

# Time to (intra-)act

A diffractive reading of heterodox economics with Barad

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July 15, 2018

*Research Master Thesis*  
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# 1 Introduction

How do we understand the avocado craze under millennials? ‘Avocados are labelled superfoods as they contain many healthy nutrients such as unsaturated fats, anti-oxidants and potassium, which may help prevent cancer and relieve symptom of arthritis’, a nutritionist might say (Gunnars, 2017). ‘Millennials don’t want to work or buy houses, but rather hang out in coffee bars and eat avocado toast for \$20’, a millionaire said (Levin, 2018). ‘Avocado plantations install illegal pipes in order to divert water from rivers to irrigate their crops’ might be the response of a Chilean resident who is obliged to use contaminated water delivered by a truck as the fallen groundwater level caused a regional draught’ (Laville & Facchini, 2018). ‘Avocados get many likes on Instagram after Miley Cyrus shared a snap of herself with an avocado facemask, showing the avocado tattoo on her arm’, a (f)it-girl might answer (Pierson, 2015). ‘Through good marketing and free trade the product became readily available and demanded in western societies, increasing GDP of exporting countries’, an economist might diagnose (Stock, 2017). ‘The money in the avocado sector attracted organized crime gangs to extort avocado growers, which makes Mexico’s environmental watchdog turn a blind eye on illegal deforestation, even though it is endangering the population of monarch butterflies in Michoacan’, a Mexican farmer might say (Burnett, 2018).

Even a ‘simple’ phenomenon such as the avocado is embedded in a dense web of meanings that arise from many different relations and interactions among and between humans, technology and the natural environment. If it is difficult, if not impossible to grasp the meaning of avocados, how then, can we understand complex issues, such as migration, increasing debt levels, environmental degradation, data privacy and income inequality? All these issues share interrelated components. Therefore, a strict division of labour to tackle these problems will hardly suffice, as the causes of the problems cannot be neatly categorized into disciplinary boundaries. Experts from different fields must combine their knowledge to come to adequate answers. Furthermore, the way in which these experts see the world needs to fit this complexity and interrelatedness of different aspects of the world.

Experts in economics are no exception to this need. This became apparent in light of the recent economic crises and the inadequate understanding and answers provided by economists (e.g. Krugman, 2009; Caballero, 2010; Mirowski, 2013; The Economist, 2014). This failure has confirmed a longer growing dissatisfaction and feeling that standard economics envisions the world and its inhabitants in a too simplistic manner to deal with the complexity of contemporary issues (e.g. Dempsey, 2013; Chang, 2014; Romer, 2015; Raworth, 2017; The Economist, 2018; Stiglitz, 2018; Chester, 2018). A growing social movement expresses the need for alternative ways of looking at the economy and of doing and teaching economics. This movement includes students, activists, economists, activist economists and they unite in organizations such as Re-

thinking Economics, the Institute for New Economic thinking and Post-Crash Economics and Post-Autistic Economics.

Though the critique on ‘standard economics’ is contested (e.g. Cochrane, 2011), the concern itself is legitimate. Therefore we need to at least complement the standard approach with alternative ways in which we think about the economy and our economic lives in order to address contemporary issues. I will refrain from providing criticism, because this focus on critiquing the status-quo diverts the focus from constructing positive alternatives to standard economic thinking. It even might suggest that these alternatives do not exist, whereas there already are lively approaches to economics that offer a rich alternative to standard economic thinking.

These alternatives can be found in so-called ‘heterodox’ economic thinking. Heterodox economic thinking aim to reinstall and elaborate on the original meaning of economics as an embedded social science by combining insights from various intellectual fields (cf. Polanyi, 1944; Jo, Chester, & D’Ippoliti, 2018). Influential heterodox currents are feminist economics, ecological economics, complexity economics, institutional economics, post-Keynesian Economics and Marxian economics. The term ‘heterodox’ suggests that heterodox economics can be defined in terms of what it rejects, implying (erroneously) that it does not have its own body of theory and policy and it risks that it reaffirms the mainstream it criticises (Jo et al., 2018). However, such a conception of heterodox economic thinking would obscure the rich variety of theory, methods and practices it has to offer as alternative to the standard way of doing economics. Furthermore, for these heterodox currents to gain credibility, both in the academic arena and for influence on policy, an affirmative conception of heterodox economics would help to unite and emancipate various heterodox economists (Morgan & Embery, 2018).

Such an affirmative conception stands or falls with the recognition of shared worldviews that are adequate for addressing the complexity of today’s world. A shared philosophical framework opens possibilities for advancing heterodox theory, because it allows scholars from different backgrounds to relate their theories to each other via a consistent and shared language. Shared philosophical underpinnings therefore offer a way to promote cross-communication of ideas within various heterodox economics currents as well as with other like-minded (social) scientists and critical thinkers.

My aim is to contribute to the recognition and development of a positive alternative discourse on economics and the economy as is already at work in various economic currents. For this I will ride the wave of ‘New Materialism’ which is a movement of various politically engaged intellectual efforts that arose around the turn of the century (Van der Tuin & Dolphijn, 2012). The movement emerges in and from several fields such as critical theory, computer science, feminist theory and science an technology studies. Central to the movement is the commitment

to rethink subjectivity by emphasizing the role of nonhuman forces in agency and their self-organizing powers. The movement aims to dissolve boundaries between the natural and the cultural, mind and matter (Braidotti, 2011). New materialist ontologies “understand materiality in a relational, emergent sense” (Coole & Frost, 2010, pp. 27-8), with a broad focus that ranges from the global political economy, ecology and issues of emancipation.

Specifically, I use the work of Karen Barad, professor in feminist studies and philosophy, and trained in theoretical particle physics, who is a prominent scholar within this movement. Barad formulates a philosophical framework that is apt to deal with contemporary economic, environmental, geopolitical, and technological developments. In her book *Meeting the Universe Halfway* Barad (2007) thoroughly rethinks notions of power and agency. She provides an alternative way of thinking about the relation between subject and object or culture and nature. Especially her concept of the ‘apparatus’ provides an analytical framework that helps to understand how given phenomena do what they do in a refined matter. Simultaneously an apparatus can be employed as a creative tool that can be used to ‘intra-act’ with phenomena and produce alternative ones. Both these aspects of the apparatus are useful for economists who aim to rethink economics. The rethinking of economics requires a different conceptualization of phenomena and the (economic world), which is exactly what Barad’s agential realist account has to offer.

Coming from a physics background, Barad’s work has a clear emphasis on philosophy of science and the implications of her ‘onto-epistemology’ on scientific or academic inquiry. This will particularly be insightful because I aim to put economics as an academic inquiry under scrutiny. Next to providing a rich ontological framework to deal with the world’s complexities, Barad’s philosophy provides the tools to open up in- and exclusionary practices in the process of scientific knowledge production. Her notion of the apparatus can be used as an emancipatory tool. Binary oppositions are resolved by so-called ‘differentiations’ that distinguish, but do not exclude. This works out very beneficially to explain tendencies in heterodox thinking and attempts to emancipate these currents. It does not posit these tendencies as ‘the other’ to standard economic thinking, nor does it exclude more standard approaches from using or moving towards this framework. The dynamism of agential realism as an empowering mechanism and agential realism’s ethical concerns contribute to balanced views and allow for change in the academic landscape. In other words, Barad’s approach does not aim to fixate specific currents, disciplines or traditions to be something. Rather it addresses what bodies of knowledge do and what they do might gain influence in academia and society

I will read Barad’s agential realism with fundamental concepts that are shared among various heterodox economics currents. To realise my project I firstly provide an account of Barad’s agential realism and her onto-epistemological framework and embed it in the wider movement of New Materialism. Setting

out Barad's account proves challenging, as many of her concepts are 'entangled'. In providing an account of Barad, I make certain 'cuts' to distill some of her concepts and provide some key elements of her work to set up a philosophical framework. In chapter three I identify commonalities among various heterodox economic currents in terms of their philosophical assumptions. In chapter four I 'diffractively' read Barad with the identified commonalities of heterodox economic thinking. I indicate philosophical assumptions made by heterodox economists that I identify in chapter three and the onto-epistemological framework offered by Barad resonate and where they diverge. Throughout the unfolding of these exercises, various questions arise: Is there an onto-epistemology emerging in the diverse fields of heterodox economics? What would, could or does that look like? How can these economic currents emancipate? If we want to rethink economics, we need to imagine alternatives together. This thesis will not give all of the answers, but it does provide entry points that have to be put to work. So let's get to work; time to (intra-)act!

## 2 A Baradian x Dillanian intra-action; an agential realist account

Societies on local, national and international levels change due to economic, ecological, political and technological developments and crises. To keep up, the academic landscape should be, and is changing as well. The present developments and crises do not let themselves neatly divide over disciplinary bounds. For instance, crashes of the economy often have causes that are, at least partially, political, technological and ecological. Therefore, interdisciplinary efforts are increasingly stimulated in order to grasp and examine the unfolding complexity of ongoing ecological, socio-cultural and politico-economic changes. New materialist scholars reconcile these various fields through their use of ‘matter’ as their central notion from which to explore the world (Van der Tuin & Dolphijn, 2010). Matter points at (academic) processes of meaning-making (‘to matter’). The innovativeness of new materialist approaches lies in that they provide ways for signification or meaning to be simultaneously material and discursive; the scholarship is ‘material-discursive’ (Haraway, 1988; Barad, 2007).

