

Diversifying deep transitions

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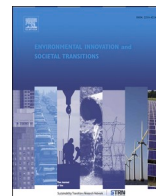
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Survey

Diversifying deep transitions: Accounting for socio-economic directionality

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ABSTRACT

The paper sets out to enrich the emerging debate on 'deep', transversal transitions. It does so by drawing attention to socio-economic developments neglected in the Deep Transition (DT) framework of Kanger and Schot, such as marketization, labour contracts becoming more individual and precarious, and changing human beliefs, aspirations, needs and wants as important developments. The framework of Deep Transition is criticised for neglecting tensions and contestations about progress, the socio-economic order and distributional issues. This paper aims to complement 'deep transitions' research with insights about socio-economic transformation processes. These are shown to be conflict-ridden and full of tensions, creating pressures on socio-economic orders and institutional logics. Because of this, development does not follow a neat pattern of convergence. In addition to identifying neglected issues and conceptual blind spots, the paper also outlines the scope for conceptual bridging between socio-technical and socio-economic transformation perspectives through attention to institutional logics and dialectics of change. We make a plea for a broader DT research agenda that covers relevant socio-economic rules, meta-regimes and institutional contradictions. Attention to directionality helps to deal with three weaknesses of the DT framework: the assumption of convergence, materialism, and insufficient attention to the multitude of value orientations and logics.

1. Introduction: deep transitions and directionality

In two important articles, Johan Schot and Laur Kanger put forward the idea of a 'deep' transition, a "series of connected and sustained fundamental transformations of a wide range of socio-technical systems in a similar direction" (Schot and Kanger, 2018: 1045). They analyse it as a historical phenomenon, constituted by Great Surges of Development and between-surge continuities, culminating in the emergence of a macro-level selection environment called industrial modernity (Schot and Kanger, 2018; Kanger and Schot, 2019). Crucially, these articles consider the influence of regimes and niches on the landscape, theorize transversal transitions that transgress functional subsystems, and take up broader issues of socio-economic change. These contributions marshal illustrative empirical evidence on transversal change, which is organised in a multi-level framework which combines insights on economic long

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waves (shifts in techno-economic paradigms) with sustainability transitions research on purposive socio-technical transitions (Markard et al., 2012; Köhler et al., 2017).

We welcome the deep transitions framework as a way to expand the scope of socio-technical transitions research to include wider issues of reflexive modernity, societal transformation, and socio-economic transformations. These topics have been elaborated earlier by eminent social theorists such as Beck, Polanyi, Bauman, Fraser, Foucault and Marx. The DT framework theorizes transversal patterns of socio-economic transformation across socio-technical systems and along timeframes of centuries. It includes a set of propositions that are generative for further empirical analysis and theory development.

Whilst appreciating these advances towards socio-economically advanced transitions theory, this paper questions the strong assumptions of convergence that accompany the proposed DT framework. These assumptions clearly underpin the definition of Deep Transitions as “a series of connected and sustained fundamental transformations of a wide range of socio-technical systems in a similar direction” (2018, p. 1045). They also emanate from the associated broadly scoped questions on future developments: *Are we witnessing the take-off of a second Deep Transition, beyond industrial modernity* (Schot & Kanger, 2018), *or towards a Circular Economy* (Kern et al., 2020)?

Assumptions of evolutionary convergence have been severely criticised by Stirling (2011). He underlines that transitions research should start from the (normative) multiplicity and the evolutionary complexity of transition processes. Transitions studies should for example articulate better how socio-technical change is interacting with economic structures, cultural change and changing state-business-civil society relations. This paper develops a similar critical-constructive argument. It demonstrates that the Deep Transition framework – despite its characterization as a diversifying ‘portfolio of directionality’ (Kanger & Schot 2018, section 7) – underplays the importance of socio-economic developments that crucially shaped the course of socio-technical change throughout the first DT, and are likely to weigh heavily in the emerging second Deep Transition. These socio-economic developments are based on a diversity of new worldviews, visions and narratives of change. Materially and organisationally, they involve a variety of initiatives towards the transformation of social relations and institutions, reaching beyond the ‘double challenge’ (Kanger & Schot 2018) of ecological crisis and social inequality.

Our analysis draws on a vast scholarly tradition on socio-economic transformation (Polanyi, 1944; Sennett, 2006; Jackson, 2017; Mason, 2015; Standing, 2015; Swilling, 2020), cultural political economy (Sum and Jessop, 2013) and critical social theory (Sayer, 2001; Rosa, 2010 and 2019; Wright, 2010). It also engages with recent work on social-institutional transitions and logics (Loorbach et al., 2017; Fünfschilling and Truffer, 2014; Smink et al, 2015), transformative social innovation (Moulaert et al., 2013; Avelino et al., 2018; 2019; Pel et al., 2019; 2020) and grassroots innovations (Seyfang and Haxeltine, 2012). Combining insights from these literatures with recent arguments for critical, directionality-conscious transitions research, we identify four important socio-economic developments that have shaped the directionality of the last 40-60 years: marketization of society, changing employment relations, the rise of demands for autonomy, emancipation and orientation to normative ideals (via social movements and involvement in alternative socio-economic practices). These transformation processes complement and specify the vectors of socio-technical directionality as discussed by Schot and Kanger. Importantly, they help to redress three imbalances in research on Deep Transitions: the persistent focus on evolutionary convergence, the socio-material bias and the neglect of (divergent) normative and ideational contestations of the existing social-economic order. To guide future research, we offer suggestions for the articulation of socio-economic directionality in socio-technical systems analysis.

The structure of the paper is as follows. We, first, offer a brief discussion of the basic tenets of the Deep Transitions framework, and presents our angle of socio-economic directionality (section 2). Next, we unpack this socio-economic directionality through the four developments of marketization (section 3), changes in the employment relation (section 4), the rise of liberal beliefs (section 5) and emancipation struggles (section 6). In section 7 we discuss the different economic responses to transformative impulses that stem from the imperatives of climate protection, more equality and justice, and the rise of a hybrid sphere based on different logics. section 8 states the conclusions and contains our recommendations for DT research.

2. The Deep Transitions model and its under-exposed directionality

2.1. The deep transitions framework

The Deep Transitions framework “is a story about the unfolding of industrial modernization, told from the perspective of socio-technical systems change” (Kanger and Schot, 2019, p. 8). The specification of concepts and mechanisms implies that it is a framework and explanatory model for socio-technical change. It is more than just an idiosyncratic process narrative – the methodological critique raised against such attempts at comprehensive transitions theory (Svensson & Nikoleris, 2018). Whereas macro-sociology often focuses on the interaction of societal subsystems (e.g. economy, polity and culture), the DT framework works with the notion of the socio-technical system as used in the MLP. This foregrounds the strong intertwinement between the following subsystems: science & engineering, business & economy, policy & regulation, user practices & everyday life and culture. For example, a mobility system includes vehicle design, instalment buying, traffic code, commuting to work and car as a status symbol. Importantly, these are only elements of broader societal subsystems: vehicle design is a subset of the subsystem of science & engineering, instalment buying is part

of the economic subsystem, et cetera.

