

Paradigms and paradoxes

The futures of growth and degrowth

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Paradigms and Paradoxes: The Futures of Growth and Degrowth

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Abstract

Purpose: This paper introduces three story-lines that address the relation between economic growth, technical innovation and environmental impact. The paper assesses if and how these story-lines as guiding visions so to increase our range of future orientations.

Design/methodology/approach: The paper first explains its general outline and then explores different strands of literature so to arrive at its analytical conclusions.

Findings: Pursuing the three story-lines in a paradigmatic articulation creates paradoxes. The growth paradigm focuses on economic growth as its main goal. To overcome environmental degradation, products have to be substituted by environmentally-friendly alternatives, but the continuous substitution of finite resources seems unlikely possible. The story-line of innovation sees technological development as a driver of economic progress, and holds that innovations allow the decoupling of economic growth from environmental impact. A claim that is compromised by the occurrence of rebound effects. The degrowth story-line holds that economic growth has to be stopped altogether, but is unclear how this can be done.

Originality/value: By articulating paradigmatic perspectives as story-lines, a new understanding on how these perspectives can figure as a constructive repertoire of guiding visions and not as mere theory-based descriptions.

Keywords: Growth paradigm, lock-in, innovation, rebound, degrowth, sufficiency

Paper type: Conceptual paper

1. The Story-lines of Growth, innovation and degrowth

With the publication of the seminal work ‘The limits of growth’ (Meadows et al., 1972), the relation between growth and ecological degradation has become a key societal concern. A decade later this concern came to be articulated in terms of ‘sustainable development’ (Brundlandt et al., 1987). Next to growth and ecology, the role of technology has been added as a decisive issue by some authors, as technology contributes to environmental degradation

but also promises to conquer it (Beck, 1992, Hajer, 1994). The precise character of the relations between economic growth and ecological quality has been a topic of debate ever since, while the role of technology is not always reflected upon systematically. This paper will discuss three distinct frames that have developed over time building forth on contrastive starting points on how to reduce the ecological impact of economic activity in relation to technological development. These frames are usually expressed as theoretical paradigms (cf. Kuhn, 1962), to which researchers add theoretical refinements to a stable core of assumptions. However, one may also regard them as *story-lines* about how the future will unfold itself as a confrontation between our attempts to actively shape the world and the unruly character of both social and natural reality (cf. McCloskey, 1983, Callon, 2010, Soros, 2013). With that, story-lines transcend the domain of science, as they entail to narratives, codifications, reflections, and reactions to sociocultural practices that structure future orientations of societal, economic and political actors: they instruct which type of decisions are considered to be legitimate in a certain context.

The three story-lines are the following. The first one is that of *growth*, in which economic growth is believed to allow greater well-being and affluence. In this, growth is allowed by pursuing efficiency gains within the context of a competitive market. Negative effects on the environment may be countered by substituting practices and processes by environmentally friendly alternatives. On the long run, however, such substitution would require an infinite reservoir of non-exhaustive resources. The second story-line sees *innovation* as a driver of economic progress, and holds that it is possible by developing the right technology, growth can be decoupled from environmental impact. However, efficiency gains induced by innovation are in many cases subjected to the ‘rebound effect’, meaning that any environmental gain is compensated by conduct with negative impacts elsewhere. The third story-line takes explicit distance from the need to pursue economic growth, and champions change in the opposite direction, which is why it is labelled as *degrowth*. The role of technology is not separately addressed, but the focus is on small-scale practices that may be supported by new sociotechnical settings. However, what a degrowth economy would imply at a wider societal scale and how technologies can be stimulated to contribute to the goal of degrowth remains unclear.

It needs to be emphasized that other classifications of story-lines are similarly possible and informative (Urhammer and Røpke, 2013), and that extensive and detailed debates are reduced to relatively simple story-lines. This paper will derive a stable core of assumptions from seminal texts in each of the story-lines, and subsequently these findings will be related

to the way in which these story-lines structure societal and political action by legitimizing the range of actions considered to be feasible or valid. In this, the focus will be on the way that economic growth, sustainability and technological innovation are related to each other in each of the story-lines, revealing the contested character of all these concepts.