To allow for this simultaneous signification, new materialists move away from a framework of representation. A representational way of thinking treats research topics from the outside, whereas new materialism demonstrates how scholars (from a large variety of disciplinary and interdisciplinary fields) are part of the phenomena that they study. For instance, when an economic crisis hits a country, the academic landscape will be affected as well; student grants might be cut and resources for research might be redistributed. In order to grasp this complexity, the new materialist movement aims to dissolve boundaries between the natural and the cultural, between mind and matter (Braidotti, 2013). To do so, fundamental notions, such as the relation between subject and object, knowledge, power, agency and causation are rethought.

Karen Barad supports the new materialist development by “contributing to the founding of a new ontology, epistemology and ethics, including a new understanding of the nature of scientific practice” (Barad, 2007, p. 25). She draws upon the insights of quantum physics, science studies, feminist theory, critical theory, postcolonial theory, (post-)Marxian theory and poststructuralist theory. Coming from a physics background allows her to rethink the relation between mind and matter in a new, very thorough manner. Her understanding of scientific practice suggests a fundamental inseparability of epistemological, ontological and ethical considerations. She proposes ‘agential realism’ as an “epistemological-ontological-ethical framework that provides an understanding of the role of human and nonhuman, material and discursive, and natural and cultural factors in scientific and other social-material practices” (Barad, 2007,

p. 26). Her philosophical framework proposes a rethinking of fundamental concepts that reject binary thinking, including the relations between subject/object and nature/culture.

Below I elaborate on how Barad reworks these concepts. Barad's (2007) book *Meeting the Universe Halfway: Quantum Physics and the entanglement of meaning and matter* on which I base most of this chapter, is a true embodiment of her own theory; concepts are entangled everywhere and their definitions are not entirely stable. For example, the 'intra-acting' elements are sometimes described as 'agencies' (p. 33 and 333) and sometimes as 'components' of apparatuses (p. 269). Because of this entanglement of concepts, it is difficult to take out only a few key concepts and present them in a logical coherent summary. I will have to make certain 'cuts' and decide what to include, exclude, how to disentangle them and how to connect them back together.

I enter Barad's new ontology (or rather onto-epistemology) by first presenting her general worldview, which she takes from quantum physics. Thereafter I zoom in on Barad's take on humans, and, necessarily with that, her take on nonhumans. Next I assess the parts of her work that are more concerned with the production and coming to (scientific) knowledge and the philosophy of science aspects of her work. I will take Barad's notions as central, but I will start every section by embedding her work in the larger movement of New Materialism.

## 2.1 A brave New Material world view?

New Materialist analysis examines the signification (process) of matter or 'how matter comes to matter' (Barad, 2003). New materialism studies matter 'in its becoming', in its vital power; how it interacts, affects and is affected by other materialities, and how material forces produce the world and human history from moment to moment (Van der Tuin & Dolphijn, 2012). Materiality here is understood as plural, open, complex, uneven and contingent, and should be understood 'in a relational, emergent sense' (Coole & Frost, 2010, p. 29) that draws together natural and social worlds. New materialism acknowledges matter's vital capacity to self-organise (e.g. Bennett, 2009). This should not be understood as imputing divine or human life and qualities onto matter, but rather, that there is actually nothing outside of matter. There is no categorical distinction between mind and matter, there is only oneness or monism. Therefore, causation comes from matter itself. Researchers then should not and cannot appeal to universal essences or ideal categories to explain phenomena, but rather search for empirically grounded interactions. New materialists are therefore committed to immanence (Deleuze & Guattari, 1987), so no higher, transcendental order can be used to explain phenomena (DeLanda, 2006).

New materialist's monism stems from a rereading of Spinoza's ontology. Instead of making a categorical distinction between mind and matter, Spinoza assumed that all things in the universe are modes of the one substance, includ-

ing man's body and mind (Spinoza, 1994, IIP21, p. 132). Spinoza argues that humans: "consist of a mind and a body, and that the human body exist, as we are aware of it" (Spinoza, 1994, IIP13C, p. 124). So for Spinoza there is no distinction between matter and agential force that comes the human mind. Therefore, change does not come from external agential force imposed on passive matter. For Spinoza, movement is not an exception for objects to being in a static state. Rather, everything is always in a continuous process of change. This idea that everything in the universe consists of the same type of stuff is (later) called a 'monist ontology'.

Both the monist ontology and its associated idea on what change and agency are, are crucial for the worldview underlying Barad's agential realist account. The conceptualization of matter as expressed in the apparatus underscore her adherence to the new materialist monism. In what follows I will work out Barad's agential realist account, starting with a conception of matter.

## Matter

Barad's take on matter is influenced and inspired by the work of the physicist Niels Bohr. With his 'Copenhagen Interpretation' Bohr challenges classical Newtonian physics. Newtonian physics is mostly occupied with the behaviour of particles. Particles are small localizable objects that have physical or chemical properties such as mass, volume, density. Particles cannot occupy the same point in space. When two particles encounter each other they retain their own distinct properties and bounce off in different directions, as two balls on a billiard table. Waves act quite different. When two waves encounter one another they are able to occupy the same point in space and time and the new emergent wave has properties that result from the combination of the two (Barad, 2007, p. 76).

Barad's starting point of her 'philosophy-physics' is the 'particle-wave paradox'. This paradox arises because if we look at a quantum level, some entities exhibit behaviours of both particles and waves. Bohr's solution to the paradox is that a given kind of quantum object will exhibit sometimes wave and sometimes particle characteristics, depending on different physical settings such as the instruments used for measurement<sup>1</sup>. This is the central insight of Bohr's work that Barad departs from. At a quantum-mechanical level, the act of observation determines the outcome of atomic interactions; consequently, it is impossible to separate out the effects of the observation from the object. It even becomes meaningless to talk of a pre-existing or independent object. The primary ontological units of the world are not independent objects with independently determinate boundaries and properties, but rather 'phenomena' (Barad, 2007, p.118). Phenomena in this sense are the ontological inseparability of components that interact with each other, and from where both matter and meaning emerge. It is through specific *intra-actions* that the boundaries and properties

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<sup>1</sup>For macroscopic particles (objects that we can see) wave properties can usually not be detected, because of their extremely short wavelengths.

of the components of phenomena become determinate and that particular concepts become meaningful.

‘Intra-action’ is a neologism that Barad introduces to indicate “the mutual constitution of entangled agencies” (Barad, 2007, p.33). The notion of intra-action recognizes that “distinct agencies do not precede or pre-exist their encounter, but rather emerge through, their intra-action.” This is in contrast with the usual ‘interaction’. The ‘inter’ assumes there is action between two separate entities, that were independently existent before the encounter occurred. However, as Barad takes from Bohr, phenomena or entities do not exist separate or isolated from each other. Bohr and Barad show that objects like particles take on the properties they do only following specific intra-actions. As Bohr shows, particles do not pre-exist to the interaction with the measurement apparatus, but instead emerge from the interaction, taking on particular properties (like position, specific to particles) while others properties (like momentum, specific to waves) are excluded. Position and momentum, in other words, are complementary states. This complementarity principle ensures that the existence of one property necessarily excludes the other.

The notion of intra-action instigates a reworking of the traditional notion of causality. For Barad, matter is “substance in its intra-active becoming, not a thing but a doing. Matter is a stabilizing and destabilizing process of iterative intra-activity” (Barad, 2007, p.155). Phenomena, the smallest material units, come to matter through this process of ongoing intra-activity. Matter is thus inherently dynamic; it never sits still, it is an ongoing process that does not necessarily follow a linear path. A lively new ontology emerges: one in which the world’s aliveness comes to light. Aliveness, vitality and dynamism are omnipresent as they arise from the reworked notion of relationality.

Barad’s methodology comes from a phenomenon in physics that describes this fluid dynamic movement; diffraction. Barad takes and elaborates this notion from Haraway (1992). The coming together of two waves is called diffraction, the resulting pattern of new waves is called a diffraction pattern, and the thing that makes the two waves come together in the first place, such as the dropping of a stone in a pond, is called the diffraction apparatus (more on apparatuses later). Importantly, by studying the diffraction pattern it is possible to learn about the physical thing that put in action the waves to begin with. For example, we can learn something about the dropping of the stones by examining the ripples in the pool and vice versa (Barad, 2007, p. 83).

For Barad, diffraction replaces reflection as metaphor for philosophical inquiry. Reflecting apparatuses (e.g. mirrors) produce images that are more or less faithful to the objects placed in front of them, thus producing sameness. Furthermore, the physical thing that enables the reflection, the mirror does not tell us much about the effects of the mirror itself apart from that it reflects. Alternatively, diffraction patterns mark differences in the relative characteristics, such

as amplitude of individual waves as they meet and combine. The rock, or any other physical body, can prompt many different kinds of waves. Depending on their physical configuration it will produce different kinds of waves. Diffraction can therefore be used to acknowledge the influential role of the knower in the process of knowledge production and particularly how we learn about “material configurations of the world’s becoming” (Barad, 2007, p. 91). For Barad, diffraction is a useful tool highlighting the entanglement of material-discursive phenomena in the world. I included a table taken from Barad’s book in the appendix. The table is helpful to understand the novelties that Barad aims to introduce, both with this diffractive methodology, and with her agential realism in general.