The framework combines the great surges framework of Carlota Perez (2002, 2010) - distinguishing five technological revolutions¹ - with the multi-level perspective (MLP) (Geels, 2002, 2005, 2011; Geels & Schot, 2007) and its distinction between niches, socio-technical regimes and socio-technical landscape. The key results of this theoretical cross-fertilization are the novel concepts of meta-rules (a rule present in multiple socio-technical systems) and meta-regimes (rule-sets present in multiple socio-technical systems, coordinating their development). These concepts support a broad, sector-transcending techno-economic analysis of the emergence of 'industrial modernity'. Industrial modernity refers to a macro-level selection environment, a deep structure, based on a belief in technology, managerialism, a commitment to economic growth, an instrumental view of nature and an important role for individual ownership.

The Deep Transition framework contributes to transition research by positing a number of transversally operating, and in that sense 'deep', mechanisms. One mechanism is that new rules (such as mass manufacturing) emerge simultaneously in a wide range of niches and first transform single systems. A second mechanism is that during irruption (the first phase of a Great Surge of Development) the emerging and incumbent rules and regimes come to compete against each other in individual systems. Third, the interaction between regimes in multiple systems gradually leads to the emergence of rules and rule-sets shared between the systems, i.e. meta-rules and meta-regimes. Fourth, the dominant meta-regime selects niches compatible with its logic. Endogenous landscape change happens through two transition mechanisms: 'sedimentation' and 'feed-in'. Sedimentation refers to "the adding of another layer to the landscape". Examples are "mass production and a car-based mobility system creating new patterns of urbanization in the socio-technical landscape". Feed-in refers to "the reinforcement of an already existing macro-trend generated by existing landscape layers, e.g. the role of cars in the increase of greenhouse gas emissions (which had been rising from the beginning of the industrial revolution)" (Kanger and Schot, 2019, p.9). Aggregation activities and intermediation work by inter- and transnational organizations are two additional mechanisms behind the creation of interlinkages between systems. The upward surge, based on reinforcement loops, ends when the dominant meta-regime loses its grip: The cycle re-starts with other niches, systems and rules becoming central to the new surge. The formerly dominant meta-regime will shape the new surge, however, through feed-in and sedimentation mechanisms.

2.2. The Deep Transitions framework and socio-economic directionality

An important contribution of the DT framework is that it endogenizes the socio-technical landscape. Instead of reducing it to a residual category (Markard and Truffer, 2008), it is taken as a diversified macro-level selection environment setting technological standards and affordances, ideological structures of acceptability and taboo, and political structures of legitimacy and administrative cultures. Through successive Great Surges of Development, the landscape becomes a layered constellation that shapes the evolution of socio-technical systems over long stretches of time.

In their exemplary case of mass manufacturing, Kanger and Schot (2019) delineate the new technical possibilities for mass production as a new managerial common sense, shaped by World War II (which showed the benefits of mass production for the production of military goods, including vehicles) and the aggregation and intermediation work of key actors and programmes. In terms of outcomes, they consider the success of mass production to have contributed to "beliefs about continuous societal progress, technology-fuelled economic growth and consumer expectations of the availability of an increasing variety of goods at lower prices" (Kanger and Schot, 2019, p. 13) and "a throwaway consumer culture" (ibid, p. 9). This exemplifies the deep, transversal transition dynamics generated by successive techno-economic surges.

The 'Industrial Modernity' constellation comprises "1. Separation of Nature and Society; 2. Efficiency, order and control over one's environment as fundamental and positive values; 3. Instrumental view of nature as a resource to be harnessed and manipulated by humans for humans; 4. Belief in general societal progress through the application of machines and Reason, resulting in emancipation, empowerment and self-realization" (Kanger and Schot, 2019, p. 12). It manifests itself in the prioritization of labour productivity over resource efficiency, the acceptance of technological displacement, and the widening of the distance between production, distribution and consumption activities in global value chains. The indicated elements of 'industrial modernity' capture a great deal of the structures diagnosed in studies on socio-technical systems of energy, mobility and agriculture. The example of mass manufacturing substantiates how the DT framework supports the analysis of transversal transition phenomena.

The specific issue that remains underexposed is the *directionality* of deep transitions. As Stirling (2011) emphasizes, transition pathways are contingent. They involve contestations between different worldviews and interests. Instead of focusing entirely on the cascades of innovation that converge into clear-cut and singular regime shifts, transition analysis should remain attentive to the multiplicity of directions that a transition process may take. To be sure, the DT framework works with an evolutionary logic that is far from deterministic. It addresses directionality explicitly. Schot & Kanger (2018, p. 8) consider how the diversity of current socio-technical niches make for undercurrents that contain the seeds for alternative, sustainable and just directions of development. Kanger & Schot (2018, pp. 15-16) describe a 'portfolio of directionality' that, throughout subsequent surges and notwithstanding the alignments across sectors, becomes broader over time. Along the formation of 'regimes' and 'meta-regimes', niche alternatives are not considered to just perish or become absorbed. Instead, these alternative directions may manifest after periods of hibernation, or they break through locally. DT analysis thus acknowledges for example that alternatives to (traditional) mass production, even in the USA,

¹ The five technological revolutions (techno-economic paradigms) noted by Perez (2016) are: the industrial revolution; the age of steam and railways; the age of steel, electricity and heavy engineering; the age of oil, automobile and mass production; and, the age of information and telecommunication.

“thrived in particular locations and industries, enabling them to be scaled up when needed (e.g. lean production in the 1970s)” (Kanger & Schot 2018, p. 16).

However, the DT framework displays a rather reductionist understanding of directionality. It reduces the matter to analytical openness, minding the evolutionary multiplicity of a transformation trajectory (e.g. towards, or away from, mass production). The normative reflection remains tied to a particular direction that a transition process should be taking (Köhler et al., 2019). Yet what is needed is a more fundamental attending to the multiplicity of possible socio-technical configurations that may emerge, to the different process dynamics that may unfold, and to the different (competing) normative appraisals – by stakeholders and by analysts - of outcomes (Pel et al., 2020). Stirling (2009, 2011) underlined the need to unfold evolutionary diversity in a way that clarifies the normative implications of this diversity. To articulate directionality is to increase evaluative diversity (Stirling, 2008: 268), opening up the wickedness and the ambiguities of transition issues.

