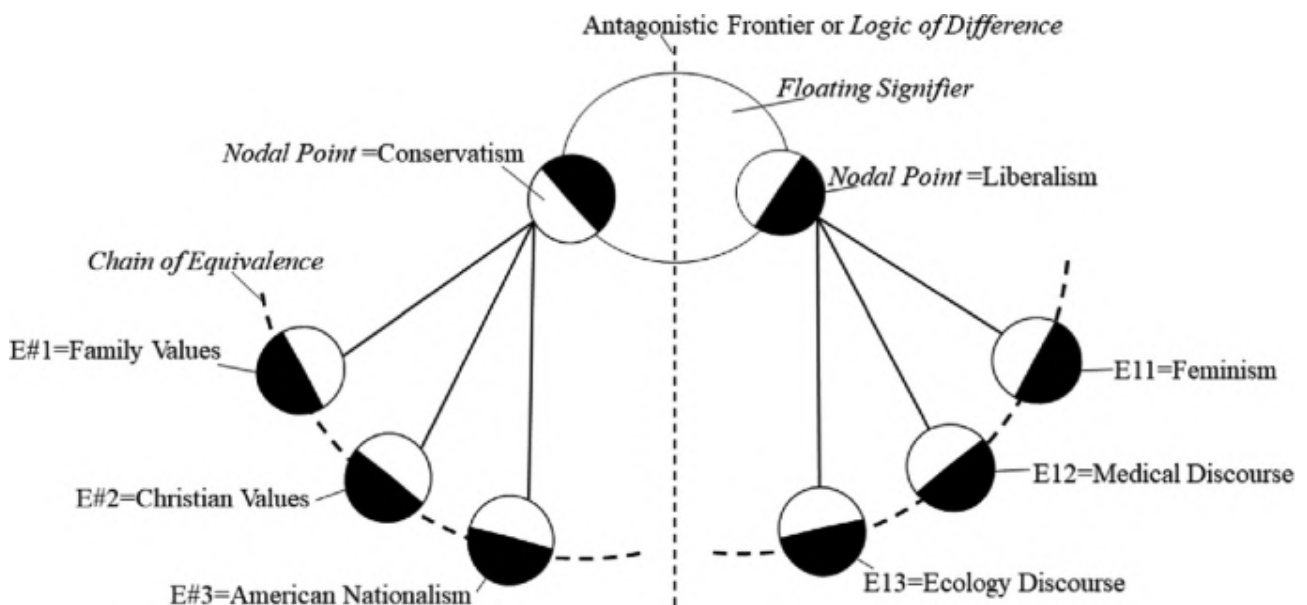


Figure 1. Logic of equivalence and logic of difference

The project employs Laclau and Mouffe’s discourse theory of hegemony to analyze the model of open cooperativism into a chain of equivalence articulating the discourses of

“commons-based peer production”, “ethical market entities” and “the partner state” around the empty signifier of “post-capitalism”. An empty signifier refers to the absence that hegemony seeks to fill. Thus, post-capitalism is a theoretical and empirical sketch for pre-figuring the counter-hegemony of radical and plural democracy vis-à-vis the current hegemony of neoliberalism. The project yet dissociates from the centralised, leftist and hierarchical tendencies of Laclau and Mouffe’s discourse theory of hegemony. The goal, instead, is to re-articulate the model of open cooperativism around a post-hegemonic chain of equivalence with the aim to tilt centralisation towards commonification via decentralisation.

The model of open cooperativism is still under-theorized and highly experimental, often exhibiting the very contradictions of commons-based peer production such as the lack of *the political*, fragmentation and precariousness (Papadimitropoulos, 2022:pp.31-36; Kioupiolis, 2019). The project embarks on empirical research to explore potential hurdles and substantiate a theoretical refinement of the model of open cooperativism. The ultimate goal is to further politicize the model of open cooperativism in a mission to sharpen its strategy vis-à-vis neoliberalism.

2.5. The model of open cooperativism

Research so far (Bauwens et al. 2019; Kostakis and Bauwens 2014) has identified a three-zoned model of open cooperativism that comprises: (1) the civil society producing material and immaterial commons; (2) ethical market entities adding exchange value on top of the commons use value to produce commodities for the market; and (3) a partner state enabling the collaboration between civil society and ethical market entities through funding, education, legislation, infrastructures, etc. We next describe each component of the model in detail.

2.5.1. Civil society

Civil society operates alongside the state and the market to produce social value that is usually deemed unprofitable for profit-oriented firms and costly for governments. It is common in the literature to assign to the cooperative economy of civil society a social and environmental function (Zaimakis & Nikolaidis 2022). Cooperatives are often considered part of the social and solidarity economy. According to the European Union directive, social

enterprises cater for the provision of cultural, health, educational and environmental services (Varvarousis & Tsitsirigkos 2019:p.98). As such, the social economy has been usually described as a “third sector” (besides the state and private sectors) identified with civil society.

Cooperatives differ from other forms of civil society organizations in that they seek to make profit just as profit-driven firms, the difference being that profit is equitably distributed among cooperative members in accordance with collectively established rules and goals. Cooperatives, in general, adopt the cooperative principles and values as defined by the International Cooperative Alliance.

Traditional and platform cooperatives cannot challenge capitalism for a plethora of reasons (Papadimitropoulos 2020; Papadimitropoulos and Malamidis 2024). To address this issue, Vasilis Kostakis and Michel Bauwens (2014) seek to infuse traditional and platform cooperatives with the principles of the commons. In contrast to traditional and platform cooperatives that adopt closed proprietary licenses, therefore, not producing commons, open cooperatives deploy open protocols, open logistics, open supply chains and open value accounting to enable commons-based open social innovation. Open cooperatives bring together the community of all members, users and contributors who produce the commons, either for payment or as volunteers, with ethical market entities that co-produce or support the commons (Papadimitropoulos 2023b; Papadimitropoulos and Malamidis 2023).

2.5.2. Ethical market entities

The Internet has allowed innovation to become social, turning it into a coefficient of networks, rather than an internal feature of R&D confined to the premises of companies beholden to shareholder value. Social innovation is now at the heart of industrial process, with companies opening up their lines of production to integrate wider user participation in their value chains, via network effects generated by peer production (Bauwens et al. 2019), user-led communities and crowdsourcing (von Hippel 2005; Tapscott & Williams 2006). Peer production has become a competitive necessity and a new baseline for successful business operation. Entrepreneurship is gradually getting divorced from hierarchical and centralised managerial control over production, and edge competencies replace core competencies as key competitive quality. Peer production gives rise to asymmetric

competition, meaning that any for-profit company that does not integrate peer production is at a competitive disadvantage.