### **Agential realism**

Barad’s describes her worldview as agential realist. Agential realism is an epistemological, ontological, and ethical framework that emphasizes that these three are inherently connected. The central notion of this framework is ‘intra-action’ which indicates the inherent relationality of everything. A phenomenon is an entanglement and the boundaries between entities do not pre-exist the phenomenon. The process of demarcating or delineating one entity from another within a phenomenon, is what Barad calls agential separability. This ‘separating’ or delineating occurs via *agential cuts*. Barad argues that agential cuts are not the result of any one person or force, but instead, the cuts that demarcate the boundaries of entities are the result of various material-discursive practices. In these practices intra-actions occur and in these intra-actions, agential cuts arise. Material and discursive networks therefore lay the conditions for specific agential cuts. Influenced by the complex apparatuses, agential cuts are repeated ‘boundary-drawing practices’ (Barad, 2007, p. 140) that delineate, like a sculptor with a knife, what the boundaries of a body are; what ‘makes the cut’ and what does not.

So intra-actions enact agential cuts, which do not produce absolute separations, but rather “cut together-apart (which is one move)” (Barad, 2014). Agential cuts effect distinctions between subjects and objects out of phenomena, or between the agencies of observation and observed. Differences are within the phenomena; differences are formed through intra-activity, in the making of ‘this’ and ‘that’ within the phenomenon that is constituted in their inseparability (entanglement). Entanglements are not unities. They do not erase differences; on the contrary, entangling entails differentiating and differentiating entails entangling. Barad explains that “the agential cut enacts a resolution within the phenomenon of the inherent ontological (and semantic) indeterminacy” (Barad, 2007, p. 140). So from all possible the world can be, agential cuts produce specific configurations; they produce determinacy from indeterminacy. In other words, agential cuts produce all differences in the universe. Perhaps we could see it somewhat like the cutting of an umbilical cord. It cuts the mother and child apart and together. Neither mother, nor child pre-existed separately be-

fore the cut (nor did they not exist). In the cut, the child became child, the mother became mother; and they were united as mother and child; they were cut together-apart.

### **Apparatus**

Barad's monist worldview and its associated dynamics needs an analytical framework, so it can be put to use. The favoured instrumentarium for new materialists is usually the *assemblage*. However, Barad opts to use an *apparatus*. The analytical frameworks of both apparatus and assemblage disclose different patterns and draw attention to different characteristics of particular phenomena. As with the particle/wave paradox, one can 'notice' things that do not readily appear within any single analytics. With their notion of the assemblage, Deleuze and Guattari privilege the tracing of deterritorialisation, which stems from their interest in social change and revolutionary force. Barad, coming from a background of quantum physics, also incorporates this open-endedness, or indeterminacy, but focuses more on the 'mattering' or materializing, stabilizing aspects of the apparatus. She is concerned with the ethico-political consequences of the formation of particular apparatuses (Barad, 2007). So rather than seeing an apparatus and an assemblage as separate phenomena, they can be used complementarily to draw attention to different aspects of phenomena; to making different cuts in coming to knowledge.

In the development of her apparatus, Barad mostly draws upon Foucault's notion of discursive practices and Bohr's concept of the apparatus, arriving at her own, agential realist formulation of material-discursive practices or apparatuses. Barad first extends Bohr's apparatus by questioning his reading of the apparatus as 'mere laboratory set-up' (Barad, 2007, p. 141), apparatuses would be no more than these elements that are nicely captured within the methods section of any scientific report. For Barad, Bohr underappreciates the range and extent of (material-)discursive factors that (re)produce and maintain apparatuses. To include this, Barad turns to Foucault and Butler.

Barad understands discourse in a Foucauldian sense, as that which constrains or enables what can be said and that what finally is treated, and exists, as a meaningful statement or action. Foucault himself uses the word *dispositif*, which is usually translated as 'apparatus' in English, to indicate the processual and physical nature of the organisation of power (Barad, 2007, p. 63). The word 'disposition' refers both as a specific arrangement of elements, but also to an inclination, tendency or propensity. A *dispositif* can thus be seen as dynamic process of congealing, or coming together of, material elements.

For Barad then, an apparatus consists of a set of strategies of relations of forces supporting, and supported by, certain types of knowledge. "[a]pparatuses are the material conditions of possibility and impossibility of mattering; they enact what matters and what is excluded from mattering." (Barad, 2007, p. 148). So

by performing these materialisations, an apparatus determines the possibilities and impossibilities of how and what matter comes to matter. In this sense, apparatuses are the material and discursive networks and entanglements that guide agential cuts. Agential cuts are boundary making instances; processes of inclusion and exclusion that are ongoing and always (to a certain extent) under negotiation. Therefore, apparatuses have no intrinsic boundaries but are open-ended social, cultural and material practices.

As said, Barad's notion of the apparatus is closely related to the concept of the assemblage. Both concepts are simultaneously analytical frameworks that help to understand how given phenomena do what they do, and they are creative tools that can be used to 'intra-act' with these phenomena and produce alternative ones. The assemblage found its place in new materialist theory through DeLanda (2006) who grounds his social ontology in assemblage theory from Deleuze and Guattari (1987). Deleuze and Guattari view assemblages as 'machines' that link a multiplicity of elements together to do something or to produce something. If different components of the machine are not situated in a particular position towards each other, or positioned in a slightly different configuration, the machine will produce something different, or it will cease to produce something at all. The particular composition of the components of assemblages are therefore important and it makes the 'outcome' of what it produces contingent upon the very material conditions.

This implies that the properties of a whole cannot be reduced to those of its parts. Elements of an assemblage generate something 'other' than themselves, and each element is also something else or 'other' beyond the assemblage. Furthermore, different components of the machine can be taken out of one particular machine, or assemblage, and plugged into another. Because, the composition of the parts changes, what the machines will produce changes as well. Therefore the same element can produce completely different 'outcomes' if it stands in relation to other elements (Deleuze & Guattari, 1987). Thus, we can never fully know what an assemblage or a multiplicity can do, as its agencies are involved in creating, unintentionally, patterns of coordination.

As a consequence, assemblages develop in unpredictable ways around actions and events. Different components are constantly drawn into and pushed out of an assemblage. The assemblage is thus in constant flux, as the specific composition of the different entities that take part in the assemblage always change. Social production is entirely due to the forces within assemblages, without any finitely determining structures, systems or mechanisms. Deleuze and Guattari (1987) described this process of components of assemblages stabilizing as territorialisation; a process of specification and power consolidation. The opposite process they describe as de-territorialization, which is a process of destabilization and de-specification, offering 'lines of flight'. Both the processes of territorialisation and de-territorialisation never reach an end-state and often both forces work at the same time. Assemblages are therefore always changing or in the process of 'becoming' something, rather than being something. This contributes to the idea that assemblages do not have fixed essences, nor fixed causal chains.

Both the apparatus and the assemblage are frameworks with which the dynamic monist ontology of Barad can be conceptualized and put to use. An assemblage might draw closer attention to the social and political forces at work in society, whereas the apparatus might reveal more about the technical and political aspects of knowledge production. However, these forces are never completely separate in this monist world.

## 2.2 Where do humans enter the story?

### Posthumans

The new materialist monist ontologies attribute a prominent role to matter and its agential force. But where does it leave humans? How can we understand the world through human knowledge practices while recognising that such practices are themselves not only part of the ‘object of study’ but that they are also the only means to try to understand their own multiple, dynamic contextualisations, their own dynamic ‘grounding’? Various new materialist authors, such as Haraway, Bennett and Braidotti engage with and develop an idea of the posthuman. Posthumanism offers an alternative to “anthropocentrism”, that is a humanistic outlook that has regarded the human as the centre of all performance and the ‘measure of all things’ (Braidotti, 2013). Posthuman studies then have “as subject and object the process of change and becoming of the natural and social world, and an ecology of human and the non-human in which neither is [ontologically] distinguished from, or privileged over the other” (Braidotti, 2013, p. 169). Posthuman studies are thus mindful of that ‘human’ is not a neutral term but rather a hierarchical one that grants access to privileges and entitlements, deriving from the humanist tradition and anthropocentrism. The allegedly universal ‘Man’ that arose in humanist bodies of thought is in fact, is masculine, white, urbanized, speaking a standard language, fertile and heterosexually and a full citizen of a recognized polity (Braidotti, 2013). ‘We’ (humans) can still speak of ‘human beings’ (or perhaps human doings would be more accurate), but this term refers to a multi-layered assemblage, and no longer to a unitary or universal entity or ontologically distinct and prioritized category.

Barad’s view on the posthuman fits the wider use of it in new materialism well. Barad uses and extends many of Foucault’s and Butler’s insights about the regulatory power and performative processes in order to formulate a posthuman notion of performativity. She takes the valuable insight that both material and discursive or social practices *jointly* perform the materialization of certain bodies. Barad extends these notions as she asserts that both Foucault’s discursive-material practices and Butler’s performativity fail to provide an adequate account of the relationship between discursive practices and material phenomena in the process of materialization. That is not to say that Barad asserts that Foucault or Butler do not include matter in their theory or that they do not assign a role for matter in the performative process. However, as I understand, for Barad, Foucault and Butler do not show that matter and dis-

cursive practices are already entangled in the process of materialization, and therefore they fail to demonstrate how matter and discursive practices jointly enact subjects and objects.