Accordingly, we identify three limitations in the articulation of DT directionality:

- 1) a focus on evolutionary convergence. Notwithstanding its capacity for empirical accuracy, DT analysis remains rather broad-brushed. It highlights, to use the terms of Pettigrew (1997), mostly the riverbeds between which transformation processes unfold. The junctions in the river, let alone the navigation of it, stay out of view. The strong attention to ‘sedimentation’ dynamics exemplifies the altogether ‘geo-morphological’ perspective on the rivers of change, focusing on the most solidified structures that remain over time. Evolutionary divergence tends to be treated less as directionality and more as variations on a theme: Regarding the ongoing ICT-based Surge it is for example highlighted (Kanger & Schot 2018, p. 16) how it reproduces the social inequalities and modes of production of the ‘first DT’. By contrast, accounts of the ‘digital transition’ testify to the more complex interplay between transformative and system-reproductive tendencies at issue (Andersen et al., 2021).
- 2) the materialism of the framework. This is evident in the treatment of the effects of WWII, as inducing “the tighter integration and coordination of multiple sociotechnical systems in a similar direction”. It also emanates from the account of the ICT-based Surge as a development driven by mass production (highlighting the mass production of microprocessors, hard drives, computers or mobile phones). By contrast, Nicholls & Murdock (2012:2) interpret the ICT-based fifth Surge as leading into a sixth wave of macro-level change in which social innovations (for example in the organization of work) take over the earlier direction-defining role of technological innovation. That interpretation finds support in the analysis of transformations regarding circular economy, sharing economy, and the financialization of the economy, whose developments revolve around the orgware, social relations and power structures that are developing along with the technical affordances. This hints at an important driver: changes in social relations that are pursued for reasons different from efficient technology deployment. Newell & Sims (2020) argue similarly that a second DT may revolve relatively more strongly on shifts in governance, financing, mobilisation and culture. The importance of non-material vectors of directionality, involving social innovation and democratization, is more evident in the ‘Transformation pathway’ (Kanger & Schot 2018: 12). Associated rather exclusively with one possible scenario in the emerging second Deep Transition, this shows how socio-economic directionality remains a sideshow.
- 3) the normative dimension of directionality. The current fifth Surge is again exemplary. Although this transformation process is surrounded with ambiguities, as Schot (2020) acknowledges, the convergence-focus of the DT framework manifests here as well: divergent normative appraisals remain secondary to the meta-rules that gain hegemony. It is also analytically problematic to amalgamate the diversity of alternative developments (and the directionality that has not yet been settled) into ‘counter-movements’, ‘niches’ or ‘grassroots’ movements, or as increasing or decreasing levels of contestation (Kanger & Sillak, 2020, p.3). The key point is that any diagnosis of evolutionary convergence or divergence has to account for phenomena of sustained systemic contradictions, institutional tensions, and socio-economic challenges (Pel et al., 2016; Westley et al. 2017). This is not a matter of ‘alternative economies’ with greater or lesser evolutionary success, but of tensions occurring throughout ‘regime’, ‘landscape’ or ‘meta-regime’ levels. Within the evolution of mass production (as a meta-regime of the first DT) there are the significant varieties between for example ‘Fordism’ or the ‘Toyota production system’, and differences in worker-employer relations (Kanger & Sillak 2020, p. 7). In the discussion of work and employment, DT analysis lacks normative depth regarding ambiguous developments such the rise of people management, the rise of the ‘precariate’, and the self-disciplining of workers. These issues of socio-economic directionality underline Stirling’s (2011) insistence on the normative implications of transitions directionality.

To address these limitations, we develop a more elaborate understanding of directionality in DT. We address the observed limitations (convergence-focus, materialism and shallow treatment of the normative dimension) through an analysis of socio-economic directionality. Building on a broad literature in critical social theory, work sociology, cultural political economy, emancipation and (transformative) social innovation research, we identify four key issues of socio-economic directionality. These issues help to analyse the important issues of contestation, opposition and collective action underlying DT processes. Our analysis discusses socio-economic directionality developments in late modernity (Giddens, 1990, 1991), with special attention to its significance for contemporary and future deep transitions.

3. The marketisation of society

According to sociologists, economists and political philosophers, society (including family life, communities and the public domain and semi-public sectors) has become more market-like. Examples of marketisation are the legal obligation of tendering in public procurement, managerialism, free trade agreements, privatization, financialisation (the growing influence of the financial system on the economy), infotainment and meritocracy as an ideology (being rewarded for personal achievement). Marketisation is exemplified

and transmitted by the WTO's principles for trade as a formal regime "to ensure that trade flows as smoothly, predictably and freely as possible". There is a long and diverse literature about the negative consequences of marketisation for society.

In "The Great Transformation. The Political and Economic Origins of Our Time", Polanyi (1944) describes how the commodification of labour, land and money led to the 'disembedding' of economic processes from their social context. As a result, social relations became increasingly subordinated to the logic of markets, instead of the economy being subordinated to politics, religion and social relations.² He developed the notion of a "double movement", where disembedding of economic processes co-evolves with increased protection to deal with the negative aspects of *laissez faire* (Block, 2008).

Several philosophers have expressed their concern about intensified marketisation of society in late modernity, such as Habermas (1984), Walzer (1983), Anderson (1990), Sandel (2012) and Satz (2010). According to Sandel (2012, 2013) since the 1980s societies drifted from a market economy to a market society, where even sanctified goods such as kidneys get traded and in which parents pay their children to do domestic tasks. He argues that markets have the potential to corrupt ourselves by crowding out our altruistic motivations for performing certain actions. Satz (2010) agrees with Sandel that markets shape our culture, but adds that it does so in positive and negative ways: instances of marketisation may foster or impede the development of human capacities, and sustain or undermine valuable forms of human relationships.

Marketisation has its own dynamic and effects that cut across sociotechnical systems. It is generally thought to drive organizations to short product cycles (planned obsolescence) with an excessive exploitation of natural resources, fueling consumerism through advertising and by holding up materialistic images of success and pleasure (Jackson 2017). Furthermore, marketisation turns people into individuals (not only as workers but also as consumers) through job performance standards and celebration of stars in commercially driven media (Verhaeghe, 2012, Kasser, 2003, Sennett, 2006).

In our view, the DT framework (and transition research more generally) neglects marketisation as an important transversal development with transformative effects. Marketisation is underpinned by specific institutions and rules: the World Trade Organisation rules, the open market and competition rules of the EU, but also by hegemonic beliefs of economic elites about the desirability of competition, open economies and economic liberalisation. Evidence of this transversal influence comes from evaluations of Dutch energy transition policies by Kern and Smith (2008) and Kern and Howlett (2009). These studies reveal how (EU-based) liberalisation of the energy sector constituted a more dominant landscape factor than sustainability, and worked against attempts at transition management by the Dutch government. Furthermore, Fünfschilling and Truffer (2014) note the growing influence of the "Water Market Logic" in Australia (the focal country of their analysis) as a new field logic, gaining prominence over the "Hydraulic Logic" (based on security of supply, national welfare and social equity) and the "Water Sensitive Logic" (based on environmental sustainability, prominent in community projects).