As sketched out above, each of these story-lines contains elements that are intrinsically contradictory, perhaps not in that their premises lead to self-negating conclusions, but they will elicit courses of action that cannot be sustained on the long run. It is considered to be counterproductive to look for a singular approach: instead of opening up the repertoire of courses of action that are needed to address the ecological problems we are facing today, the range of options is closed down by categorically denying the viability of the alternative problem definitions and solutions. Instead, the relations between different approaches needs to be subjected to research: questions need to be asked such as in which societal contexts and in which situations do certain approaches work and how can their co-existence help to overcome the problems of each of the approaches. This firstly points to the goal of setting a research agenda, the paper also aims to stimulate real life experimentation with new societal practices and policies that target new ways to deal with growth and innovation given the awareness of concrete ecological boundaries. In this, the role of technology and innovation is considered to be important enablers and constraints of these practices and policies and as such these need to be given dedicated attention, which – apart from the innovation story-line – is not taking place sufficiently.

2. The Sustainability of Growth?

The spell of economic growth may not so much be a conscious choice that can be changed at will, instead we are ‘locked-in’ to mechanisms of growth, be it cognitively, culturally or economically (Spangenberg, 2010, Loiseau et al., 2016, Fuchs and Lorek, 2005, Storm, 2009). This lock-in situation means that we are incapable of choosing not to grow, either politically or mentally (Van den Bergh, 2011, Berg and Hukkinen, 2011). This lock-in diffused from the domain of industry to government and the domain of consumption, and find its roots in the institution of ownership, as brought forwards by Thorstein Veblen (1904, 1994) more than a century ago (Van Griethuysen, 2010).

A property-based economy can only be sustained by growth, the credibility of the return of investment has to be present before any investment in artefactual resources that

allow production will be made (Veblen, 1994). In turn, these investments can only be based on capital that is borrowed at a positive interest rate. As such, businesses are entrenched in a cyclical mechanism that involves property, capital and interest that can only be sustained by ongoing growth. In today's globalized economy, the lock-in of growth only seem to have become more prevalent. Especially under the label of neoliberal policies (Abraham and Ballinger, 2012), governments have come to assess the quality of their economic policy in terms of their contribution to growth (Bouder, 2008, Spangenberg, 2010).

As such, there is no need to consider the possibility of institutions that would allow for alternative practices. Apart from its embedding in institutional structures, growth has become an ideological panacea that helps appease society by promising that current inequalities and injustices will be resolved at some point in the future (Daly, 1974). Indeed, the consumerist society allows individuals to be primarily regarded as consumers whose happiness is warranted by satisfying the 'external needs' of new goods and products (Hamilton, 2010, Brown and Kasser, 2005).

The starting point of growth has also become embedded in the dominant academic perspectives, especially in the neo-classical theories that figure as mainstream or 'orthodox' approaches (Dequech, 2007). Neoclassical economics revolves around the idea that individual agents aim for the maximization of their utility within the context of the capitalist market. Usually neoclassical theory is formulated in mathematical terms that are derived from a set of specific assumptions about the functioning of the market which are considered to be a political choices that lay outside of the scope of theory. One of these assumptions concerns the pursuit of growth which follows out of the aggregation of rational choices of firms and households concerning investments and savings mounts up to an increased level of output, as is expressed in the classic growth model of Solow and its later refinements (Van den Berg, 2012, Solow, 1956).

Though neoclassical approaches have been blamed for reproducing the neo-liberal status quo (Lawson, 2005), eminent scholars like Solow and Nordhaus have been surprisingly quick to react to the challenges posed by Meadows's connection between growth and environmental degradation (Solow, 1974, Nordhaus et al., 1973, Nordhaus, 1977). They explicitly acknowledged the environmental threats posed by the exhaustion of resources, and they have tried to think through the ramifications of these threats for neoclassical growth theory (also see Berck, 2008). The discussion then comes to boil down to the sign of the discount rate. If this is positive, which means that future goods are valued less than present

ones, future generations will be richer than us, so that they can easily pay the higher prices that we induce upon them. Bringing in environmental considerations, however, means that in a situation of a positive discount rate, the costs of future ecological disasters are lower than current investments in the prevention of these disasters (Broome, 2008).