Barad argues that Butler prioritizes the performative process of the production of human bodies only and that “the processes that matter for her are only social processes” (Barad, 2007, p. 151). Furthermore, according to Barad, Butler implicitly assumes that matter can somehow be separated from linguistic practices in the process of performativity. Butler acknowledges that bodies are materialized or come to matter through both material and discursive (or linguistic or semiotic) practices, so indeed through two separate forces, whereas these forces are entangled, also in and during the process of materialization, not only after the enactment.

### **Power**

Let’s first look at Barad’s take on Foucault. Barad recognizes that humans are influenced by structural influences, such as social norms. However, at the same time she notes that humans are not completely subjected or determined by these structures. Barad draws upon work of Foucault on power and discourse to avoid this agency/structure dichotomy (see Giddens, 1979). Foucault analysed the historical conditions that invoke certain kinds of subjectivity. He avoids the structure/agency dichotomy by providing a conception of power:

Power is not an institution, and a structure; neither is it a certain strength we are endowed with. (...) [Power] must not be sought in the primary existence of a central point, in a unique source of sovereignty from which secondary a descent forms would emanate; it is the moving substrate of force relations which, by virtue of their inequality, constantly engender states of power, but the latter are always local and unstable. (...) [P]ower is produced from one moment to the next, at every point, or rather in every relation from one point to another. (Foucault, 1978, pp. 92-94)

Power is thus an immanent set of forces that constitutes, but it does not fully determines the subject. Power is not imposed by an external force that acts on a pre-existing subject. Foucault argues that the body’s materiality is regulated through the movements it exercises. Through repetition of specified bodily acts, power can take hold of the body. Both linguistic repetitions as well as specific material configuration have influence on this regulatory force. For example, Foucault’s analysis of the Panopticon shows how a material configuration, such as a prison, supports and enacts particular discursive practices (Foucault, 1977). Discursive practices are therefore not limited to speech acts or linguistic statements, but they are material conditions that define what count as meaningful statements.

Then Barad turns to Butler, who uses Foucault's understanding of how repetition of regulatory practices produce specific materialization of (gendered) bodies. In *Gender Trouble* (1990) and *Bodies That Matter* (1993), Butler explains gender not as an innate essence or natural quality, but as something that "proves to be performative that is, constituting the identity it is purported to be" (Butler, 1990, p.33). Butler argues that biological sex, gendered identification, and heterosexuality comes to appear natural through a 'naturalising trick'. Butler argues, like Foucault, that discourses are performative of the identities they appear to be describing objectively. These (gendered) performances are behaviours and thoughts that people repeatedly act out, both for themselves and in relation to others. Performances are acted out in accordance with social scripts that prescribe 'ideals' that provide a framework for people's behaviours and activities.

Butler argues that these dominant ideals favour the power of certain groups, for example, men and heterosexuals, over others. Gender, therefore, is partially socially constructed, or as Butler has put it herself: "This very concept of sex-as-matter, sex-as-instrument-of-cultural-signification (...) is a discursive formation" (Butler, 1990, p. 50). Consequently, there is no necessary link between gender and any particular bodily shape. Furthermore, gender is not an attribute of individuals, but something that is a collectively repeated act. It is the iteration of norms, through which subjects come into being. Performative approaches offer an understanding of power and subject formation by including an examination of the effects of exclusions and inclusions.

So Butler proposes an understanding of identity not as an essence, but as a verb, something that we collectively do. Butler explains that human subjects, or the 'I' from where we speak, does not precede nor follow this process of gendering, but emerges exactly within this process of iteration of norms (Butler, 1993, p. 7). So (gender) performativity constitutes, but does not fully determine the gendered subject. This gives Butler the opportunity to escape the structure/agency dichotomy.

### **Posthuman performativity**

Barad takes these insights from both Butler and Foucault to formulate a posthuman notion of performativity. Barad argues that humans are "intra-actively (re)constituted as part of the world's becoming" (Barad, 2007, p. 206). Humans are of the world, not simply in the world. In particular, they are not outside of the world looking into it. Humans, while not the mere effect of the world's becoming, are not the sole cause of the world's becoming. The question, Barad states, is what role human practices play in the world's becoming. Barad thus moves humans somewhat away from the central place of explanation and interpretation through her notion of the posthuman. Barad describes her take on posthumanism as:

Posthumanism (...) is about taking issue with human exceptionalism while being accountable for the role we play in the differential constitution and differential positioning of the human among other creatures (both living and nonliving). Posthumanism does not attribute the source of all change to culture, denying nature any sense of agency or historicity. In fact, it refuses the idea of a natural (or, for that matter, a purely cultural) division between nature and culture, calling for an accounting of how this boundary is actively configured and reconfigured. Posthumanism does not presume that man is the measure of all things. (Barad, 2007, p. 136)

So posthumanism for Barad is the recognition that nonhumans, or entities other than humans play an important role in everyday social practices, scientific practices and of course practices that do not include humans. It rejects anthropocentrism. Furthermore, her use of posthumanism is a refusal to take the distinction between human and nonhuman for granted. She argues that positing these categories as fixed excludes the opportunity to put under scrutiny the very processes, or apparatuses that delineate humans and nonhumans. Barad argues that all bodies, not only human bodies, come to matter through the world's iterative intra-activity or its performativity. Bodies are then not objects with strict boundaries and properties, but they are material-discursive phenomena. Human bodies are therefore not inherently or categorically different from 'non-humans'. What constitutes the human is thus not a fixed or pre-given notion. Theories that focus exclusively on the materialization of human bodies, such as Barad purports Butler's work to be (Barad, 2007, p. 145), miss the point that the very practices by which the differential boundaries of the human and the nonhuman are drawn are always already implicated in particular materializations. The constitution of the human is itself always accompanied by particular exclusions.

Given this posthuman view, for Barad, agency is not something that is specifically something humans have. Rather, agency is enactment, or what happens in an 'intra-action'. It is therefore something someone or something does, not something has. Agency is "the enactment of iterative changes to particular practices through the dynamics of intra-activity" (Barad, 2007, p. 178). Important for Barad is that agency is not only about being able to bring about change, but also to change the preconditions for the possibilities of change. Particular possibilities for (intra-)acting exist at every moment and could (potentially) be enacted in every moment. Therefore, these changing possibilities entail an ethical obligation to intra-act responsibly in the world's becoming, to contest and rework what matters and what is excluded from mattering. We are responsible for the 'agential cuts' that we help enact, not because we choose these delineation of in- and exclusion intentionally, or fully out of free will. But rather because humans are an agential *part* of the material becoming of the world. Logically, nonhumans form another part in this process. So cuts are agentially enacted partially by wilful individuals, but also by the larger material arrangement of which humans are part.

### 2.3 How can we come to scientific knowledge?

Can we still observe the world if humans cannot step out of it to look into it? If phenomena can be one thing in one moment, and something else in the next, can we come to knowledge about them? If matter and meaning are entangled, how can we do good science? How do we situate and understand the world's dynamic, relational openness? How do we deal with the lack of fixed boundaries and changing contextualisations? How can we understand processes of organising social, spatio-temporal, relational phenomena? If researchers are entangled with the phenomena they study might make one wonder whether this will not end up in a relativist 'anything goes' scenario in which science becomes irrelevant. Fortunately, this is not the case. What is needed is a reworked concept of what objectivity entails. More traditional conceptions of objectivity are concerned about the researcher's detachment from what they research. In this sense, the researcher should be neutral and distanced enough to completely observe the phenomenon of interest.

In a new materialist world, this idea of scientific detachment is not tenable. New materialists therefore aim to rework these notions of objectivity and scientific validity and formulate alternative ways to deal with the complexity and entanglement of world's phenomena. They recognize that natural and social sciences cannot be seen as strictly separate. The social and natural sphere are entangled. Consequently, a disciplinary division of labour will yield only partial knowledge about certain phenomena. New materialism deals with this through the notion of *transversality*, a concept introduced by Van der Tuin & Dolphijn (2010). They argue that a new materialist inquiry traverses disciplinary borders since it is not bound to any specific disciplinary practices. Transversal theories and inquiry aims to work through complex and multi-layered analysis of natural-cultural entanglements (Van der Tuin & Dolphijn, 2010). Though not coined by Barad the notion of transversality seems to be at work throughout her project as she does not hide her intentions to rework disciplinary boundaries:

My aim (...) is to provide a transdisciplinary approach that remains rigorously attentive to important details of specialized arguments within a given field, in an effort to foster constructive engagements across (and a reworking of) disciplinary boundaries. In particular, this approach provides important theoretical tools needed to move conversations in science studies, feminist studies, and other (inter)disciplinary studies beyond the mere acknowledgment that both material and discursive, and natural and cultural, factors play a role in knowledge production by examining how these factors work together, and how conceptions of materiality, social practice, nature, and discourse must change to accommodate their mutual involvement. (Barad, 2007, p.25).

And indeed, transversality is something that is at work throughout the construction of her agential realist account in her book as Barad constantly cutting

across different disciplines as she reads the physicist Bohr, with various philosophical and interdisciplinary approaches, such as science studies and critical social theories. The notion of transversality does justice to the entanglement of meaning and matter that Barad proposes. It acknowledges that disciplinary knowledge is limited and cannot grasp all aspects of phenomena under scrutiny. Furthermore, it emphasizes, as appears from Barad's quote above, that it is important to research how (not just that) these various aspects together, in their specific intra-action produce phenomena. This implies that collaboration with experts from outside of the field is required to come to adequate understanding of certain phenomena, but also that it is important to take into account how these experts together come to the knowledge they produce.