Despite the transversal operation of marketisation and the convergence into a marketised society, there are also countervailing trends and persistent variations. The persistent existence of varieties of capitalism (Howell, 2003) and alternative economies (captured in the notion of diverse economies of Gibson-Graham, 2008) speak against a (strong) convergence in economic order. Marketisation based on efficiency, managerialism and narrowly defined gain-seeking actions (and the neglect of negative external effects) experienced a rising trend after 1980, but it meets with growing resistance and conflicts with other institutional logics (Thornton et al., 2012) and alternative views of organizing society. Anti-capitalism is presently showing a rising trend and is combined with new social imaginaries, for example a "well-being economy" based on the SDGs (Felber, 2019; Abrar, 2021). Anti-capitalism also speaks from calls for "rebalancing society" (Mintzberg, 2015) and a "natural social contract" (Huntjens, 2021). Accumulating dissatisfaction by elites and the public can be expected to act as a source of change (a landscape change in the form of criticisms and proposals for reform and protection). At the same time, we should acknowledge, that the reliance on markets for economic production is firmly established. It creates barriers to alternative forms of economy that are being experimented with, based on responsibility, values of equality and cooperation (in section 7 we discuss a third possibility: the expansion of a hybrid sphere as an important phenomenon, based on hybrid institutional logics).

4. Changes in the employment relation

During the last century, relations between employers and workers underwent significant change. The DT framework raises attention to this set of transversal developments – yet it focuses mainly on social-material tendencies towards convergence, with lesser sensitivity to the broader socio-economic directionality.

According to Kanger and Schot (2019) rules of electrification, work process optimization and subdivision of tasks resulted in a regime of mass production used in car manufacturing and other sectors. The focus is on work tasks. Less attention is paid to the social relations in which these tasks are embedded, and these have undergone important changes in the past 50 years. In an overview article, Barley et al. (2017) note three changes regarding work and the employment relation. First, from the 1970s onwards there has been a shift of manufacturing jobs to new industrializing countries. A more recent development is the offshoring of professional and technical jobs to countries such as India. Second, there has been a growth of "contingent work", defined as "forms of employment tied to the completion of a specific task and, hence, of relatively short duration". Contingent work "covers workers in a variety of employment

² Polanyi saw capitalism and democracy as based on irreconcilable logics. His explanation of the rise of fascism is somewhat one-sided in the focus on the capitalism-preserving element, neglecting the mass movement element of the "disaffected petit bourgeoisie over whom socialists had failed to exercise hegemonic leadership" (Dale and Deason, 2019, p. 166). Polanyi's work predates sociological contributions on late modernity and psychological work on self and identity (discussed in section 6).

relationships including independent contractors who are self-employed, contractors who “pass through” staffing agencies that act as employers of record and temporary workers who are also placed by staffing agencies”. Contingent workers include those working in the “gig economy”: Typically obtaining their jobs through online platforms, these workers may never meet their “employer”.³ Third, there has been a rise in project-based forms of organizing across employing organizations, partitioning jobs into (unique) activities with a beginning and end. First appearing in the construction, consulting, aerospace, and defense industries, “project work is now becoming a predominant form of organizing in high-tech industries, and it is spreading into banking, retail and other sectors of the economy”. Project work and loose employment relations can be viewed as niche elements that are diffusing in many sectors. Even if they have not yet converged into a stable meta-rule, they amount to developments relevant for DT.

An additional socio-economic trend is the rise of Human Resource Management. HRM aims to align employee performance to the goals of the organization, with employee concerns very much a secondary consideration (Guest, 2017). Employee recruitment, training and development, performance appraisal and rewarding (e.g., managing pay and benefit systems) are typical HR activities (Paauwe & Boon, 2009). Fevre (2016, p. 145) speaks of “people management”, which “encompasses the rise of personnel and human resource managers but also includes the legal framework under which work places and labour markets operate”. According to Turbey et al. (2015), HRM serves the twin goals of maximizing the value from workers and minimizing the influence of unions. Although the emergence of HRM and associated activities of work surveillance are not mentioned by Schot and Kanger, they clearly constitute a new managerial common sense or meta-rule, increasingly facilitated by information technology. From a work relation perspective, they involve a more individual relationship, with a reduced role for unions.

With regard to work autonomy, this seems to have increased for high-educated workers and reduced for lower-educated workers. Especially the tasks of the latter are carefully monitored. This is especially true for the social care sector, where workers are being put under a system of time-based tasks for reasons of efficiency and billing. In terms of directionality, this points at two developments that head in quite different normative directions: autonomy and disciplining. Autonomy is related to liberal values of freedom and well-being that recognizes psychological needs and to human resource management theories saying that employee productivity and motivation will be increased by job autonomy. This is in contrast to management theories that seek efficiency improvements in controlling ways. Disciplining occurs in two ways, via self-disciplining and external disciplining. In the framework of Schot and Kanger, the self-disciplining of workers might be viewed as a new institutional practice, together with their legal rights. Yet the ambiguities and contradictions of the autonomy/discipline developments remain rather under the surface. Others discuss these developments in terms of subjectification and as normative internalization (Perez-Zapata et al., 2016 based on Foucault, 2004). These more detailed discussions demonstrate how there is no evidence of a clear-cut convergence, but rather “a hybrid trend of both convergence and divergence in the use of a broad range of HRM practices across market economies over time” (Ligthart and Farndale, 2018).

In the DT framework, issues of work and employment relations tend to be treated too much as matters of technical skills. This obscures the associated developments of changing social-economic relations and power structures, and the emergence of social innovation niches and state-based responses of protection.

5. Liberalism as an important transversal (historically and spatially diverse) development

The past 200 hundred years have not only witnessed the creation of industrial modernity, but also the birth and growth of liberalism (with different variants thereof). In this section, we discuss liberalism as an important development for socio-cultural and socio-economic relations. The emergence of liberalism is connected to the turmoil and consequences of industrial capitalism and changing beliefs about human character and progress. According to Fawcett, as a system of ideas, liberalism is based on four ideas: i) acknowledgement of inescapable ethical and material conflict within society, ii) distrust of centralization of power in governmental institutions, iii) faith in human progress, and iv) respect for people independently of what they think and who they are (Fawcett, 2014, pp. xii-xiii).