Ethical market entities are for-benefit companies and social enterprises that cooperate with civil society organizations to either co-produce commons or access commons in exchange for a fee. The main argument here is that any for-profit entity that is faced with competition from a for-benefit entity will face difficulties to survive (Bauwens et al. 2019). A prominent example is open-source software and the emergence of Linux as a strong contender for the operating system of computers, and which is already an essential part of the Internet's infrastructure. Exclusive proprietary software approaches are no longer viable vis-à-vis open-source competitors. Similarly, companies that adopt open business models and can profit from social innovation, co-creation, co-design and crowdsourcing mechanisms will tend to out-innovate those that do not. The main argument is that multiple stakeholders such as user communities and ethical market entities that co-produce or gain access to common-pool resources benefit from knowledge diffusion and innovation spillovers, as well as from low production and transaction costs, thus gaining a competitive advantage compared to closed proprietary socio-economic models.

Free and open-source software is the archetype of the large-scale communal production of information, knowledge, and culture (Bauwens et al. 2019; Benkler 2006: 5). IBM, RedHat, Oracle, Google and Microsoft have focused their business strategy on supporting open-source software communities. The problem is the co-optation of the commons (Birkinbine 2020) by these and similar firms and the subsequent precarity of commoners, volunteers, software developers, etc. Copyleft and open-source licenses permit the free access, use, modification and commercialization of code. This allows companies to profit disproportionately compared to user communities producing digital commons.

To tackle corporate cooptation, the model of open cooperativism introduces mechanisms for benefit-sharing between ethical market entities and commons-based peer production. Bauwens and Kostakis (2014) build on the Peer Production License (PPL), designed and proposed by Dimitri Kleiner (2010), to propose the *Copyfair* license that allows for commons commercialisation, but on the basis of reciprocity. Ethical market entities are for-benefit companies that can either co-produce commons or access commons produced by civil society organizations and FLOSS communities in terms of reciprocity, that is, in exchange for a license fee. For example, multinationals can use the code if they contribute, as IBM does with Linux. However, companies that do not contribute would pay a license fee, in order to secure sustainable livelihoods for user communities producing the commons.

Open cooperatives adopt multi-stakeholder forms of governance that would include workers, users-consumers, investors and the concerned communities. Today, peer producers are largely oriented towards the “start-up” model and are subsumed to profit maximization, while traditional and platform co-operatives remain closed, use exclusive intellectual property licenses, and, thus, do not create a commons (at least a knowledge commons). In the new model of open cooperativism, a merger should occur between the open peer production of the commons and the co-operative production of value (Table 3).

Open cooperatives adopt open protocols, open logistics and open supply chains that provide transparency and real-time information feeding into a circular economy co-designed to internalize negative externalities, reduce material/energy use and balance out thermodynamic flows of production inputs and outputs (Bauwens et al. 2019). Contrary to the strategy of companies to purposefully reduce the actual lifetime of products - termed “planned obsolescence”- open cooperatives value interoperability, repairability, resilience and adaptability. They employ modularity, indirect coordination (stigmergy) and open value accounting that equitably distributes value among multiple stakeholders. They seek to regenerate value and engineer processes rather than products and commodities. They connect to material production via distributed micro-factories for (g)localised manufacturing on demand to satisfy local needs for basic goods and machinery.

Capitalist enterprise	Traditional/platform co-operative	Open cooperative
information asymmetry	information symmetry among coop members	openness, sharing, transparency
profit maximization for shareholders	value distribution among coop members	value distribution among multiple stakeholders
one dollar, one vote	one member, one vote	one member, one vote
centralised proprietary R&D, patents, rent extraction	closed proprietary licenses, not producing commons	open protocols, open supply chains, decentralized coordination, commons
planned obsolescence, negative externalities	sustainability, internalisation of externalities	circular economy, repairability, adaptability, maintenance
division of labour	division of labour	modularity, stigmergy
salaries	salaries	open value accounting

Table 3. From capitalism to open cooperativism

Open cooperatives aim, thus, to transform the mainstream commercial sector into a generative market, which serves the accumulation of the commons rather than the accumulation of capital. Shared incentives would further be co-designed in the context of for-benefit associations, aiming to converge the corporate and the cooperative economy as in the case of open-source software (Figure 2).

For-benefit associations as in the case of Linux or Mozilla foundation set consensus rules and incentives, fundraise and set the exchange rules within the commons and externally to other ecosystems, set the ownership/membership and sharing rules for the commons, define and enforce reputation, act as the interface to not-for-benefit entities, protect the commons through licenses and manage conflicts (Bauwens et al. 2019). In short, they prefigure the role of a partner state at a macroeconomic and political level.

Productive community	Linux	Mozilla	GNU	Wikipedia	Wordpress
Entrepreneurial coalition	e.g. Linux Professional Institute, Canonical	e.g. Mozilla corporation	e.g. Red Hat, Endless, SUSE	e.g. Wikia company	e.g. Automatic company
For-benefit association	Linux Foundation	Mozilla Foundation	Free Software Foundation	Wikimedia Foundation	Wordpress Foundation

Figure 2. The three institutions that shape the model of open cooperativism

2.5.3 The partner state

The concept of the partner state was first introduced by Cosma Orsi (2005, 2009) and then further developed by Kostakis and Bauwens (2014). A partner state ensures the stability of the macro-economic arrangement between contributory communities, for-benefit associations, and entrepreneurial coalitions. It enables the collaboration of civil society organizations with ethical market entities through infrastructural, financial, legal and institutional support.

Scholars of various schools of thought have long emphasized the creative role of the state, on the one hand, to collectively produce value and bootstrap markets around publicly-funded innovative technologies, and the predatory role of large, investor-controlled firms, on the other hand, to feed on collective innovation and value production (Mazzucato

2018). Companies have been free riding on prior public investment (i.e. share buybacks), with taxpayers, Internet users and workers being stakeholders and key contributors to the innovation process.