### **Ethico-onto-epistemology**

As Barad describes, phenomena arise or emerge specifically in this intra-action of researcher and researched. This implies that what things are (ontology) and how we can know these things (epistemology) and what we should do about them (ethics and politics) cannot be seen in isolated and treated completely separately. Therefore, Barad suggests the term 'onto-epistemology' (Barad, 2007, p. 185). It offers a foundation for scientific practice that is both material and cultural. It implies that ontologically, culture and nature are not two distinct categories and one cannot be privileged over the other; the always are at work together. This draws the researcher into the research; the researcher is entangled with her research, she is not an independent observer of an independent object of inquiry.

Barad proposes a notion of objectivity that requires a communication of the larger material arrangement (i.e., the full set of practices) that is a part of the phenomenon investigated or produced. This alternative idea of objectivity draws inspiration from Bohr's 'philosophy-physics', which rejects Newtonian mechanics, with its positivist certainties, discrete objects and measurable forces. Instead, Bohr's thought pursues its case via principles of uncertainty and indeterminacy. Barad stretches this as she insists upon the presence of the scientist as a productive force in her experiments. Despite all this blurring and indeterminacy, quantum measurements are still objective insofar as they are reproducible and communicable with "permanent marks (...) left on bodies which define the experimental conditions" (Barad, 2007, p. 119).

So research is no longer only about 'the results'; it is not necessarily only about finding adequate scientific theory or descriptions of phenomenon. Rather, as intra-actions reconfigure both what will be and what will be possible- they change the very possibilities for change and the nature of change. 'Objectivity' then becomes a question of the clear communication about both the phenomenon and the embodied concepts that are used to describe them are conditioned by one and the same apparatus. Scientific integrity is about disclosing, as much as possible, the material and discursive practices at work that

both formulate the ‘rules of the game’ and that influence the outcomes; about recognizing and showing the in- and exclusionary practices that are at work in the process of knowledge production.

Agential realism thus insists that key elements involved in experimentation or study, the particle or the phenomenon, the measuring apparatus, the conceptual frameworks and the scientist recording the measurements all emerge from the experimental entanglement and do not pre-exist them. This is entirely a result of the apparatus making resolute ‘cuts’ that create subjects and objects within phenomena; the apparatus produces determinacy. Objectivity becomes embodied within material configurations without the necessity of human observation or communication. Barad’s goal of a reformulated notion of objectivity is “not simply to put the observer or knower back in the world (as if the world were a container and we needed to merely to acknowledge our situatedness in it) but to understand and take account of the fact that we too are part of the world’s differential becoming” (Barad, 2007, p. 91). Matter, through the creation of ‘agential cuts’ within phenomena, becomes a key player in objectivity. Academically research is then about intra-acting of researchers and phenomena, which enacts particular results.

To understand Barad’s rethought concept of objectivity it is helpful to look at the notion of situated knowledge, as introduced by Haraway. Haraway (1988, p. 582) pleads for an idea of objectivity that is about “particular and specific embodiment and definitely not about the false vision promising transcendence of all limits and responsibility”. The notion of situated knowledge provides an alternative in which objectivity is about locatable, partial and (self-)critical knowledge, that acknowledges and takes responsibility in the stake of the scientist’s or observer’s location and embodiment. Haraway argues against identity politics in the making of science, nor does she agree with the idea of the ‘death of the subject’. The (scientific) subject is not death, but split, it consists of ‘heterogeneous multiplicities’ that cannot be reduced to a single identity.

Barad develops her idea of ethico-onto-epistemology with Haraway’s situated knowledge. The notion advocates just knowledge production and emphasizes the idea that one cannot but ethically engage with the world. Because we are part of the world, we can no longer see ourselves as innocent bystanders, observing the world from a freestanding perspective, or, as Haraway has called such a falsely neutral point of view; a “god trick” (Haraway, 1988, p. 581). The notion emphasizes that all beings share in their intra-actions with the world, as we are all in and part of the world’s becoming. So Barad’s ethics starts from “a relational, situated and embodied model of (inter)subjectivity, and reveals how ethics, being, and knowing no longer can be separated” (Barad, 2007, p. 392).

## 2.4 Conclusion

This chapter is the materialization of my intra-action with Barad's agential realist account. Barad's framework is based on discursive practices that are not merely linguistic or social activities, but specific material configurations of the world through which boundaries, properties and meanings are enacted.

*Matter* is not a fixed and static essence, but rather it is a substance in its intra-active becoming. It is not a thing, but a doing. *Apparatuses* are material and discursive practices that produce and are part of the material phenomena. Different material-discursive practices or apparatuses produce different material phenomena in the world. Different apparatuses do not only provide a different description or different result of (scientific) inquiry, but rather give rise to different phenomena and possibilities for what the world may be. This is because the profound commitment that everything is entangled with everything else means that any act of observation makes a 'cut' between what is included and excluded from what is being considered. Therefore, being, doing and knowing all intrinsically come with responsibility.

The notion of the *posthuman* refers to the recognition that nonhumans, or entities other than humans, play an important role in everyday practices. Furthermore, all bodies, not only human bodies, come to matter through the world's iterative intra-activity or its performativity. Human bodies are therefore not inherently or categorically different from 'nonhumans'

The researcher does not stand in independent separation from the natural or social world she observes; there is no such point of exteriority. Nothing is inherently separate from anything else, but separations are temporarily enacted through agential cuts, so one can examine something long enough to gain knowledge about it. The particular configuration that an apparatus takes is not an arbitrary construction of our choosing, nor is it the result of causally deterministic power structures. Humans do not simply assemble different apparatuses for satisfying particular knowledge projects, but are themselves specific parts of the world's ongoing reconfiguring.

Barad's work is valuable for understanding new materialist theory in general, as it is one of the most prominent works within the movement. This is because she fundamentally rethinks perceptions of dichotomies such as nature/culture, subject/object or reality/representation. It does so by providing a new ontology based on important social and scientific theories, with an explicit focus on the process of scientific knowledge production. It is a move towards a new paradigm that allows us to abandon paradoxical and unproductive dichotomies on which more traditional worldviews rests.

This thorough critical analysis of the rules of the game of academic inquiry is crucial for economists that aim to rethink economics. The very preconditions

for the production of knowledge determine who and what are included and who is excluded. Barad's framework will therefore be a fruitful tool to emancipate various economic currents that aim to establish themselves as serious alternatives to standard economic thinking. Furthermore, Barad's agential realism provides a worldview that is adequate to grasp and deal with complex issues; an onto-epistemology that resonates with the worldviews underlying various heterodox economic currents. Various currents in economic thinking in which rethought notions of agency, power and relationality are already at work have emerged and are still emerging.

In what follows I present various of these so-called 'heterodox' economic currents. I detect shared philosophical underpinnings among these currents. It becomes apparent that many of the notions Barad posits are already at work in these various economic currents. In chapter four, I will diffractively read these philosophical commonalities with the key concepts from Barad as I have presented in this chapter.

### 3 Commonalities of heterodox economics

In light of the recent economic crises and pressing global and local challenges, many economists call for an alternative discourse on economics (e.g. Lee, 2012; Mirowski, 2013; Chang, 2014; Raworth, 2017; Stiglitz, 2018). This alternative already exists in the bodies of knowledge of various heterodox economic currents. Heterodox economic thinking aims to make economics a true social science again (Morgan & Embery, 2018). To do so, it seeks connections and collaborations with other disciplines to account for social, political and philosophical insights in its theory and practice. These efforts are not entirely novel, in that the economy has always been embedded in a larger social sphere (e.g. Polanyi, 1944). Classical economics, of which Adam Smith is often considered ‘the founding father’, emerged as theory on political economy. Only recently, as from the 1970s, economics has emancipated as an isolated and ‘pure’ science that is seen as a completely independent field (Weintraub, 2002).

The term ‘heterodox’ suggests that heterodox economics is just the ‘other’ of the ‘pure’ orthodox science of economics. It would then be defined in terms of what it rejects, implying that it does not have its own body of theory and policy. It thus risks that it reaffirms the standard it criticises (Jo et al., 2018). This is mistaken. Any definition, either positive or negative, will create a (strict) artificial boundary between two groups and put them in opposition. This does not do justice to the dynamics of economic knowledge formation and the fuzziness that any such categorization would necessarily invoke. This is visible in the various problematic attempts that have been made to delineate ‘heterodox’ from orthodox or standard economic thinking (Dequech, 2007). Categorizations are based on theoretical concepts (e.g. equilibrium theory, rationality as suggested by Davidson (2003)), method (e.g. formalism as formulated by Lawson (2005)), methodology (e.g. methodological individualism as suggested by Arnsperger & Varoufakis (2006)), ontology (e.g. open system as suggested by Dow (1990)) or sociological criteria (i.e. mainstream such as advocated by Lee (2012)). Any of these attempts to classify are doomed to fail as the responding group will always be more refined than assumed in the category and will always come up with exceptions to rule (e.g. Colander et al., 2004).