Originally, liberalism freed individuals from the constraints of traditionalism and tyrannical rule at a time where religious institutions and traditionalist regimes lost legitimacy in an industrializing and secularizing society in the sign of rationalism, competition and enlightenment. In late modernity neoliberalism emerged as a particular interpretation of liberal principles. As articulated and implemented by dominant US and UK political parties, it had a transversal impact in facilitating “individualistic value orientations based on self-interest and personal opportunities” (Madsen, 1997, p. 197). This was countered by social liberalism, pairing self-actualisation with concerns for the well-being of others and a commitment to equal opportunities.

As a dialectical countercurrent, the new discourse on flourishing, purpose and immaterial forms of well-being (which builds on liberal theory (Mautner, 2018) and positive psychology (Ryan and Deci, 2000)), gives more prominence to aspects of personal autonomy, human dignity and relatedness in work and social interaction. Historically, social innovation consisted of mutual support associations such as insurance schemes against disease, cooperative banks and worker cooperatives. The creation of a modern welfare state and commercial banks reduced the need for those. However, new circumstances and technologies led people to re-introduce elements of support associations into forms of production and consumption (de Moor, 2011; Pel and Kemp, 2020).

It is a key research task for DT to understand the continued transversal effect of liberalism and its countercurrents. One area of

³ Standing (2011) speaks in relation to this of the rise of a new emerging class (next to “The Salarate”): “The Precariate”, consisting of people in precarious jobs, lacking seven forms of labour-related security. The Precariate includes migrants and low-skilled workers but also university graduates doing internships with no or bad pay in the hope of landing a better job.

particular interest is the cultural political economy of consumption. Trentmann (2017) documents the changing nature of consumption. The basic functions of nourishment and subsistence have become accompanied by functions of self-fulfillment, identity formation and lifestyle. Transition research has paid little attention to the evolution of preferences, desires and immaterial needs. Current analyses of excessive consumption and responsible consumption reveal that consumption is subject to moral evaluation with growing attention to climate change and duties of responsibility. This constitutes in certain ways a return to social liberalism with an important role for virtue and duties.⁴

The heritage of liberal beliefs is important to acknowledge in the first Deep Transition. It consists of faith in human progress, belief in human rights, demand for autonomy (which is developing into a human right). The perception of rights is deeply ingrained in people and may act as a source of opposition to energy transition policies, even when they agree with the goals of the need. Liberalism has to reassume forms with a more important role for duties. This is already reflected in the discourse on the responsibility of business and economic reform (Mason, 2015; Standing, 2015; Mintzberg, 2015; Monbiot, 2016; Collier, 2018; Felber, 2019).

6. Emancipation and the orientation to normative ideals

The Deep Transition Framework speaks of Industrial Modernity. Little attention is given to emancipation and the changing wants and needs of people, in particular wants for self-determination and orientating life to normative ideals, as constitutional elements of postmodernity or late modernity (Giddens, 1991). In discussing the double movement model of Polanyi (discussed in section 3), Nancy Fraser (2013) contends that it fails to give attention to “the extraordinary range of emancipatory movements that erupted on the scene in the 1960s and spread rapidly across the world in the years that followed: anti-racism, anti-imperialism, anti-war, the New Left, second-wave feminism, lgbt liberation, multiculturalism, and so on”. These “new social movements” (Scholl, 2014) differ from “older” ones, especially the worker movements, in having a greater focus on immaterial issues. This shift has been related to the broader post-war shift from industrial or material to postindustrial and postmaterial societies (Inglehart, 1977; Touraine, 1974). The orientation to normative ideals is visible in the rise of collective alternative everyday practices (CAEPs), such as community gardens, clothing swaps or repair cafés (Deflorian, 2021) and green consumption. The feminist credo ‘the personal is political’ is embraced and lived by these new social movements and practices. Various scholars have pointed out that contemporary activists not only loudly express their ideals, but also implement these ideals, if only for a moment, as a lived practice (Yates, 2015; McDonald, 2002; Deflorian, 2021).

Of the movements of the last century, emancipation is probably the most influential phenomenon of late modernity. Although the second-wave feminist movement is probably the most well-known case, ‘emancipation’ as a form of liberation is pursued by diverse social groups with ascribed identities based on social ordering principles, such as gender, sexuality, race, ethnicity, class, age, dis/ability etc. Since all these social ordering principles can result in exclusion and domination, the societal process of emancipation has continued and diversified. New oppressive relations are being discovered and addressed by groups in the process of emancipation. Hence, emancipation – as a process of breaking with oppressive relations/ communities and building more egalitarian ones - can be considered an ongoing process and constituent directionality for future evolution (subject to counter-reactions).

In the process of emancipation Fraser (1995) sees a shift from a politics of redistribution to politics of recognition. Two types of freedom are being sought: negative freedom from identity-based oppression (“emancipation”), and positive freedom of creating their own self-chosen and of identity-based communities, such as the exemplary gay community in San Francisco’s Castro district (Duyvendak, 2011). This second move – of finding or creating a meaningful community – is often underestimated or even forgotten. Extreme individualization can therefore also be seen as an outcome of uncompleted emancipation processes from traditional and oppressive social relationships of various groups in society. The wants for autonomy and community are not easily reconciled. In a market society in which professional occupation and place of residence are short-lived, community life is undermined and temporary. Nuclear disasters and the rise of counter expertise about almost everything gave rise to subpolitics of contested expertise (Beck, 1992; Collins, 2014).

In Kanger and Schot (2019), emancipation, empowerment and self-realization are mentioned in a table (where they are strangely linked to ‘Reason’) but not taken up in the analysis. To us, the described emancipation struggles are important socio-economic developments that co-shape the direction of transitions in various economic sectors and systems. As changing informal institutions, they indicate emerging ‘rules’. The quests for emancipation indicate normative aspirations that are guiding people’s life in individual and collective ways. Presently, we observe a growth in collective alternative economic practices based on citizenship and volition. They may become more politically assertive over time and the basis for alternative forms of production and consumption, but also remain marginal. Identities are less given and static but becoming self-reflexive and assertive (and a source of conflict). This will affect the employment relation, the acceptance of transition policies and gives rise to citizenship action in the form of energy cooperatives and protests such as Fridays for the future. The directions in which emancipation struggles and citizen-based doings may take us are thus remaining highly uncertain, yet their importance for socio-economic directionality is evident.

⁴ Moral duties always were part of liberal thought: “At heart, most liberals were moralists. Their liberalism had nothing to do with the atomistic individualism we hear of today. They never spoke about rights without stressing duties. Most liberals believed that people had rights because they had duties, and most were deeply interested in questions of social justice. They always rejected the idea that a viable community could be constructed on the basis of self-interestedness alone. Ad infinitum they warned of the dangers of selfishness” (Rosenblatt (2018) quoted in Hodgson (2021)).