A partner state moves away both from a distributionist welfare state and a neoliberal state by establishing mini-states of commons-based peer production ecosystems that implement direct democratic procedures and practices. Likewise, developmentalist or neo-Keynesian versions of the state focusing solely on taxation, public investment, public ownership and capital controls should be “updated” according to the principles of the commons. Representative democracy would be extended through participatory mechanisms (participatory legislation, participatory budgeting, online and offline deliberation mechanisms, liquid voting, real-time democratic consultations and procedures, proxy voting mechanisms). The state should be de-bureaucratized through the decentralisation of public services via public-commons partnerships. Traditional and bureaucratic hierarchies should be transformed or replaced by poly-governance models of participation and deliberation that include user communities and other stakeholders (Bauwens et al. 2019).

Taxation of productive labour, entrepreneurship and ethical investing, as well as taxation of the production of social and environmental goods should be minimised. On the other hand, taxation of speculative, unproductive investments, unproductive rental income and of negative social and environmental externalities should be increased (Bauwens et al. 2019). In these ways, the partner state would sustain civic commons-oriented infrastructures and ethical commons-oriented market players, reforming the traditional corporate sector in order to minimise social and environmental externalities. The partner state would also engage in debt-free public monetary creation, while supporting complementary community currencies, digital public financial commons and peer-to-peer lending.

A partner state would align education with the co-creation of productive knowledge in support of the social economy and the simultaneous open commons of productive knowledge. A partner state would distribute all publicly funded research and innovation under a commons-based license along with laws to enable municipal Wi-Fi and mesh-networks and “open data” regimes and resources that would allow local governments and multiple stakeholders to analyze Big Data from public sources to devise useful social policies and programs.

Big tech should recognize more actively the contribution of open-source software and the digital commons to their business models. A partner state should set transparent rules for the commercialisation of the digital commons as well as for the participation of civil society groups and communities in a democratic dialogue over public goods such as

the Internet, Big Data and Blockchain (Papadimitropoulos 2023a). Free and open-source software could become the default infrastructure in public administration and education (DeNardis 2011). State-endorsed open design protocols for information services, housing, ride-hailing services and energy grids could foster open-source innovation and benefit local communities. A partner state should devise policies to support participatory governance and participatory budgeting of state-funded technological education, state-funded technologies of public utility and interest such as open-source libraries, makerspaces, FabLabs and technological parks hosting public-commons partnerships among multiple stakeholders such as municipalities, civil society organizations, ethical market entities, freelancers, digital nomads, etc. (Figure 3).

Thus, a partner state would make use of open-source technologies to gain on efficiency, agility and adaptability, save on public expenditures, reduce trade deficits, boost innovation and collaboration, equitably distribute value among multiple stakeholders, foster sustainability and circular economies, enhance democracy, reclaim technological sovereignty and autonomy and promote open-source business models to transform sectors of the economy towards a fairer and freer society.

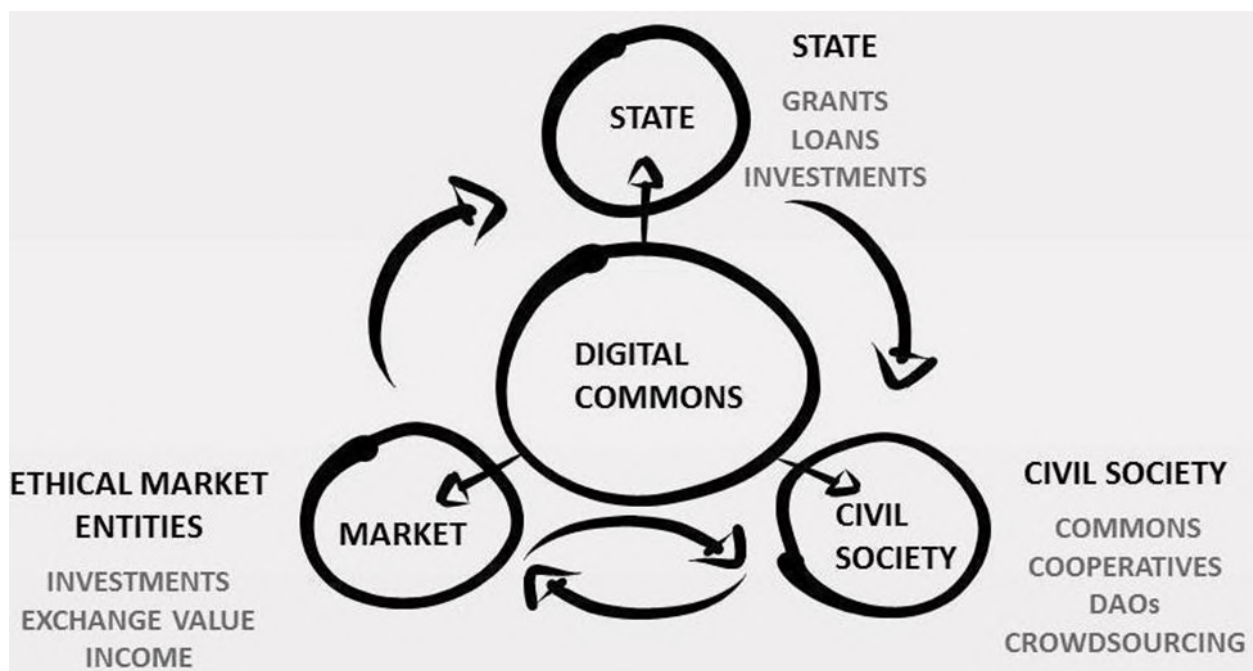


Figure 3. The partner state, ethical market entities and the commons.

The ultimate goal would be to reimagine politics in the model of open cooperativism between the commons, ethical market entities and a partner state, setting out to establish the counter-hegemony of a post-capitalist transition vis-à-vis the current hegemony of ne-

oliberalism. Laclau and Mouffe's discourse theory of hegemony could be instructive here to help articulate a chain of equivalence between civil society organisations, ethical market entities and a partner state around the post-hegemony of post-capitalism. The project yet dissociates from the leftist, centralised and hierarchical tenets of Laclau and Mouffe's discourse theory of hegemony. It advocates for a chain of equivalence that links up often disparate interests around cross-sectoral value chains that seek to establish the post-hegemony of open cooperativism. Post-hegemony moves beyond the distinctions of the left, the centre and the right to re-articulate pluralism around a universal political project anchored on the principles of the commons, openness, self-management, overlapping consensus, mutual advantage and the equitable distribution of value.