The analytical tool-kit of neoclassical theory does not straightforwardly provide solutions to avoid catastrophe in case of negative discount rates, as these solutions are seen as political or ethical choices to be made that are taken outside of the realm of economic analysis. Nevertheless, some routes to avoid environmental degradation while allowing economic growth can be found, for instance by substituting exhaustive with non-exhaustive resources, which is above all allowed by the introduction of more efficient *technologies* (cf. Boyd, 1972). This substitution is based on the assumption that man-made and natural capitals are interchangeable, so non-renewable production resources can be replaced by renewable resources (which include human capital) (Loiseau et al., 2016). Another approach assumes environmental degradation to be an external effects, meaning that it is not included as part of market prices. By bringing the costs of degradation into the price of a product, the economic system is believed to converge to a new equilibrium in which no ecological harm is done. If a product that is purchased at its ‘real’ price, alternative products that are cheaper on the whole (so do not impose costs on the environment) will become attractive for rational actors, which will prompt them to replace the products that have been underpriced. Also here, technology can help out as the right prices and regulations will stimulate sustainable innovations, so that in the end, as is claimed by Porter and Van der Linde (1995), there is no trade-off between social benefits and private costs.

In all, these solutions suggested inform that no need to deviate from ‘business-as-usual’. This does not mean that environmental degradation is legitimized, but that economic growth and sustainability may be aligned. Still, the assumptions of neo-classical theory have received criticism, especially by so-called ‘heterodox’ approaches to economics (Colander et al., 2004, Dequech, 2007) that are above all united in their dislike of neoclassical ideas. The other two story-lines can be said to be manifestations of heterodoxy, disputing the starting points of neo-classical thinking. In this, scholars representing the innovation story-line claim to come up with a better understanding of the process of economic growth by opening the ‘black box’ of technology development (Mazzucato, 2011, Nelson and Winter, 1974).

The scholars and activists that support degrowth emphasize the exceedance of planetary boundaries that results from eternal economic growth, as such sustainable development is an ‘oxymoron’ (Demaria et al., 2013, Wall, 2007, Victor, 2008). In the story-

line of degrowth, the belief of an infinite resource base is disputed, but it also discredits the idea that all wants are worthy of pursuit. These considerations are hardly traceable in the discourse of industrial and governmental actors for whom economic growth still is the only viable road forwards. Also individuals, be it in their roles as labourers, consumers, retirees, house owners, or voters, are dependent on the reproduction of the growth story-line. As such, the assumptions of the growth paradigm, even if they fail to be convincing, are embedded in organizational and individual strategic choices, increasing its lock-in.

3. Innovation and its rebounds

The story-line of innovation builds strongly on the work of Joseph Schumpeter, who featured innovation as an evolutionary process that did not align with the starting point of equilibria as is maintained by conventional economic theory (Godin, 2012, Freeman, 2007). With that innovation became an endogenous factor, contrasting with the neoclassical dogma which features technology as a ‘residual’ factor that is not understandable “as a systemic part of the [growth] model itself” (Solow, 1994). The Schumpeterian view is that capitalism is a form of ‘creative destruction’, in the sense that industrial entrepreneurs try to gain competitive advantage by innovating their production processes and their products so to destroy their commercial antagonists. It may be the case, that Schumpeter has not been consistent regarding which firms are the designated producers of innovation, be it new or incumbent firms (Dolfsma and Van der Velde, 2014, Malerba, 2002), but his ideas have given rise to the approach of evolutionary economics which portrays entrepreneurs not as merely taking new technologies off the shelf, as neoclassical approaches suggest, but as exploring new directions, basing themselves on previous experiences (Nelson and Winter, 1974, Nelson and Winter, 1977). Hence, technologies are developed by pre-empting on future situations that build on extrapolations and beliefs that are based on current technology and society (Nelson, 1995, Van Lente and Rip, 1998).

The most fertile role of the innovation story-line lies in the way it allows for the explication of future directions of technology development. Opening up the black box of innovation allows us to see how new technologies are constructed, being subject to mental models that include beliefs, visions, and expectations (Rip, 1995, Van Lente, 2012). By expanding the scope of these mental models, innovation may be steered into more societally desirable directions (Schot and Rip, 1997, Te Kulve and Rip, 2011, Garud and Ahlstrom,

1997). For instance, by attending public values and by bringing in relevant stakeholders in the process of innovation, new technologies may become more responsive to societal need, which includes sustainable development (Taebi et al., 2014, Pesch, 2015a).