7. Different economic responses to transformative impulses

In the previous sections, we discussed four transversal developments that merit stronger attention in the DT framework: the marketisation of society, (changing) employment relations, liberal beliefs and emancipation and the orientation to normative ideals. Across sociotechnical systems, imperatives of profit-making favoured production modes with little regard of environmental consequences. Yet in late modernity those are criticised for a range of reasons: well-being, inequality, environmental responsibility and justice. This raises doubts about the very usefulness of the term “industrial modernity”. As a container concept it obscures the complex interactions between various elusive but important developments, which include the orientation to immaterial values and human flourishing, success being seen as an individual achievement, anxiety about inequality and injustices, the sustainable developments goals as a point of orientation and use of “Beyond GDP” well-being metrics by statistical agencies. If continuing to investigate the relationship between economy and society from a purely socio-technical perspective, DT research is at risk of overlooking the four developments we have discussed. These are summarized in [Table 1](#).

[Fig. 1](#) shows the observed and hypothesised responses to transformative impulses in the global economy and the expanding alternative (diverse) economy based on values of doing good, co-ownership and absence of hierarchy and subordination. Salient differences of the ‘two’ economies are: in the global economy, renewable energy is profit-driven, in the alternative economy it is foremost value-driven. In big corporations, demands for responsibility and equal opportunity are taken up through a metric-approach, whereas in the alternative economy (of cooperations and mutuals) they are lived and dealt with without formal rules. Ownership is more collective in the alternative economy and transactions are (more strongly) governed by ethics. A partial convergence of the capitalist economy (based on institutions of meritocracy and surveillance) and the non-and-less capitalist economy is occurring, in the form of a hybrid sphere ([Huntjens and Kemp, 2022](#)), with hybrid value systems and associated business models and forms of governance, which combine different logics. Examples are businesses which are value-based, NGOs which are turning entrepreneurial, platforms for stakeholder interaction. The adherence to values of citizenship, relational autonomy, self-development and responsibility (prominent in the alternative economy and hybrid sphere) contrasts with the more adaptive responses in the shareholder economy. Distinctive differences will remain, because a wholesale replacement of capitalism is not on the agenda and unlikely to happen. Diversity, self-organisation and non-capitalist forms of work are prominent features of the less-capitalistic economy.⁵ The diverse economic forms co-exist and interact in ways that beg further research, but which includes dialectic change in the form of thesis-antithesis-synthesis. Examples of this are: commercial companies becoming B-corps and learning to work with NGOs (with the help of sustainability labels and business models based on multiple value creation) and the creation of new governance models (such as commoning and citizen juries).

Within the literature on social innovation there are those who see the alternative economy as a response to neoliberalism and inhuman state policies (as two sources of alienation) ([Laville and Delfau, 2000](#); [Moulaert and Ailenei, 2005](#)) and those who see it as a long-existing phenomenon ([Gibson-Graham, 2008](#)). Research on transformative social innovation ([Avelino et al., 2018](#); [Pel et al., 2020](#)) and self-determination brings out another motivation for people to join TSI initiatives, which is that they fit with basic human needs for autonomy, relatedness and competence (mastery) ([Ryan and Deci, 2000, 2006](#)) and demands for coherence and congruence as important aspects of personality integration ([Sheldon and Kasser, 1995](#)). Wishes for “knowing your farmer, knowing your food” ([Duffhues et al., 2020](#)) and participation in (nature inclusive) community-supported agriculture offer a different lens on transitions by putting the focus on social relations and identity constructions in a world of different and changing institutional logics. The focus on personal life facilitates more grounded exploration of modernity than theoretical ‘grand’ narratives ([Heaphy, 2007](#)) and helps to move away from simple categories of people as workers, consumers and voters. An important avenue for research is how consumerism (materialistic lifestyles) became ‘sedimented’ across social groups and economies, and counter-reactions in the forms of downshifters and the various motivations and reasoning of political consumers. The role of consumer choices as a shaper of transformations in societal subsystems and the diminution and ascendance of diverse economies is worthy of more research (by transition researchers).

For the Second Deep Transition the following processes are believed to be important: 1) growing dissatisfaction by lower-income workers about their own economic prospects, who are supported in this by elite people (public intellectuals and populists who are objecting to objectionable aspects of the status quo), 2) greater attention to justice, virtue and fairness (which is related to the previous issue and to the growing importance of post-material values in late modernity) and 3) a search for alternative economic practices and stronger (moral) duties for businesses, citizens and government (formal ones and informal ones). For taking up the interaction of those processes the dialectical framework of Institutional Contradictions, Praxis, and Institutional Change developed by [Seo and Creed \(2002\)](#) is believed to be useful in drawing attention to (multi-level) incompatible institutional processes, contradictions causing a reshaped consciousness and praxis as a source of economic and institutional change. The outcomes of such interactions, however, are unpredictable, since they are conflict-ridden and full of tensions. Because of this, socio-economic development does and will not follow

⁵ A recent investigation of the new/alternative economy elements of 20 networks of transformative social innovation resulted in the identification of four types of new/alternative economy thinking: 1) degrowth and localisation, 2) collaborative economy, 3) solidarity economy, and 4) social economy and social entrepreneurship ([Avelino et al., 2015](#), [Longhurst et al., 2016](#)). The diversity of the alternative economy is confirmed in the article “One Transition, Many Transitions?” by [Feola and Jaworska \(2019, p. 1653\)](#) who found important differences amongst four transition networks with regard to the desired role of the state, the degree of reform or radical innovation, the use of emotional words, explicit opposition to capitalism and importance of economic growth. According to [Gibson-Graham and Domboski \(2020\)](#), the economy always has been diverse, with capitalist firms co-existing with green and socially responsible capitalist firms, non-profit enterprise, social enterprises and producer and consumer cooperatives.

Table 1
Socio-economic directionality: Developments neglected in the DT framework.

Socio-economic developments	What it consists of	System-evolutionary effects
Marketisation	Expansion of market logics in other domains	Social relations are becoming more transactional; efficiency thinking led to new public management, legal obligations for tendering; meritocracy and competition is crowding out altruistic values; the informal economy is marginalized (paid jobs and careers are favoured over unpaid work) despite the useful services to society in the form of providing care to others. Marketisation is strongly supported by a global economy and by ideas that success is a personal achievement
Changing employment relation	Use of people management and reduced power of unions and precariate work	Work relationships are becoming more individual and precariate and a source of inequality and anxiety. Autonomy is increasing for high-income workers and reduced for low-income workers who are subjected to surveillance
Rise of liberal beliefs	Rise of various forms of liberalism: social liberalism, individual liberalism and anti-state beliefs	Faith in human progress, belief in human rights, demand for autonomy (which is developing into a human right), attention to the limits of concentration of power (especially state powers). There is less trust in state-based solutions and elite expertise
Emancipation	Emancipation of workers, followed by emancipation of women, minorities, who oppose dominating structures	Emancipation movements and social struggles against structures of domination. Modernity is no longer industrial but increasingly liquid (identities and activities of people change when they change jobs, move to other countries and come into contact with other cultures). Identities are becoming self-reflexive and assertive (and a source of conflict)

a neat pattern of convergence.