3. Case studies

Methodology

Next, the project explores empirical applications of open-source technologies and the digital commons in the cooperative economy. Research has adopted a case study approach (Yin, 2014), which is deemed more appropriate when exploring novel organisational models such as the digital commons, cosmopolitanism, platform and open cooperativism. The case studies have been documented in detail elsewhere (Papadimitropoulos, 2023; Papadimitropoulos and Malamidis, 2023; Papadimitropoulos and Malamidis, 2023; Papadimitropoulos and Perperidis 2024). Here, we cite only core fragments of empirical research. Data collection was based on literature review, participatory observation and interviews. Semi-structured in-depth interviews (Fiss, 2009) were conducted with core members of the selected case studies. In total, 34 members of P2P Lab, Tzoumakers, Open Food Network, CoopCycle and Circles UBI were interviewed. Interview length ranged from 40 to 100 minutes. Interviews were recorded via Skype and transcribed using Descript. Interview questions revolved around four coding themes: value proposition, governance, economic model, law policy. The author (principal investigator) also participated in workshops, online meetings and general assemblies. Data from the interviews was then triangulated (Gibbert et al., 2008) with data collected via literature review and field work.

3.1. Tzoumakers

Tzoumakers is an illustrative case study of commons-based peer production, cosmopolitanism and open cooperativism (Figure 4). It is a pilot project incubated by the P2P Lab¹, a research collective situated at Ioannina, Greece. P2P Lab explores the democratisation of knowledge and technology in science, academia, politics and economics. It advocates the counter-hegemony of a post-capitalist transition geared by open-source technologies and the digital commons. P2P Lab has received funding from the European Research Council (ERC) to launch Tzoumakers² as the Greek pilot of the cosmopolitanism project³.



Figure 4. Tzoumakers

Tzoumakers is a community of farmers, peasants, researchers and entrepreneurs who experiment with open-source agriculture (Table 4). Tzoumakers seek to address the lack of commercial agricultural tools for small-scale agriculture located in the mountains as well as the hegemony of closed, costly agricultural technologies that are unaffordable and non-repairable by smallholder farmers (Pantazis and Meyer, 2020).

¹ <https://www.p2plab.gr/en/>

² <https://www.tzoumakers.gr/english/>

³ <https://www.cosmolocalism.eu/>

VALUE PROPOSITION	GOVERNANCE	ECONOMIC POLICY	LAW POLICY
<p>the digital commons, cosmopolitanism, open cooperativism, small-scale open-source agriculture, technological sovereignty, sustainability, circular economy, degrowth</p> <p>problem: the absence of commercial agricultural tools for small-scale agriculture</p> <p>solution: peer production of small-scale open-source agricultural tools to be used as a commons</p>	<p>direct democracy, decentralization, open participatory design, multi-stakeholder governance, heterarchy, revocability, do-ocracy, liquid democracy, modularity of research teams</p> <p>multiple stakeholders: researchers, farmers, community members, the municipality</p> <p>workshops: open participation calls</p>	<p>equitable distribution of value, manufacturing of on-demand customizable low-cost tools</p> <p>revenue streams: EU grants, donations, crowdfunding</p>	<p>non-profit organization, EU, municipality</p> <p>licenses: copyleft, Creative Commons, copyfair, lack of open source licenses and certifications for hardware</p>

Table 4. Discourses in P2P Lab/Tzoumakers

To this end, P2P Lab, in concert with the municipality of Ioannina and the local community of farmers and entrepreneurs (Tzoumakers) situated at the whereabouts of Tzoumerka mountains, set up a FabLab at the village of Kaletzi near Ioannina. The FabLab is equipped with computer numerical machines such as welding station, laser cutter, milling machine and sensors to be used, among others, for the manufacturing of small-scale open-source agricultural tools (Pantazis and Meyer, 2020). Farmers, researchers and entrepreneurs organise workshops where they co-design and manufacture agricultural tools on demand. Thus far, Tzoumakers have organized 30 workshops and created 13 types of agricultural tools. Some examples include a legume-harvesting machine, a hammering fencing pole, a tilling fork and an aromatic herb grinder. The blueprints, bills of materials, and assembly instructions are open sourced on the project's website. The FabLab, the machinery, the designs, the tools, all are part and parcel of the commons to be used freely upon demand. Sustainability, relocalization, openness, sharing, transparency, collec-

tive decision-making, resilience and commoning are at the core the principles of Tzoumakers.

Tzoumakers have recently progressed into a non-profit organisation. P2P Lab and Tzoumakers prefigure a model of open cooperativism inasmuch as they comprise: (1) a community of researchers, farmers and technicians producing the commons; (2) ethical market entities such as social enterprises and local coops participating in the workshops and the co-production of the artifacts; and (3) the ERC and the municipality of Ioannina supporting the project with capital (funding and infrastructure). Yet, a number of factors challenge the long-term sustainability of Tzoumakers. Low demand, non-familiarity with digital technologies for local farmers and peasants, vested interests, neoliberal lock-ins and path dependencies, are some of the main obstacles going forward. We discuss the future prospect of Tzoumakers in the last chapter.

3.2. Open Food Network

Open Food Network⁴ (OFN) is a well-established open cooperative run by a global community of volunteers and members who deploy the digital commons to launch Internet-enabled short food supply chains (SFSCs) that cut out the middlemen by directly interconnecting producers and consumers (Figure 5). SFSCs come thus to address, among others, the profit squeeze most prevalent in agriculture, with farmers getting paid the 1% of their produce sold in the market. The rest 99% variously splits in taxes, production costs, processors, suppliers, wholesalers and retailers. SFSCs guarantee local and fresh quality products, support sustainable and healthy agricultural methods, increase producers' income and contribute to the revitalization of local society and economy (Jarzębowski et al., 2020:p.2). "The result is customers are getting better, fresher, more ethically raised food. In return, farmers get direct lines of feedback from their customers, less food waste and more money in their pockets" (Cornish, 2019).

The OFN calls for systemic change in agriculture by juxtaposing agroecology against neoliberal agri-business. It sets out to spawn a global social movement aiming to reverse climate change through sustainability practices that promote permaculture, fair pay, food democracy and food sovereignty. Cosmolocalism, transparency, sharing and the equitable distribution of value are core features of the OFN, which encompasses various community food enterprises adopting a diversity of business models (Table 5).