In terms of expanding our scope of orientations about the future, the innovation story-line helps us to look at the role of technology by providing suggestions about how to actively stimulate the development of new, more desirable, innovations. Indeed, the awareness about sustainable development has led to investments and research in renewable energy systems and other environmentally friendly technologies. Such innovation is usually connected to broader visions, such as the ‘circular economy’ in which practices that turn resources into waste are replaced by practices in which resources are turned into new resources (Pesch, 2015b, Stahel, 2016, Gregson et al., 2015). Though an economy that is circular in absolute terms may not be attainable, but as a guiding vision it will give rise to new patterns of production and consumption that can significantly reduce ecological impacts.

With that, the focus on innovation is believed to allow the *decoupling* of economic growth and environmental impact. Tim Jackson (2011) states: ‘decoupling is about doing more with less: more economic activity with less environmental damage; more goods and services with fewer resource inputs and fewer emissions. Decoupling is about doing things more efficiently. And since efficiency is one of the things that modern economies are good at, decoupling has a familiar logic and a clear appeal as a solution to the dilemma of growth’. The notion of decoupling is rooted in the so-called IPAT-equation (Holdren and Ehrlich, 1974), which states that the environmental impact (I) is the product of population size (P), economic affluence (A), and technological efficiency (T). As the decrease of population size and global economic affluence are usually seen as undesirable options, the designated route for decreasing environmental pressures is by developing technologies that allow way more efficiency than current technologies.

But to which extent is decoupling possible? According to Tim Jackson, the evidence is not pointing in the right direction. Efficiency gains, even if they have been substantial, do not appear to have contributed significantly to a decrease of environmental impacts. This failure to decouple is usually attributed to the rebound effect, which states that the surplus that is created by efficiency gains is straightforwardly used to pursue more growth (Van Griethuysen, 2010, O'Neill et al., 2010, Binswanger, 2001, Nørgård and Xue, 2016). Rebound effects are bound to happen as long as the institution of ownership prevails. The story-lines of growth and innovation are irrefutably based on the institution of ownership, which can be seen as an incentive structure that drives actors to acquire more than they need or even want

to have. Industrialists, supported by national government, expect to earn their investment back, so that these earnings can be invested again.

This is especially the case for the production system, but also in the realm of consumption, there is no underlying logic that provides an intrinsic drive towards rebound effects, but still they have arisen frequently (Herring and Roy, 2007, Binswanger, 2001, Greening et al., 2000, Carolan, 2004). The problem of the rebound effect in the use of new technology lies in the fact that it is fundamentally unclear what the exact nature of these effects will be, rebounds effects only transpire in the actual *use* of a new technology – which is fundamentally subjected to uncertainty (Rip, 1995). In all, this means that innovation might contribute to decoupling, but it will be a process with a limited scope and with erratic features.

4. Does degrowth suffice?

Approaches to sustainability can be sketched out in two main variants, the first aiming to *reform* existing social structures and institutions the second pursuing the societal *transformation* (Rees, 1995). The solutions for sustainability proposed by story-lines of growth and innovation can be seen as embracing reform while maintaining their ‘expansionist worldview’, but one may also find economic approaches that seek for transformation (Hopwood et al., 2005, Kennet and Heinemann, 2006). Of these approaches, the notion of degrowth has received an increasing amount of support, especially since the economic crisis that started in 2008 (De Saille and Medvecky, 2016, Asara et al., 2015). The values that are forwarded in the degrowth (or ‘post-growth’) discourse can be seen as a fundamental re-ordering of values that are in many cases straightforwardly opposed to the values that are credited by many to have led to the crisis: austerity instead of greed, solidarity instead of greed, trust-based localism instead of impersonal globalism (Fournier, 2008, D’Alisa et al., 2014).