8. Conclusions

In this paper, we engaged critically with the framework and thesis of a Deep Transition, the transition from a pre-industrial society to “industrial modernity” and the possibility of a second Deep Transition.

We find that the Deep Transition framework of rules, meta-rules, meta-regimes, functional and structural coupling of systems and aggregation activities offers a useful meta-framework for analysing historical epochs in a multidisciplinary way with special attention to newly emerging and changing directionality and mechanisms around socio-technical change. A strong element of the framework is the connection to concrete, tangible socio-technical change in the form of artefacts and practices of production and consumption.

However, the framework is underdeveloped in considering the interplay between irreconcilable institutional logics of marketisation, surveillance and profits with logics based on responsibility, human flourishing, empowerment, fair pay and human needs for autonomy, relatedness and purpose (in work and life more generally). As a result, the DT framework is revealed to be overly materialist, neglecting normative diversity and structures of domination in the landscape (which are related to technical change but also to changing social relations and orientations). Appendix A evidences the material bias, and supplies the socio-economic diversity we have identified and described in sections 3 to 6.

Our second criticism is that the authors overemphasise evolutionary convergence. The ‘evolution of a portfolio of directionality’ that Kanger and Schot articulate (2018: 17) displays an increasing diversity of alternatives over time, but this diversity grows along a firm backbone of path dependency. It exhibits a singular understanding of transitions that has been rightfully criticized by Stirling (2011). The convergence in products and manufacturing technology, driven by competitive pressures, is taken as evidence for convergence in rules. Grassroots innovation is mentioned as an example of diversity, but the co-existence of different irreconcilable institutional logics in organisations and society is insufficiently acknowledged.

Our third criticism is related to the second one: even in the case of convergence, there exists a multitude of value orientations and logics at any time (a remaining research task is to map out the diversity of these in different time periods). A surge based on values of responsible action, democracy and collective ownership is imaginable, but is up against the logic of market-based coordination and state policies that attach great importance to growth in material well-being.

Fourthly, we feel that the DT framework of rules, regime and systems as articulated by Schot and Kanger runs the risk of reification and reductionism. The durability and coherence of rules cannot be assumed, but rather constitutes a topic for empirical research, which should then pay attention to their emergence, the motivations of actors for initiating them, and the components of translation as identified in Actor-Network Theory: ‘problematization’ (defining a problem for which a particular technology is a solution), ‘inter-essement’ (getting others to accept this problem-solution), enrolment (defining the key roles and practices in the network), and mobilisation (engaging others in fulfilling the roles, undertaking the practices and linking with others in the network) (Callon, 1986). Attention to such aspects helps to avoid “reification, naïve realism and thin and myopic analysis of social process” (Lounsbury et al., 2021, p. 263).

Finally, we are critical of the apparent discontinuity in conceptualisation of a first and second Deep Transition. We consider the drivers of the second Deep Transition (climate change and inequality) to be rather restricted, as we also observe responses to the ‘alienation’ that results from marketisation, surveillance and meritocracy. These responses include calls for basic income and more relational (value-based) forms of production and consumption (Mason, 2015; Standing, 2015; Mintzberg, 2015; Monbiot, 2016; Collier, 2018; Felber, 2019) and alternative economy networks and movements (e.g., Slow Food, Shareable, ecogood.org, weall.org).

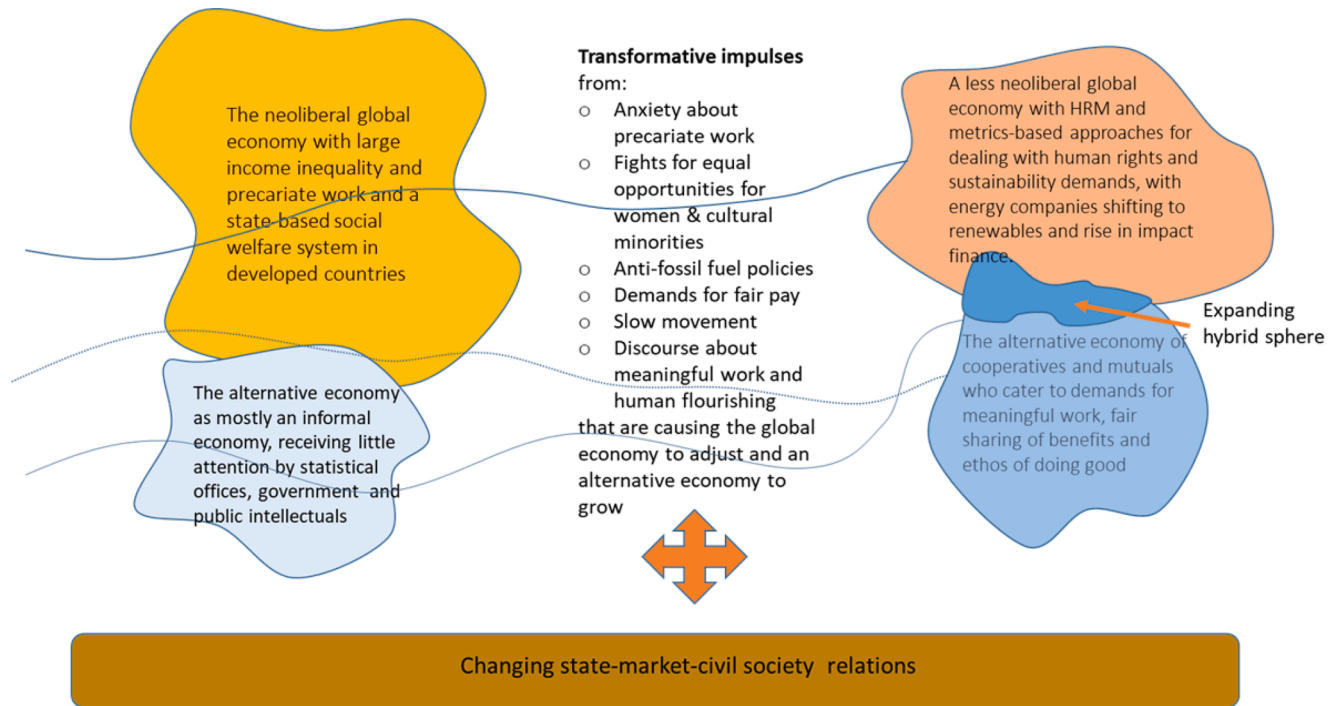


Fig. 1. The different responses to transformative impulses in the neoliberal global economy and the alternative economy in late modernity between 1960 to 2020 Legend: the lines visualise the historical dynamics with which the evolution of diverse economies is associated.