⁴ <https://openfoodnetwork.org/>

The OFN institutionally is backed by the Open Food Foundation, which is a non-profit charity established to protect the open-source knowledge, code and platform. As such the OFN is a paradigmatic case of an open cooperative, since it comprises: (1) a community of volunteers and members producing the digital commons and managing the OFN platform in terms of subsidiarity and democratic governance; (2) ethical market entities participating in the OFN platform; and (3) a Foundation and local authorities variously supporting the OFN, thereby prefiguring the role of a partner state. The OFN expands further the digital commons into open protocols and standards designed to launch data food interoperability with the aim to enhance value flow traceability and low-cost efficiency across different platforms connecting to the OFN.



Figure 5. Open Food Network

Yet, systemic change is in tension with diversity, which often breeds fragmentation and contradictions. “There's tension between not-for profit, open-source philosophy, and closed-source profit-making, individual gain versus collective gain” (Interviewee).” OFN seems to focus mostly on business management, food security, data interoperability and sustainability, thus losing sight of broader societal transformation. Long-term radicalism goes hand in hand with short-term reformism and a mixed economy often curtailing a more radical vision. Therefore, one wonders whether OFN could deliver in its promise to realize systemic change in the long term. We discuss this prospect further in the last chapter.

VALUE PROPOSITION	GOVERNANCE	ECONOMIC POLICY	LAW POLICY
<p>the digital commons, SFSCs, agroecology, systemic change, food sovereignty</p> <p>problem: food centralization and disconnection, profit squeeze</p> <p>solution: decentralization and connection via SFSCs</p> <p>economic sustainability: fair pay, “cutting out the middleman”, lower costs, reduced information asymmetry, consumer empowerment, producer-consumer reconnection</p> <p>social sustainability: inclusion, relocalisation, reduced health inequality and food poverty, community building</p> <p>environmental sustainability: organic, recycling waste, permaculture, reduction in CO₂ emissions, resource efficiency, biodiversity</p>	<p>multi-stakeholder governance, subsidiarity, holacracy, sociocracy, lazy consensus</p> <p>OFN Global: 5 coordination Circles (Delivery of code/software, Marketing/Communications, Governance, Fundraising, Other Services/Providers)</p> <p>instances/members: 20 local/national instances, 100 members (members of local/national instances)</p> <p>decision-making: subsidiarity, equal voting rights, online voting tools, lazy consensus</p> <p>stakeholders: farmers/growers, food processors, food hubs, shoppers, distributors, consumers, associates (white label users), service providers, volunteers</p>	<p>diversity of revenue streams and business models, transparency, fair pay, “cutting out the middleman”</p> <p>revenue streams: fundraising, grants, subscriptions, fees, OFN instances contribution</p> <p>fair pay for farmers: cutting out the middlemen > decrease of production and transaction costs</p> <p>fair pay for OFN employees: 10 to 40 euro per hour</p> <p>business models: direct sales, food coops, farmers’ markets and food hubs</p>	<p>open-source software, the digital commons, diversity of legal entities, data food interoperability</p> <p>for-benefit foundation: the Open Food Foundation</p> <p>community pledge: informal legal agreement</p> <p>food certification: compliance with organic and food safety standards</p> <p>open-source content and code: licensed with CC BY-SA 3.0 and AGPL 3 respectively</p> <p>data food interoperability: common standards and protocols</p> <p>community food enterprises: not-for-profits, charities, associations, local food markets, coops, social enterprises, community interest enterprises, community supported agriculture</p>

Table 5. Discourse on Open Food Network

3.3. CoopCycle

CoopCycle is an informal federation of more than 67 bike delivery cooperatives spanning the globe (Spier, 2022). Formally, CoopCycle is a French-based association of volunteers who develop open-source software for bike delivery e-logistics and services in the cooperative sector. As such, the association/federation provides the institutional backbone as well as the digital infrastructure for bike delivery coops across the globe (Figure 6).

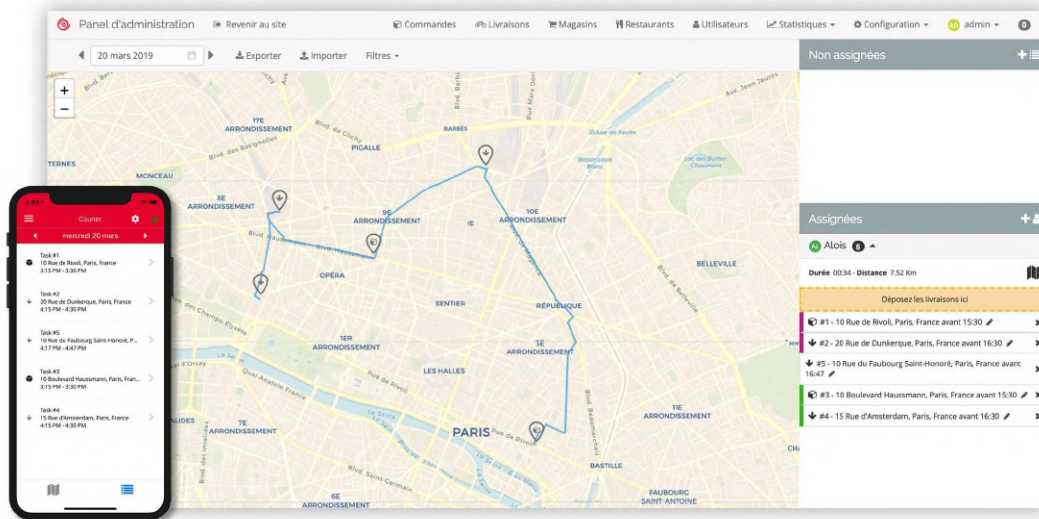


Figure 6. CoopCycle

CoopCycle was initially founded to combat the precariousness of the couriers working in the so-called gig economy. The developer behind CoopCycle copied the proprietary software of foodtech platforms and reprogrammed it into a digital commons to be deployed solely by cooperatives or collectives that adhere to the principles of the social and solidarity economy. CoopCycle puts the digital commons in the service of an anticapitalist model premised on the collective ownership of the means of production, democratic decision-making and the equitable distribution of value among workers (Table 6).