That is not to say that classification, seen as a temporary heuristic abstraction, cannot be useful as to enable greater understanding of complex objects or for analytical convenience (Dow, 2000). Or, in the case of ‘heterodox’ economics, for strategic and emancipatory purposes to gain more influence on economic policy, curriculum design and respected economic journals. A ‘category’ of heterodox economics could then be regarded as ‘political fiction’ (cf. Braidotti, 2011), which is a conceptually empty set that can be filled with particular meanings, research and emancipation purposes. In any case, such a definition should be “multi-faceted, temporary and, perhaps, purposefully vague” as argued by (Mearman, 2012) as he recognizes that “heterodox economics appears a complex web of interacting individuals and as a group is a fuzzy set” (p. 408).

I am happy to follow Mearman’s suggestion. In this thesis I refer to the term heterodox economics, but I will not give a strict definition. Rather, in this chapter I aim to contribute to a positive constitution of heterodox economics by seeking to recognize commonalities among the various practices of economic currents that are typically labelled, or self-categorized, as ‘heterodox’. These currents<sup>2</sup> include institutional economics, ecological economics, post-Keynesian economics, feminist economics and complexity economics. For the sake of the argument, I loosely refer to standard economics to indicate branches of economics that are more commonly incorporated in economics education curricula (see De Muijnck et al., 2018), which more or less corresponds to Lee’s (2012) categorization of mainstream economics.

I will provide an account of the key concepts that bind various heterodox currents together. I used two main sources for this exercise. The first source I used is an introductory textbook to pluralist economics (Van Staveren, 2014). This book is written to introduce students to various economic currents, including these that are seen as standard approaches. Therefore, some key elements in economic thinking are presented from a variety of perspectives. In such a text, commonalities among the various currents must become clear to present an understandable mapping of the academic economic landscape to students. However, relying on a textbook risks oversimplifying what happens in heterodox thought. I therefore supplement my inquiry with findings from the *Handbook for Heterodox Economics* that has a more diffuse collection of the most recent projects of various heterodox economic researchers (edited by Jo et al., 2018). Where possible, I support the claims I make about these various ‘general currents’ with insights from specific heterodox economists that I am familiar with.

This research comes together in this chapter with the following structure: I will first look at the general worldview of heterodox economists and at how they view the economy. Then I assess the way heterodox economists view human beings and how they relate to each other. Thereafter I evaluate what implications this worldview has on the way economists produce and come to knowledge.

### 3.1 The economy; what are we talking about?

The very definition of economics and what the economy entails is highly disputed (Backhouse & Medema, 2009). The most common currently accepted definition of economics comes from Robbins’s *Essay on the Nature and Significance of Economic Science* (1932, p. 15), where he defined economics as “the science which studies human behaviour as a relationship between ends and scarce means which have alternative uses.” In heterodox thinking the emphasis

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<sup>2</sup>Also these economic ‘currents’ are artificial categories. What is written above about categorization also applies in their case. I will mainly use the term ‘current’ to indicate that these bodies of knowledge are fluid and dynamic, not fixed categories.

is not on the allocation of scarce goods. Instead, the economy is conceptualized as a collection of historical processes through which the society is organized and reproduced in terms of social and material needs (Jo et al., 2018). The economy thus consists of the material basis of the society; as a situation in a continuous process of open-ended interaction between human beings and nature, technology, social classes, agency and structure. Heterodox economists understand that the economy is part of society and that society is embedded in a larger ecological or planetary system. This acknowledges that there are moral, political, ecological and cultural dimensions to economic behaviour.

Heterodox economists are reluctant to provide definitions for what economics is and rather give descriptions of what it does. Jo and Todorova posit that “economics is concerned with the ongoing organization of individuals and households in societies to provide in the material goods and services necessary to maintain and reproduce themselves” (Jo & Todorova, 2017, p. 18). Van Staveren provides a tentative definition in the textbook that states: “economics is the study of how human beings interact for the provisioning of their livelihoods in markets, the state, and communities” (Van Staveren, 2014, p. 11).

Heterodox schools put to work some division of labour when it comes to focus on different aspects of this provisioning process. In other words, different schools draw from different fields of knowledge and emphasize different realms in which the economy is embedded. For instance, institutionalist economists focus on the economy as embedded the social sphere and they draw upon social theory about institutions. Institutionalists understand humans as social beings who derive preferences and value orientations from the social context they are embedded in as well as from direct interactions with other people, which do not necessarily take place in the market sphere (Hodgson, 2009). The economic system consists of formal and informal social organization related to the production, distribution and consumption of goods. Rather than presupposing certain universal features rooted in human nature, a central insight is that the concrete characteristics of societies and forms of economic organisation considerably vary across space and time (Henry, 2018).

Closely related to institutionalists, evolutionary economists focus on the importance of technology in the provisioning process. They draw from evolutionary theory to explain developments in technology, which is seen to enhance the growth and continuation of organisations, be it also to explain continuation of organisations, be it a household, a business enterprise, or the government (Hodgson, 2002). Consumption and production are explained in close connection to the underlying system of institutions.

Feminist economists point out that a going-concern household makes its living by engaging in the production and consumption of commodities and non-commodities (un-paid) such as birthing, raising, educating and recreation, all of which are essential to the life process (Ferber & Nelson, 2009). These household

and non-household (re-)production activities are intertwined in that, for example, recreation and care activities require earned income. But also vice versa, to earn wage income, labour power should be created, recreated and refreshed, taken care for (Marçal, 2016; Todorova, 2018). So taking the provisioning process as central point of analysis in economic inquiry (instead of the allocation of scarce resources) broadens the focus from only transactions that are expressed in monetary terms, to make linkages between going-concern activities. Such interrelationships can be extended to other constituents of society, such as values, beliefs, institutions, technology and environment.

Ecological economics broadens the focus by explicitly addressing the embeddedness of the economy in the natural environment. Ecological economics aims to ground economic thinking and practice in biophysical realities, especially in the knowledge of ecological systems. The planetary level is seen as a closed system; materials only cycle within it and do not enter or leave. Within this closed system, many open systems are embedded. The difference between a closed and open system is that in an open system, energy can leave and enter the system. In a closed system, energy levels are fixed. Therefore, open systems stand in relation to other systems. Changes in the system will have effects on other systems. The economy is seen as one of these open systems with constant inflows and outflows of matter and energy (Daly & Farley, 2011). The economy is dependent on other subsystems, and ultimately on the larger, limited global ecosystem, the biosphere (Georgescu-Roegen, 1971). Production is therefore subject to material and energetic limits. These limits are codetermined by fixed ‘planetary boundaries’ and open and dynamic social factors, such as values and institutions.

### **Changes in the economy; economy as system.**

The embeddedness of the economy in other spheres, such as the social and ecological suggests that (economic) change is complex and perhaps not as predictable as some economists might hope. Many heterodox economists let go of the idea of linear causation and prediction. Complexity economists in particular deal with how to understand and conceptualise non-linear causation. Complexity economists view economic phenomena as emerging and are not geared towards any final or teleological ideal or a static equilibrium state (Elsner, 2017).

In order to grasp this, complexity economists, like their ecological colleagues, conceptualize the economy in terms of different systems. The economy is an ‘open’ sub-system inside the larger planetary system. The latter is a closed system in the thermodynamic sense. All human production uses energy to convert matter and can therefore be described as a natural, biophysical or metabolic process. Complexity economists aim to trace these ‘energy’ flows. They introduce concepts, such as path-dependency (e.g. Acemoglu & Robinson, 2013), lock-in (Arthur, 1999), feedback loops (e.g. Helbing, 2012) and self-organization (Arthur, 1999) to explain the particular patterns of movement and dynamics

of these flows. Self-organization is of particular importance. It implies that elements within the system do not organize according to some sort of externally imposed blueprint. Through ongoing processes of recursively elaborative adaptation, the system can maintain its form without some externally-imposed discipline or organizing device (Arthur, 1999).

This system thinking gives rise to a different idea of how micro- and macro level analysis relate to each other. Complexity economists use the concepts of sub-system and supra-system to indicate how systems are embedded in each other. Levels that could be indicated as micro-, meso- (which is a heterodox addition to the conventional micro/macro dichotomy) and macrolevel of economic phenomena are not absolute, as their level of abstraction depends on the relative relation to other ‘systems’. For instance; the supply and demand for houses in Rotterdam might be a microlevel in the system of the Dutch housing market. However, it stands in a ‘macro’ relation to the supply and demand of houses in specific neighbourhoods such as Charlois and Blijdorp. Furthermore, the supply and demand for houses in Rotterdam can simultaneously stand in relation (either macro or micro) with and in other systems, such as the system of influx of students in the city, or the organizational system of Unilever.

Therefore, heterodox economists focus on how these levels influence each other and how they are at play at the same time (Gräbner & Kapeller, 2017). The strict separation of micro- from macroeconomics ignores the interrelationships between constituents that generate, constrain or facilitate the dynamics of the social system. Aggregates contain not only individual entities, but also a corresponding set of relations which tie their individual nodes together and create a certain structure that has different characteristics than that of the individual components. It follows that the conventional micro-macro dichotomy is a limited if not restrictive, analytical apparatus.