In spite of its appeal, it is hard to substantiate concrete future pathways (cf. Ligvoet et al., 2016, Quist and Leising, 2016), which may have to do with the various approaches that have been developed with regards to degrowth, ranging from activist approaches with small-scale pretensions to wide-ranging theories and model (Weiss and Cattaneo, 2017). To clear up this variety, the degrowth story-line will be sketched out here in terms of an opposition between the *decroissance* and the *sufficiency* approaches. The *decroissance*-approach

emerged in recent decades in France as a project that aspires the full reconstruction of the socio-economic system, so that it is subservient to the goals of social and ecological sustainability (Demaria et al., 2013, Muraca, 2013). The sufficiency-approach is mainly developed in the United Kingdom, and focusses on ‘capping’ economic growth so that it will protect the eco-system and support social justice. It needs to be stressed that these are not the only approaches on degrowth, for instance there are also German debates on *Suffizienz* (e.g. Linz, 2004, Muraca, 2012), which entails elements from both approaches and admittedly offers a more balanced account.

Whereas the advocates of *decroissance* emphasize the view that this economic activity should not be interpreted solely in market-based terms (Sekulova et al., 2013), the advocates for sufficiency continue to frame their approach mostly as such. The starting point of these latter scholars is that our current economic system is based on always wanting *more*, while an economy that is based on *enough* is what we should be striving for (O'Neill et al., 2010). At the same time, the assumptions of both approaches are similar: further growth is an undesirable pursuit as our planetary boundaries do not allow us so, but also because it has not succeeded in making us happier (Huetting, 2010).

In their view on the economy, sufficiency scholars usually refer to the work of Herman Daly who introduced the notion of a steady-state as an alternative to ‘growthmania’, and defines it as an economy that has ‘constant stocks of physical wealth (artifacts) and a constant population, each maintained at some chosen, desirable level by a low rate of throughput’ (Daly, 1974). Daly had been a student of Nicolas Georgescu-Roegen whose more radical thoughts have inspired the *decroissance* movement (Kerschner, 2010). In turn, Georgescu-Roegen studied with Joseph Schumpeter, and stretched the logic of creative destruction until its ultimate conclusion: if we depend on destruction to move forward, what will happen when there is nothing left to destroy?

Schumpeter (2000) himself actually pondered over the possibility of a stationary state, which would occur in the event that all economic wants be completely satisfied, an event that is unlikely as ‘new wants emerge or are created, satiety becomes a flying goal, particularly if we include leisure among consumers’ goods’. Even more unrealistically, according to Schumpeter, would be the case in which the methods of production have reached a state of perfection which does not admit of further improvement. This would lead to a ‘more or less stationary state’, causing the atrophy of capitalism and the end of the institutions of property,

instead “Socialism of a very sober type would almost automatically come into being” (Schumpeter, 2000).

Daly does not share Schumpeter’s dread for the stationary state, and he comes to endorse it so the destruction of the eco-system can be avoided. He emphasizes that the economy is a subsystem of the natural system, and as such there are physical limits to the economy, necessitating society to adapt its economic system accordingly (Loiseau et al., 2016). The goal is to scale down the economy so it does not transcend a safe operating space. Following Daly, the proponents of sufficiency see degrowth a process of *transition* towards the end goal of a steady state economy (O’Neill et al., 2010).

In contrast, Georgescu-Roegen finds the idea of a steady-state economy as unrealistic as the belief in eternal economic growth. For him, both doctrines make the crucial error that a state, even a declining one, cannot exist forever in a finite environment (1975). His central starting point is to see the economy in terms of thermodynamics, which he opposes to the conventional mechanical view that is assumed in conventional economic theory. The ‘mechanistic dogma’ portrays the economy in terms of a principle of conservation and a maximization rule, assuming the economic process as an isolated, self-sustaining process (Georgescu-Roegen, 1975). With that, the economic process is featured as a ‘circular merry-go-round which cannot possibly affect the environment of matter and energy in any way’ (Georgescu-Roegen, 1975). However, as the economic process is irreversible, it is more appropriate to explain it in terms of thermodynamics, using the principle of entropy, coming to a simple, but worrying conclusion: ‘*All kinds of energy are gradually transformed into heat and heat becomes so dissipated in the end that man can no longer use it*’ (Georgescu-Roegen, 1975).