In contrast to foodtech platforms that classify workers as independent contractors and pay them per drop, workers in the CoopCycle federation are paid per hour, all the while enjoying the benefits of safe employment such as social security, insurance, sick day and holiday leave pay. In contrast to foodtech platforms that seek to maximize shareholder value, CoopCycle strives to equitably distribute value among workers: “Money should not

VALUE PROPOSITION	GOVERNANCE	ECONOMIC POLICY	LAW POLICY
<p>the digital commons; anticapitalist economy; sustainability; lobbying</p> <p>problem: foodtech platform precarisation and uberisation</p> <p>solution: the digital provision of bike-delivery e-logistics and services</p> <p>services: software development; onboarding and training; food delivery; last mile</p> <p>economic sustainability: cost reduction; fair pay; the sharing of value</p> <p>social sustainability: local and ethical social economy; solidarity; care</p> <p>environmental sustainability: less traffic and noise; reduced waste and CO₂ emission</p>	<p>direct democracy; general assembly; centralization vs decentralization</p> <p>federation: 67 coops across 10 countries; 3 employees (2 developers, 1 coordinator); a board of 8 administrators; working groups</p> <p>decision-making process: general annual assembly; monthly coop assembly; one coop, one vote; one member, one vote; consent-based decision; majority voting; sociocracy</p> <p>decision-making tools: Slack, Loomio</p> <p>centralization: hard and heavy software development (backend)</p> <p>decentralization: software customization; coop self-management; marketing</p>	<p>contribution; fair pay; delivery fee; partnerships</p> <p>federation revenue streams: 2,5% of the added value of coops annual turnover (500 euros minimum annual fee); donations; grants; awards; consulting services</p> <p>coop revenue streams: delivery fee 20-30%</p> <p>fair pay: replace volunteer work in the federation with paid work; couriers paid by the hour; annual profits distributed to workers</p> <p>partnerships: MAIF; MACIF (insurance); FACTTIC Argentina; ITDP Mexico: Programa Rodando Juntas; Maison des Coursiers / Riders' Shelter; CG SCOP</p>	<p>multi-stakeholder cooperative; worker-owned cooperatives; non-profit social inclusion companies; Coopyleft license</p> <p>legal entity: formally a French association, informally a federation, a precursor to a multi-stakeholder cooperative</p> <p>license: Coopyleft license</p> <p>partnership agreement: associations and collectives joining the federation commit to becoming a cooperative within 2 years</p>

Table 6. Discourses in CoopCycle

make money. All the benefits should go to workers. You need to ride a bike to earn money” (Riders Collective, 2021).

Opting for bikes, CoopCycle is a pioneer in reducing the carbon footprint of the food delivery sector. CoopCycle’s environmental mission features most prominently in its value proposition, establishing partnerships with City Councils and companies aiming to adopt a more ecological approach and no longer risk having their trucks stuck in traffic jams. Thus, CoopCycle fosters economic, social and environmental sustainability for coops and local economies.

CoopCycle is currently evolving into a multi-stakeholder cooperative, supported by the French legal framework that allows for various economic actors to join forces for social and environmental purposes. Eco-friendly companies, zero-waste restaurants, family-run social enterprises, associations, municipalities, hospitals and schools, all craft an entrepreneurial coalition in the local economy. Thus, the organizational melange of CoopCycle illustrates a diverse ecosystem of a social and solidarity economy variously intersecting with the capitalist economy.

CoopCycle’s future vision is to further develop the software and specialize in lobbying to expand the cooperative economy in France and beyond. CoopCycle seeks to occupy a niche of socio-economic activity and become sustainable in the short term, thus posing a potential threat for platform capitalism in the long term. CoopCycle’s members are aware that establishing an anti-capitalist block presupposes the transformation of politics at a macro-institutional level (Borrits, 2019a, 2019b). Yet, there is no clear strategy on how to contribute to broader societal transformation besides lobbying. We explore this scenario in the next section.

3.4. Circles UBI

Circles UBI is a decentralized blockchain-based sovereign version of credit money operating on a web of trust (Figure 7). In contrast to the commodity theory of money according to which money is backed by a commodity such as metal or gold and is determined by market forces and relevant factors of production, sovereign money derives its legitimacy merely from trust and political power (Crocker, 2020: 32–35). Sovereign money thus can be anything that is backed by trust or political power, be it fiat currency, cryptocurrency or community currency.

In technical terms, Circles UBI is a protocol built and deployed on the Gnosis Chain in October 2020 (Linares, 2023). Contrary to a state-backed UBI, the Circles protocol distributes ERC-20 tokens equally and unconditionally on a per person stateless basis (Avanzo et al., 2023). Contrary to other blockchain-based UBI projects, Circles is not a commodity type of a virtual asset designed for the purposes of accumulation and profit. It is rather a unit of credit issued to settle debts in accordance with promises made among individuals.

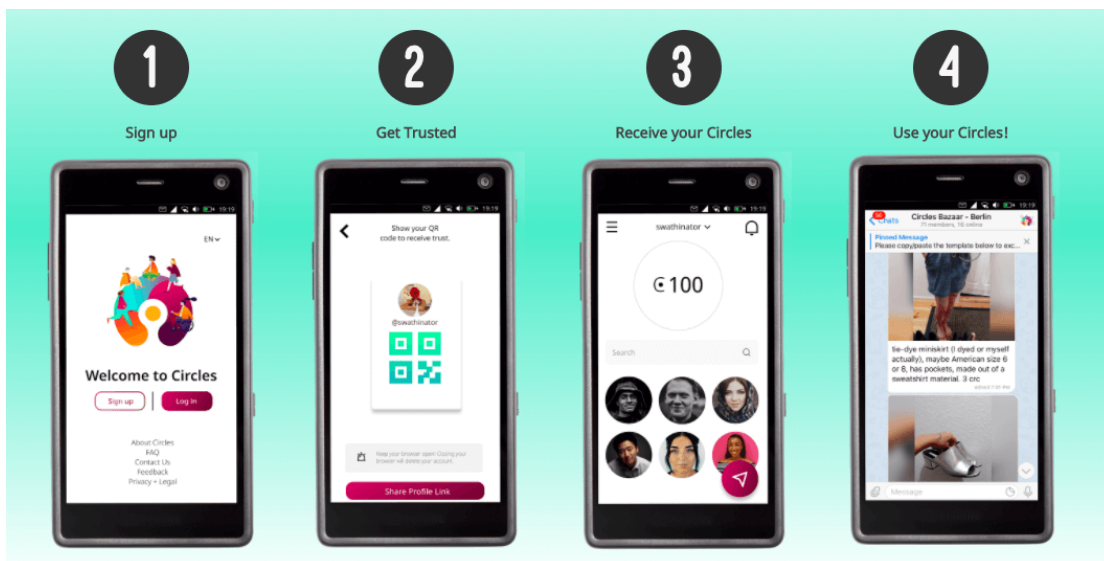


Figure 7. Circles UBI

The idea behind Circles was to create a fairer and less concentrated cryptocurrency than Bitcoin and to connect it with a political project aiming to provide a universal basic income (UBI) for all people across the globe to cover their basic needs. This societal transformation presupposes a reversal of values away from neocolonialism, exploitation, extraction, individualism and laborism towards the ethics of creativity, ecology, self-sufficiency, autonomy, community, care, and mutualism (Table 7). To this end, money dissociates from

the commodity fetishism of both Marxism and Liberalism, in which money represents reification and utility, respectively. Money also parts ways with the nation-state sovereign money, fiat, or credit, to empower people through mutual credit systems designed to circulate values others than profit maximization and capital accumulation (Cabaña and Linares, 2022).