An illustration of this can be found in feminist analyses of the assumption in economic theory that takes the household to be the smallest unit of analysis. The aggregation procedure derives household preferences from the sum of the preference of homogenous ‘representative’ individuals that constitute that household (Todorova, 2018). This procedure neglects the underlying relational structure among individuals that explains the position of women and children. Taking the household as a fundamental economic actor, therefore, contributes to the exclusion of gender issues from economic analysis. This example illustrates that (simplistic) aggregation procedures can fail to take into account important dynamics, which is not restricted to feminist analysis. Behaviour in aggregate social systems, like a firm, a community or a nation state, depends heavily on its internal relations. Therefore, many heterodox economists advocate for a multi-level approach to economic theorizing (Gräbner & Kapeller, 2017; Lee, 2012; King, 2013).

### 3.2 What place do heterodox economists attribute to humans?

As the economy is embedded in a larger social and ecological sphere, the humans who live and act in this economic environment must be embedded as well. To understand a human who stands in a relation of mutual influence to her environment, an elaborate account of the notions of structure, agency and power is required.

#### Structure

The embeddedness of the economy in a larger system and its entanglement with other open systems implies that agency is influenced by structural context. Structure consists of stable patterns of social relations. Once stabilized, socially and temporally resilient patterns may become institutionalized (Giddens, 1979). Humans are born into a set of institutionalized structures and are socialized through them. Structures form the mental models of humans, which enables them to process information and make decisions (Morgan & Embery, 2018). Structures are constraining in this sense, but also enabling. For instance, structures regarding academic writing constrain me in the freedom that I have in what and how to write this thesis. I have to stick to certain rules in order for my writing to count as ‘academically (and philosophically) valid’. However, simultaneously, this structure enables me in that it offers me tools to formulate thoughts and to express and communicate ideas (though they are influenced by the academic ‘format’). Moreover, the structure enables me in that I can participate in the academic arena; adhering to the structure grants me certain agency or power.

So because of the influence of these social structures or institutions, people do not act fully out of free will. The power and decision to act is influenced by more than a rational trade-off between costs and benefits of anticipated outcomes of a certain action. That is not to say that humans are passive marionettes whose strings are pulled by structural influences. A person is historically and socially situated, interactive and interdependent, and at the same time causally significant within a complexity of causes that make up the world, including the economy (Morgan & Embery, 2018).

#### Agency

Van Staveren emphasizes the opposite position when she defines agency as “making autonomous choices and acting upon these” (Van Staveren, 2014, p. 62). Here I think she does not do justice to the presence of more refined views of agency in various economic currents. Wrenn regards agency as something reciprocal in terms of “the power to influence and be influenced by the surrounding environment” (Wrenn, 2018, p. 177). She asserts these relations of mutual influence can be relations of acting, choosing, imagining, understanding, engaging,

affecting, etc. Also Lee views “human agency as embedded in a cultural context and social processes in historical time affecting resources, consumption patterns, production and reproduction, and the meaning (or ideology) of market, state and non-market/state activities engaged in social provisioning” (Lee, 2012, p. 340). This implies that agency can take place only in an interdependent social context, which emphasizes the social and de-emphasizes the isolated nature of individual decision-making.

### **Power relations**

The study of the provisioning of material means in contemporary society requires an explicit and refined understanding of power. However, standard economics is constructed in a way that makes it difficult to include power relations in economic analysis. The definition of economics as the study of the allocation of scarce resources directs attention towards questions of efficiency and yields distribution mechanisms that are perceived to arise naturally in the market. In addition, standard economics assumes that the market is a place free of power (apart from market power held by companies) and that any transaction or economic behaviour is based on voluntary exchange and free choice. This makes standard economics inept to address the influences of power structures on economic behaviour and outcomes. Therefore, economic analysis requires an alternative theoretical framework that explains how activities are organized. Heterodox economics agree on this point and all (except some branches in complexity economics) acknowledge that power is a significant factor in the organization of (economic) life.

Rather than starting economic analysis off from scarcity, a common focus for many heterodox economists is on abundance or a situation of non-scarcity and how value or resources are distributed (Martins, 2018). If resources are not viewed as scarce, prices cannot be taken as scarcity indexes as standard economics assumes. If there is no scarcity index, market activities cannot be coordinated by the price mechanism (Jo, 2016). Therefore, no ‘natural’ allocation mechanism (or invisible hand) arises that neutrally assigns how resources are distributed in society. Distribution can therefore not be seen as something neutral deriving from marginal productivities, but it is an inherently political process.<sup>3</sup>

To be able to account for this political dimension, heterodox economists tend to take scarcity as relative limitedness of resources, depending on the specific situation, and not as something fixed or absolute (Van Staveren, 2014). For instance, innovation creates new means of communication, production and power. Or clean air might be abundant, but is made scarce through pollution and emission permits. Therefore, some heterodox schools, such as post-Keynesians and

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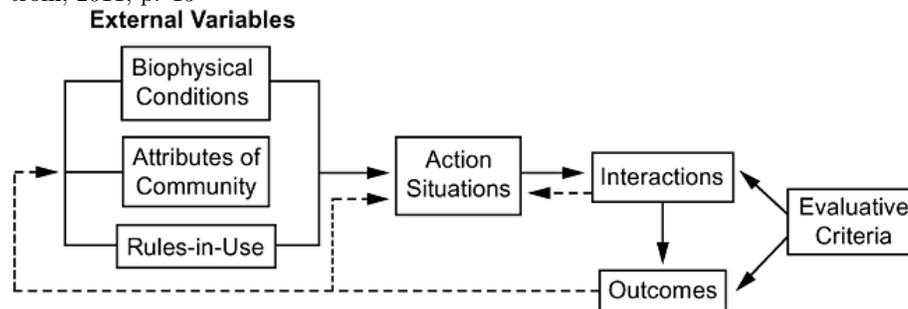
<sup>3</sup>This is in line and builds on, for instance, Robinson’s (1953) critique that resource distribution depends on institutional factors, such as bargaining power, rather than (merely) marginal productivities.

complexity economists focus on these dynamics of innovation and changing systems, rather than on scarcity itself.

The account of what power is and how power is dealt with differs in the various heterodox schools. Marxian economists address the asymmetric distribution of opportunities to accumulate capital and the dynamics of wealth inequality. They address the asymmetric power between those who own capital and employ labour, and those who seek employment. Post-Keynesian economists, on their turn, do not explicitly assume a split between labour and capital, but do look at the power dynamics behind the distribution of income and resources. Additionally, they have an explicit focus on the bargaining power of labourers, without assuming that most unemployment is voluntary (Van Staveren, 2014).

Institutionalists focus on the power asymmetry of institutions. This can be manifest in that institutions that enable specific forms of power, such as access to education, are not equally accessible or distributed among different member of society. Furthermore, some institutions are designed on the basis of power asymmetry. For instance, the voting power in the World Bank depends on the size of a nation's economy (Van Staveren, 2014). An example of how these power dynamics can be accounted for in theory is Elinor Ostrom's framework for Institutional Analysis and Design (Ostrom, 2011). Her framework shows different moments where power relations are at work and how they result in collective and individual behaviours. For Ostrom, her framework is a way to conceptually reconcile structural or institutional influence on behaviour with the findings of rational choice theory (which assume individual autonomy). See Figure 1.

Figure 1: Ostrom's Framework for Institutional Analysis and Design. Source: Ostrom, 2011, p. 15



The aim of this framework is the identification of an action situation and the resulting patterns of interactions and outcomes. The outcome of these patterns can be evaluated against different evaluation criteria (e.g. economic efficiency, sustainability, equity, etc.). Ostrom suggests that discursive influences, such as norms and values (attributes of community) influence the way we see the biophysical conditions of our world, which jointly influence how people inter-

act in certain action situations. So, Ostrom creates space for both biophysical and social aspects to influence particular actions. This makes the model very rich (here I provided only the very superficial characteristics) and applicable to analyse a wide range of dimensions of a wide range of situations.

Feminist economists have addressed that the distribution of resources is not only dependent on initial endowment (or class as Marxian would have it), but also on gender. Power relations emerge and feed into dichotomies that are commonly found in economics and the economy, such as economic/social, productive/unproductive, masculine/feminine, paid/unpaid or public/private (e.g. England, 1993; Barker & Kuiper, 2003). Typically one side of the dichotomy is favoured and the other marginalized. For instance, the dichotomies of productive and unproductive and paid and unpaid become apparent when looking at what is happening in households.

Often, microeconomics tend to view households as the smallest unit of analysis, homogenous, and it considers anything that goes on inside of this private sphere to be irrelevant. Feminist economics pointed out that the emergence of the private sphere of the household and public sphere of the market are highly gendered (Ferber & Nelson, 2009). Women are assigned to the private domestic sphere in which reproductive and caring work occurs. These are activities that are typically unpaid, and therefore seen as unproductive and not generating value. The private sphere on the other hand was occupied by (ideally) rational men who engage in productive (trans)actions (England, 1993; Barker & Kuiper, 2003). Including these dimensions of power in economic analysis is crucial to understand how economic phenomena ultimately influence people's agency or their ability to influence and shape their environment to their interest.

### **3.3 The lost innocence of the economist, but regained value of economics**

We saw above that the various ways of depicting the economy, the different definitions of what economics is and the different conceptions of humans beings, and their ways of standing in relation to each other and their environment, are of influence on what kind of knowledge is produced about the economy. Therefore, economists can no longer be seen as innocent observers that objectively describe the economic world from a safe distance. Below I describe ways in which heterodox economists acknowledge this and deal with it.