Georgescu-Roegen’s refutation of Daly’s steady-state also is explained in thermodynamic terms, as this is said to assume the stationary economy to consist of an *open* macrosystem which maintains its entropic structure constant through material exchanges with its ‘environment’ (Georgescu-Roegen, 1975), while there are ‘simple reasons’ against believing that mankind can live in a perpetual stationary state. On the one hand, people would have to live in state that is not capable of changing its structure, while, on the other hand, they would be compelled to continually change its technology as well as its mode of life in response to the inevitable decrease of resource accessibility – these social and technical innovations would ‘miraculously’ fit the emerging need for new resources (Georgescu-Roegen, 1975).

The inevitable outcome of economic activity, be it in the state of growth or a steady state is the ‘annihilation’ of that state. As such, degrowth is not a deliberate choice but a destiny, moreover it will not stop at a certain desirable size of the economy, it is *bound* to shrink to infinitesimally small proportions. According to Kerschner (2010), the advocates for *decroissance* follow Georgescu-Roegen’s position ‘religiously’, while failing to ‘adequately ask questions about the end-point of what they propagate, conveniently omitting the word “annihilation” when they cite Georgescu-Roegen’.

With their holistic approaches to the questions of planetary boundaries, both Daly and Georgescu-Roegen come with rather scholastic eschatologies. How to practically change our act cannot be derived straightforwardly from their accounts and, indeed, the point in time where we have to make the choice whether to continue the course of degrowth or to stop once arrived at a desirable stationary state lies in a future that probably is still far away. The transformation from theory to practice is generally connected to real-life societal developments, which focus on the endorsement on values that are neglected in mainstream economic accounts, such as ‘sharing’ and ‘togetherness’ (Jarvis, 2017) or that deploy other spatial scales of consumption and production (Schulz and Bailey, 2014, Xue, 2014). These real-life developments figure as a source of inspiration and legitimacy for theoretical degrowth accounts. The empirical shape they usually take is that of local experiments with ‘social’ and ‘solidarity-based’ economies (Bauhardt, 2014), that have to give rise to broader patterns of, what has been called, social innovation (Sahakian, 2014, Johanisova et al., 2013, Healy et al., 2015). Such ‘degrowth experiments’ include local monetary systems, forms of social entrepreneurship and collaborative economy, community-based initiatives, collective forms of ownership, ecovillages, and so on (for instance see Alexander, 2013, Kunze and Becker, 2015). The emphasis on the social aspects of innovation appears to go to the extent of the attention for technical issues, while new technologies that cater sharing and bottom-up organization will be necessary drivers (or barriers) for further social initiatives (Pesch et al., 2018, Metze, 2017). Here, one may think for instance about ICT systems that allow for self-organization, the exchange of information and goods, and new financial models (Morell, 2014). Other examples are new energy systems that allow for new modes of production and consumption.

What small-scale initiatives seem to call for are brackets on the exclusionary pretensions of the capitalist economy, not by contrasting it with another universal system, but by emphasizing a plurality of institutional and economic systems. The pursuit of a

heterogeneity of social goals at different geographical scales does not unequivocally match the all-encompassing agenda of radical institutional transformation, but it provides room for social factors such as empowerment, citizenship, justice, equity, democracy, the fulfilment of ‘real needs’, or the ‘good life’, ‘rediscovery of human identity’ which does right to the ‘emerging need for more meaning in life’ (Muraca, 2012, Demaria et al., 2013, Schneider et al., 2010). As such, these small-scale initiatives may offer interesting starting points, but still it is not directly clear how what their more generic repercussions are (cf. Boonstra and Joose, 2013). To resolve this lack of clarity, a number of issues needs to be addressed in more detail. First, small-scale initiatives involve a limited amount of members that have a shared outlook, while society at large includes a variety of moral standpoints and interests that are in many cases conflicting, moreover, it is hardly possible to terminate one’s membership. Democratic societies are designed to cope with these characteristics: elections allow citizens to articulate discontent; legal and democratic procedures allow the resolution of conflict. It also should be acknowledged that bringing the economic system to a hold will have immediate impacts that not a lot of people will support (Van den Bergh, 2011, Kallis et al., 2012, Klitgaard and Krall, 2012). To start with, the financial system will collapse, which might lead to the counterproductive reaction of public and private decision-makers to pursue even more growth in order to recover (Tokic, 2012). Perhaps more important for society at large is that a decreasing domestic income will lead to a significant increase of unemployment, affecting the livelihood and the self-esteem of individuals and the legitimacy of the societal system as a whole. The institutional structure demands growth, and hence degrowth may only be a viable option if the dominant institutional structures are completely revised (Romano, 2016).