Mutual credit systems point to the potential democratization of money, its creation, and its institutions—a money commons—a currency for the commons where credit is issued, co-owned, and administered by people democratically from the bottom-up rather than by state bureaucracies and banks (Cabaña and Linares, 2022).

In February 2020, the Circles Coop was established to build up a flagship pilot in Berlin, aiming to apply the Circles protocol in the local economy and support equivalent implementations across the globe. The Circles Coop supported groups and businesses who want to join the network and use Circles. The team set out to onboard cooperatives, producers, and businesses that can complement each other to claim the stuff of a basic income: food, care, health, housing, etc. After the official launch in October 2020, the network grew to a worldwide entanglement of over 100,000 people. In July 2021, the Circles Coop began running a subsidy program for a group of local businesses, which allowed them to convert their Circles (CRCs) into fiat (EUR). The goal of the subsidy program was to broaden the Circles network by incentivizing like-minded businesses to accept and circulate CRCs across their supply chains. The subsidy program comprised a diversity of businesses such as bicycle sales and repairs to cooperative distribution bike fleets; yoga studios and saunas; meditation and massage practices; small farmers and local cooperative supermarkets; local shops and cooks that produce their own drinks, products, and clothing; and other service providers.

Circles UBI is a sort of a decentralized voting system that distributes reputation points across a web of trust in a digital marketplace and/or a local economy. The Circles standardized smart contract issues one Circles ERC-20 token (CRC) per hour for everyone who has an account in the network. To get an account, one needs to create a Circles Wallet and gain the trust of at least three trustees to start issuing. One can then spend or gain CRC by selling products or services. CRC cannot be exchanged for fiat or cryptocurrency but only for products and services. To become a buyer or a seller (private or business), one needs to register at the Circles Marketplace, which is the matchmaking infrastructure for resources and needs. Today, Circles UBI accounts number around 200,000 in total.

Value proposition	Governance	Economic policy	Tech/law policy
<p>UBI, blockchain, anticapitalism, anarchism, libertarianism, economic democracy</p> <p>problem: nation-state centralized debt-based money supply and unfair capitalist distribution of money</p> <p>solution: blockchain-based decentralized UBI</p> <p>fair circular economy, money as a commons</p> <p>solidarity, diversity, resilience, self-sustainability</p> <p>change in the ethic of work</p> <p>Berlin and Bali pilots</p>	<p>direct democracy, monthly general assembly, decentralization, localism, democratic confederalism</p> <p>Circles worker cooperative: two full time and eight part time employees and several freelancers</p> <p>executive board, core team meetings, online and in-person assembly, collective brainstorming, community hub, coordination group, working group, community reach out</p>	<p>complementary currency, transparency, €2.3 million in donations, employee salaries</p> <p>R program in EUR for businesses participating in the Berlin pilot</p> <p>resilient localized and complementary supply chains which allow for affordable prices using CRC</p> <p>community regulated exchange rates of CRC and fiat money</p> <p>transaction fees on Gnosis Chain are covered by Gnosis</p> <p>proposed 1/5 ratio between Circles credit and reserve capacity for B2B</p>	<p>bylaws of Circles worker cooperative</p> <p>Bitsposessed collective</p> <p>Gnosis Chain, open-source software</p> <p>Circles wallet, seed phrase, public and private key</p> <p>Circles Safe: a smart contract that holds the keys to the accounts</p> <p>transparency of transactions versus privacy (Entropy project)</p>

Table 7. Discourses in Circles UBI

To prevent hoarding and incentivize economic activity, Circles UBI comes with an in-built deflationary monetary policy in the form of demurrage, which is a 7% annual de-

crease on all Circles balances. Inflation (an increase of 24 CRC/day or 8,760 CRC/year) and deflation (7% decrease per year) eventually cancel each other out in the course of approximately 14 years, meaning that every account would converge to around 125,143 CRC if they did not engage in any economic activity (buying or selling with CRC). The goal of demurrage is to increase the velocity of spending and ensure that over time there is a convergence between those who own more and those who own less CRC, thereby decreasing the disparity between those who join first and those who join later. Eventually, demurrage aims to engineer a fairer circular economy.

However, the idea of each individual issuing her/his own token is problematic both technically and economically. The web of trust mechanism supported by the pathfinder algorithm is very complex and it does not work in practice. Also, the value an individual brings into the system can be subject to a misalignment of incentives like the one, for example, witnessed in the Berlin pilot. An amount of fiat money in Euro (EUR) was given as a subsidy, aiming to lower the risk on the part of businesses that were willing to accept and use CRC as a means of payment. Yet, the Berlin pilot faced a number of hurdles that caused the Circles cooperative to run out of funding, end the pilot and stop its operation.

The Circles Coop ran into a number of problems. Blockchain technology is not ready to support thousands of users willing to join the network. Scalability issues, cumbersome smart contract upgrades, and numerous bugs constantly popping up in the system made its use problematic in Berlin and in Bali where Circles UBI is being currently implemented. Also, most businesses participating in the Berlin pilot were cashing out 90% of their CRC into EUR. Businesses were using CRC as an exit to EUR, thereby not contributing to the circulation of CRC across their supply chains (Avanzo et al., 2023). Eventually, they were doing business as usual, while oftentimes being engaged in price gouging. Businesses and merchants were raising the prices of the products traded in CRC to unaffordable levels for the community, thereby rendering those products luxury items. Encountered with the realities and contradictions of building alternatives outside the state and within the current capitalist economy, the Circles Coop ceased its operations in January 2024.