We expect the transformative impulses from the imperatives listed in Fig. 1 to lead to a combination of regime reproduction, adaptation and transformation, with transformative change not just occurring in niches but at various scale levels).

To us the concept of a Deep Transition and the set of mechanisms that Schot And Kanger have postulated are useful to understand transversal developments in sociotechnical systems only when they are applied with sensitivity to the dialectical nature of directionality that characterizes both sociotechnical and socio-economic developments. Rather than assuming convergence around an overarching direction, important questions are:

- 1) What types of complex change processes can be usefully conceptualised as a transition, and what types are better understood as (interrelated) diverse transformations (Stirling, 2011; Pel et al., 2020)? Examples such as just transition (Swilling, 2020), the transformation of socio-ecological systems (Olsson et al., 2006) and the Well-being Transition (Abrar, 2021) are offering a different lens on creating sustainable well-being via transformative change. Such labels and approaches speak to a pluralist understanding of transitions, which acknowledges that there is a diverse directionality in transition processes, because the transformative nature of transformations causes them to be “messy and unruly political re-alignments” (Stirling, 2014).
- 2) How can the Deep Transitions framework provide a basis for the analysis of ongoing complex change processes? The epistemology of historical research has not yet been mobilised in the development of the Deep Transitions framework, and doing so can help to improve the understanding of the possibilities (and limits) of theorising long term societal change, specifically the extent to which such theorising can be used as a basis for mapping emerging transformations. In our view, historical research will also reveal the changing economic order and changing cultural wants (mentioned in this paper).
- 3) How are the dynamics of Deep Transitions affected by the temporal and spatial embeddedness of socio-economic and socio-technical developments? Like Schot and Kanger, in our argument we have by and large abstracted from this embeddedness, focusing on late modernity (i.e. 1960-2020) in high-income countries. Future research needs to be attentive to the consequences of spatial and temporal dispersion of these developments (Harvey, 1990; Binz et al., 2020), as this can affect the operation of the mechanisms identified in the Deep Transitions framework
- 4) What existing theorising can be mobilised to avoid the reified approach to rules and regimes that characterises current articulations of DT? Such theorising needs to accommodate both sociotechnical and socio-economic developments. As one example, the perspective of institutional logics (Thornton et al., 2012) constitutes a useful avenue to help understand the dialectic nature of directionality that we have shown. Already used by transition scholars (Fünfschilling and Truffer, 2014 and Smink et al., 2015), this perspective permits an integration of the meso- and macro-levels consistent with the DT perspective, but with more attention to the presence of multiple ‘institutional logics’ in regimes and niches and the dialectics of change.⁶

As argued in this paper, attention to the dialectical interplay between sociotechnical and socio-economic developments, in an empirically rich and theoretically informed way, will augment our insight into long-term societal transformations.

Authorship

The International Committee of Medical Journal Editors (ICMJE) recommends that authorship be based on the following four criteria:

1. Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work;
AND
2. Drafting the work or revising it critically for important intellectual content; AND
3. Final approval of the version to be published; AND
4. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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⁶ Dialectics of change are considered in cultural political economy (where Marxists have long-pointed out the contradictions of capitalism), but one should also not overlook the cultural contradictions of anti-capitalism, in particular the clash between the emancipatory individual and community-based values of solidarity and mutual support (Fletcher, 2017).

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Research ethics

We further confirm that any aspect of the work covered in this manuscript that has involved human patients has been conducted with the ethical approval of all relevant bodies and that such approvals are acknowledged within the manuscript.

Appendix Table A1: Diverse developments: techno-economic and socio-economic ones

Developments of the first Deep Transition mentioned by Kanger and Schot (2019) ⁷ , mostly techno-economic	Socio-economic developments mentioned in this paper (dominant ones and counterreactions) in Late Modernity
1) Reliance on fossil fuels and non-organic inputs, increasing energy and resource-intensity, ecological footprint and waste production.	1) Intensified marketisation, the process of making social relations more market-like (transactional and competition-based).
2) Mechanization and increasing knowledge-intensity of individual technologies and socio-technical systems.	2) The widespread use of HRM as a system of performance measurement and evaluation, leading to self-disciplining and feelings of self-responsibility.
3) Increasing use of formal science as a direct input to technological research and development activities	3) Meritocracy as a widely accepted cultural and economic rule, which is contributing to cultural clashes.
4) Emphasis on labour productivity as a prime metric of efficiency in production (vs. resource efficiency).	4) The rise of a new emerging class: "The Precariat" (which includes skilled self-employed people).
5) Normalization of temporary unemployment due to technological displacement, involving a constant pressure towards the upgrading of education and skills.	5) Demands for autonomy and emancipation (both of which have to do with self-expression values and liberalism).
6) Widening distance between production, distribution and consumption activities as they have increasingly come to be organized on a global level in global value chains	6) Globalisation and shareholder capitalism are a long-time target of criticism, which increased in the 1990s and 2010s.
7) Preoccupation with economic growth as end and means on the state level as indicators of "societal progress" and "development".	7) Ecological and emancipatory movements managed to institute state policies of environmental protection and liberal freedom.
8) Increasing investments in R&D by the State, the results of which are appropriated by the private sector under the rubric of innovation.	8) Governments have introduced climate mitigation policies and are accepting the need for transformative change. They are mindful about distributive effects and willing to accommodate demands for a Just Transition.
9) A largely reactive approach to the consequences of science, technology and innovation: impacts are perceived as negative externalities to be solved by the State through regulation, and developers of new knowledge and technologies are generally not to be held responsible for societal impacts.	9) Growing attention to immaterial needs for autonomy, relatedness and competence (mastery) necessary for human flourishing.
10) Regulatory emphasis on the volume and speed (vs. directionality) of innovation.	10) An alternative economy is expanding, taking four forms: i) degrowth and localisation, ii) collaborative economy, iii) solidarity economy, and iv) social economy and social entrepreneurship.
11) Increasing reliance on various technologies and infrastructures for the "normal" conduct of everyday life and for satisfying the "basic human needs" of society, however defined.	11) Calls for a new natural-social contract (with the Donut model and SDGs as examples) and the rise of a hybrid sphere.
12) Acquisition of ever more goods and services in individual consumption.	12) Growing dissatisfaction with inequality (in income, wealth, access to good education)
	13) A rebalancing of society is being called by influential people (Mintzberg, Collier, Mason)

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(continued)

13) Dominance of a throwaway consumer culture (vs. reuse and recycle).	14) State welfare policies are increasingly viewed as inhuman because of the use of bureaucratic rule and sanctions.
14) Increasing sense of time-space compression and acceleration of social life.	

⁷Developments 5, 13 and 14 are socio-economic, but they can be viewed as consequences (13 and 14) and facilitator (5) of techno-economic change.

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