In the context of the threat of unemployment, degrowth authors have tried to explore alternative economic systems in which full employment can be provided without depending on economic growth (Jackson, 2011, Alcott, 2013). By the redistribution of labour, especially by having part-time jobs, and by rewarding labour differently such a system can be created. A fixed income could for instance be provided by the state, so that labour could become instrumental to further personal goals (Alexander, 2014). Such a system would not only benefit society, but is also believed to increase societal fairness.

Another point that needs to be raised here relates to the fact that innovation is not merely the engine of growth, it is also the engine of progress in other domains. One may say that besides the negative external effects of environmental degradation, economic growth also comes with positive effects such as the increase of our knowledge base, tolerance, peacefulness, improved medicine, and so on (Schumpeter, 2000). Do we really want to

abstain from these positive effects, or can we find ways to maintain these in a degrowth society? Some degrowth scholars have claimed to pursue an economy that maximizes ‘positive externalities’ such as cooperation, solidarity and so on, but the positive externality of innovation and progress has not been named yet; while also in a degrowth society we have to change our technology in order to reduce environmental impact. This also brings back into mind the quotation of Georgescu-Roegen given earlier: how can we stop innovation, while expecting to come up with the technology that is necessary for a sustainable life?

5. Pluralizing futures

The three story-lines on growth that have been presented here are often forwarded in theoretical terms, apparently aspiring the status of a scientific paradigm. What has been argued is that following the logic of these story-lines, we inevitably run into trouble. Maybe, this does not compel a new theory with universalistic pretensions, but demands a reorientation towards the efficacy of these story-lines. Instead of portraying them as excluding each other, they can also be featured as alternative pathways that may co-exist.

In this, the fundamental problem is that the dominance of the growth model contributes to a profound crisis of resources, while restricting the capacity to think of alternative futures. The legitimacy of the goal of economic growth is challenged by the degrowth story-line, and approach provides a valuable addition to our repertoire of future orientations. It is exactly the plurality of future perspectives that allows us to experiment with different directions, overcoming the tendency to get entrenched into one set course (Stirling, 2011, Cuppen et al., 2016, Ligtoet et al., 2016). As such, story-lines that propose certain future visions should refrain from any monopolistic appropriation of moral and scientific rectitude. In the end, a solution that works has to be ‘clumsy’ in the sense that it accommodates different moral starting points and ideological convictions (Verweij et al., 2006).

Extending the diversity of options also alludes to the different spheres of action, such as economy, politics, civil society, family that characterize modern society (Walzer, 1983, Pesch, 2014). This point of societal separation does not seem to be unequivocally acknowledged by the story-lines. For instance, in the growth and the innovation story-line, politics is mainly seen as the facilitator of growth and innovation, while society is seen as the sphere of consumers. In the degrowth story-line, the aim is to ‘socialize’ the economy,

effectively dismantling the boundary between economy and society. The problem is that pervasive boundaries between economy and other societal domains make it harder to have stronger limitations for the economic system. To overcome this problem it is important that, instead of reducing people to consumers or upgrading consumers to people, the plurality of roles that individuals can have in modern life could be emphasized, also in order to stimulate pro-environmental behaviour.

In line with this account on the differentiation of societal spheres is the consideration that it would be productive to put the three story-lines adjacent to each other instead of presenting them solely as oppositions. Moreover, elements from the story-lines could be fused in order to further understanding and practical efficacy. Above all, it is important to find out how technologies relate to the different story-lines, and how the development of appropriate technologies can be stimulated – for which the innovation story-line seems to be an informative source. Especially, we need more insight regarding technologies that may contribute to the nurturing of degrowth experiments, for instance ICT systems that allow sharing or localized forms of consumption and production.

In all, our reserves of future orientations have hardly been exhausted; more arrangements that include not only economic, but also cultural, political, and institutional alternatives need to be brought to the stage, enticing us to do things differently, so to make a sustainable society achievable. This means that practices should not only be studied as isolated manifestations of degrowth experiments, but that they should be studied as part of a broader ecosystem of societal practices and contexts that allow us to pursue a wide range of societal goals.

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