4. Discussion

P2P Lab/Tzoumakers, OFN, CoopCycle and Circles UBI apply core principles of commons-based peer production and cosmopolitanism: sustainability, openness, sharing, transparency, self-governance, decentralisation and the equitable distribution of value among coop members. They deploy transformative tech such as open-source software/hardware, the digital commons and copyleft licenses to put forth a post-capitalist ethical and sustainable economy.

Whereas P2P Lab/Tzoumakers, OFN and Circles UBI sketch out a model of open cooperative, which produces material and immaterial commons that are freely accessible to all such as agricultural tools, software and credit, CoopCycle operates under a version of a copyfair license (Bauwens and Kostakis, 2014) that restricts the use of the software to federation members such as bike delivery coops and collectives that pay membership dues and comply with the principles of the social and solidarity economy. CoopCycle operates mostly as a platform cooperative that limits the digital commons - that is, the software, e-logistics, etc. - within the confines of the federation. Whereas a copyleft license keeps the software code open to all (Stallman 2002), a copyfair license requires reciprocity (contribution) or some sort of capital in exchange for software use. Cooperatives and collectives that seek to avail of CoopCycle's software need to pay at least €500 per year as membership dues.

A copyfair license thus comes to overcome a major hurdle open cooperativism: the capitalist cooptation of the digital commons, which is owing to the unrestricted openness of the copyleft license (Birkinbine 2020). Profit-driven digital platforms such as Facebook and Google capitalise on open-source software to benefit from peer production and network effects on the Internet. In Marxian terms, the capitalist cooptation of the digital commons is merely surplus value extraction of the digital labour and the general intellect of Internet users and e-communities, appropriated by platform capitalism.

While the copyfair license such as the one adopted by CoopCycle helps secure the sustainability of the commons vis-à-vis extractive capitalism, it is not enough to foster the counter-hegemony of open cooperativism vis-à-vis neoliberalism. Laclau and Mouffe's (1985) discourse theory of hegemony can be instructive here as to how to articulate a chain of equivalence between the commons, ethical market entities and a partner state, seeking to establish the counter-hegemony of the model of open cooperativism vis-à-vis the current hegemony of neoliberalism. By a chain of equivalence we refer here to a tem-

porary alliance of societal actors operating in different spheres of the social such as politics, economics and civil society. A chain of equivalence links together a disparate set of particular demands (freedom, ecology, feminism, democracy, equality) in a common discourse so as to construct a more universal political project capable of bringing about systemic change. A common discourse such as the model of open cooperativism connects disparate actors of the economy, politics and civil society into a chain of equivalence represented by the common identity of a collective subject that incarnates the values of the commons. In short, a collective subject applies a minimum agreed-upon set of principles (i.e. the commons) that lie at the core of a common sense other than the one of neoliberalism that feeds on individualism, private property, market fundamentalism and profit maximization.

Interestingly, we are witnessing P2P Lab/Tzoumakers, OFN and the CoopCycle gradually opening up their value chains with the aim to scale widely across the economy via public/private/commons partnerships with municipalities and ethical market entities that share common values. In particular, OFN and CoopCycle are currently discussing a partnership in Spain. CoopCycle is interested in utilising the OFN e-commerce platform to expand its operations in the Basque country. Similarly, a network of woodland cooperatives in the UK is willing to use the OFN platform to distribute firewood, charcoal, permaculture and educational courses. Circles UBI is currently experimenting with future implementations of the protocol across the globe.

Cross-sectoral synergies put forward by P2P Lab/Tzoumakers, OFN and CoopCycle can be backed by alternative community currencies such as Circles UBI and multiply across the economy, politics and civil society to form a commons-based networked ecosystem of open cooperativism. Politics begs for a theory of hegemony to accommodate institutional diversity across a chain of equivalence linking up ethical market entities, the commons and a partner state around the model of open cooperativism, wherein freedom and pluralism meets equality and fairness in the prospect of a radical and plural democracy. Future research needs to elaborate on sustainable business models in the cooperative economy coupled with a political theory of hegemony capable of transforming capitalism into post-capitalism. To this end, cross-sectoral synergies, inclusive governance, value distribution, innovative law and open sustainability standards are sine qua non for the counter-hegemony of open cooperativism to challenge the current hegemony of neoliberalism.

5. Conclusion

The report presents the research findings from the project "Techno-Social Innovation in the Collaborative Economy", funded by the Hellenic Foundation of Research and Innovation for the years 2022-2024. The project examined the role of open-source technologies and the digital commons in the creation of a cooperative economy. In doing so, it went through an extensive literature review on platform cooperatives and the commons to lay the theoretical background for empirical research. The project backs the theoretical building of the model of open cooperativism with empirical evidence to offer some glimpses of the transformative potential of open-source technologies and the digital commons. The project reviews in particular the cases of P2P Lab/Tzoumakers (Greece), Open Food Network (Australia), CoopCycle (France) and Circles UBI (Germany) as illustrative case studies of Internet-enabled grassroots organisational models such as the digital commons, platform cooperatives, open cooperatives and Distributed Autonomous Organizations (DAOs) on Blockchain.

P2P Lab/Tzoumakers, OFN and Circles UBI sketch out a model of open cooperative, which produces material and immaterial commons that are freely accessible to all such as agricultural tools, software and credit. CoopCycle operates as a platform cooperative that deploys a copyfair license that limits the digital commons - that is, the software, e-logistics, etc. - within the confines of the federation. While all four case studies put forward cross-sectoral synergies with ethical market entities and municipalities to expand their operations and scale, a copyfair license turns out to be a crucial component of open cooperativism, since it shields the commons from capitalist cooptation, all the while allowing the use of the commons within the confines of the federation. The copyfair license functions as membrane that protects the commons and allow the ecosystem of open cooperativism to scale deep and wide.

However, neither legal hacks nor grassroots federalism can produce systemic change alone. To challenge the current hegemony of neoliberalism, projects such as P2P Lab/Tzoumakers, OFN, CoopCycle and Circles UBI need to articulate a political chain of equivalence linking up the commons, ethical market entities and a partner state around the counter-hegemony of open cooperativism. The model of open cooperativism can thus advance an alternative technological rationality and modernity anchored on the values of democracy, pluralism, equality, openness, sharing, value distribution and sustainability. Future research needs to elaborate on the political project of open cooperativism in a mission

to come up with concrete policy proposals that aim to support the creation of sustainable business models of open cooperativism.

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