#### **Historical and geographical specificity**

In heterodox thinking, the economy and human beings are embedded in a larger social and natural sphere. Economists, who are also human beings, are embedded in these very same spheres that they study. Therefore, also the body of economic inquiry and economic knowledge itself is embedded in these specific settings of historical and geographical circumstances. The theoretical discourse itself should be put into and start off from the socio-historical and geographical

context (Hodgson, 2002). Economics then is a body of historically contingent social theory with an analytical focus on real economic activities as articulated by classical political economists (cf. Polanyi, 1944).

As the economy is developing in real historical time, the past has a persistent effect on the future through path dependency. Post-Keynesians, for instance, do believe that capitalist economies exhibit certain regularities that are generated by causal mechanisms. These regularities can be captured by economic theories. Post-Keynesians conceive of the economy as a dynamic system that is subject to a permanent change in historical time. Therefore, empirical regularities can change as well, so that the knowledge produced by economic theories cannot be regarded as universal laws (Harcourt, 2008). Reality is complex, so even the more complicated models are a simplification of reality. This acknowledgement of inherent partiality and uncertainty leads to a more cautious confidence in economic models. The world can only partly be observed by humans. In their research, economists will therefore always have to make (unintentional) decisions about which realms and parts of reality to focus on, and which parts to leave out.

### **Economic knowledge production**

Because of this partiality, economists can no longer see themselves as neutral observers, or objective bystanders. Feminist scholars have pointed out that the economists and the knowledge they produce are necessarily situated (Harding, 1995). Furthermore, knowledge is always produced out of a certain position of power (Nelson, 2003). Consequently, questions arise around the process through which economic knowledge is produced. Which topics and methods are included and excluded in academic inquiry? Whose interests do scientists serve? Feminist economists point out that in economics the very production of knowledge happens through male biased methods (England, 1993; Ferber & Nelson, 2009; Grapard & Hewitson, 2012). For instance, Nelson (1996) described that mathematical models rely on notions such as abstraction, rigour and exactness, which are characteristics associated with masculinity. Qualitative methods, such as discourse analysis, are seen as ‘vague’, ‘chaotic’ and ‘intuitive’, which are often perceived as feminine characteristics. Nelson argued that economics has been particularly favourable towards the former, ‘harder’, methods and unfavourable towards the latter, ‘softer’, ones. She pleads not to discard mathematical methods, but that economic analyses should involve a broad variety of models and methods which are suited best for the respective research question.

Also, the notion of performativity is slowly arriving in economics (MacKenzie, 2004; Butler, 2010; Callon, 2006). Economists are part of the world they study, and they enact or perform parts of economic reality in their process of knowledge production (e.g. Callon, 2006). This makes economists responsible for the very conditions and possibilities through which collectively economic knowledge can be attained. Furthermore, as they enact certain parts of reality, economists are responsible for the way parts of society and economic institutions

are designed.

For instance, the health system in the Netherlands is designed based on insights from economic theory that emphasize the benefits of efficiency through competition and benefits of scale. In order for these efficiencies to arise, these theories conceptualize patients, or those in need of care, as rational well-informed healthcare consumers. These theories have material effects in that they are enacted and are still enacting the very way in which health care is organized in the Netherlands. Furthermore, some monetary incentives given by health insurers or the very organizational procedure of for instance, a general practitioner's visit might prone people in need of care to behave and see themselves as these theories dictate, i.e. as consumers of a service rather than as patients or as someone depending on someone else to care for them.

### **Methodological pluralism and interdisciplinarity**

Because of the inevitable partiality of economic knowledge, heterodox economists are welcoming towards multiple methods and intellectual backgrounds (Dow, 1997; Lee, 2012). First, this is because methodological pluralism or interdisciplinary research is mindful of the embeddedness of the economy or the system perspective. Combining different disciplines allows to look at the interconnections between different realms and systems. This takes into account possible unforeseen consequences of (economic) action on other realms and vice versa. It also offers a look at ecological and economic processes from the perspective of systems, and less from the perspective of individuals. Second, pluralism of methods accommodates incommensurability of values, which is an important issue in questions of (re-)distribution of resources, caring labour and environmental concerns (Lee, 2012). Finally, methodological pluralism prevents that one specific methodology or approach is prioritized. This makes economic inquiry more inclusive and open to various perspectives (Ferber & Nelson, 2009). This allows for a wider range of topics and interests to be accounted for.

### **Engaged science**

Heterodox economics does not hide its political outcomes and agenda under the cover of scientific neutrality, but it admits and actively recognizes its own partiality. It recognises that economists cannot but ethically and politically engage with the world. This allows and stimulates heterodox economists to imagine and enact an alternative, more sustainable and equitable economic reality that is both consistent with and supported by their theory (Jo et al., 2018). Most heterodox strands explicitly consider their work more as a type of socially relevant problem solving than as a conquest for truth. This urge for affirmative or positive change is what heterodox thinkers have in common. Again, the focus or entry point differ per heterodox school. Ecological economics addresses sustainability-related problems and solutions. Feminist economics has an explicit political mission of emancipation of marginalized groups in addressing gender-specific issues. Complexity and evolutionary economics aim to deal with

large technological changes and post-Keynesian economists have an explicit focus on the distribution of wealth.

### 3.4 Conclusion

Economists work along many different axes: ontology, epistemology, methodology, theoretical concepts employed, location within social groups within economics, areas of interest, politics and the vision of agents with economic power. Any single economist or economic concept will lie somewhere on a scale on each of these dimensions. Heterodox economics is a fuzzy set in those dimensions that does not have a strict boundary with standard economics. Still, in this chapter I identified that various heterodox economic currents share fundamental assumptions about what the economy is and how it changes, about the place of human beings in the economy and about the conception of economic knowledge production.<sup>4</sup>

The economy is conceptualized as an open system embedded in a larger closed system. Changes in the economy are part of an open-ended continuous process that arises in the interaction between human beings and their natural and institutional environment. The starting point of economic analysis is always grounded in the real world. Humans have the freedom to act in this economy, but this freedom is influenced by structural forces and restricted by historical conditions. This applies to the economic phenomenon under scrutiny, to the body of economic knowledge, and to the economists themselves. This makes heterodox economics partial, inherently unfinished and open for various methodological approaches. Furthermore, the situatedness of economics in the real world ensures that it is politically engaged and does not evade but rather calls forth the most basic questions for economics: how can we meaningfully, justly and sustainably live and provision in our needs?

So, the common ground of heterodox economics mostly lies within its philosophical underpinnings. But common ground does not suggest common outcomes or common goals. Different schools of thought have different areas of interest: the nature and distribution of economic surplus, the problem of instability of and within systems, issues of exploitation of humans and nature, etc.

In the next chapter I diffractively read the key concepts of Barad, as presented in the previous chapter, with the shared concepts among heterodox economists identified in this chapter. Barad's agential realism can inform heterodox economic thinking and offer a resilient philosophical framework that underlies its theory. Additionally, a diffractive reading of the concepts can inform further developments of heterodox economic thinking as it becomes apparent where and how resonances and dissonances occur. Finally, Barad's framework will help to

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<sup>4</sup>To be clear; most likely more standard approaches will, to a certain extent, share some of these characteristics as well. However, a careful evaluation of standard approaches on these dimensions is beyond the scope of this thesis.

formulate a shared positive account of heterodox economics that provides a serious alternative to standard economic thinking. In that way heterodox economics can realize the collective potential as critical community and establish itself as a living body of knowledge that plays an important role as social science, able to address the urgent questions of today's society.

## 4 Intra-acting Barad and heterodox economics; is an e(thi)co-onto-episte-nomics emerging?

How is the heterodox economy embedded into a new materialist world? With the benefits of the New Materialist theoretical insights, what then might the imagination of alternative economics encompass? How can Barad's insights be used to recognize, explain and emancipate the new developments in economics? If various heterodox currents unite on the ground of the communal philosophical underpinnings, how could Barad's onto-epistemology inspire this branch of economics to advance its research programmes?

Both heterodox economic currents and Barad's work emerged and are still emerging in 'intra-actions' within the larger specific practices or apparatuses of our time. In this chapter I aim to provide some pre-taste of how various heterodox economic theories and concepts can be read with Barad's agential realist account. This is of course not a definitive or exhaustive reading. The findings below are based on general practices that are most likely less refined than what heterodox economists actually conduct. The suggestions I provide are therefore food for thought aimed to stimulate further research. Could there be an e(thic)o-onto-episte-nomics emerging? Let's find out!

### 4.1 The economy, economic matter and phenomena

The view that the economy is embedded in a larger social sphere, which in turn is embedded in a larger planetary, fits well with Barad's ideas about entanglement. The economy is not an isolated, separate realm that barely communicates or interacts with other spheres. The natural and ecological environment is not something passive whose only function is to be of use value for humans. Rather, the ecological system gives rise to self-organizing structures. The economy is inherently part of this system, that is full of dynamic matter and phenomena. Economic phenomena arise in 'intra-action' with these material forces. Ecological economists would express this in terms of energy dynamics. Energy constantly moves through economic production, but also through ecological and biophysical forces. 'Externalities' of production cannot arise, as ultimately all energy is inherently part of the same larger system. This resonates with Barad's monist ontology and her dynamic notion of matter and phenomena.

#### Emergence in intra-action

Barad's notion of intra-action resonates with the heterodox conception that economy is produced in a continuous process of open-ended interaction between human beings and nature, technology, social classes, agency and 'structure' (Jo et al., 2018). The notions fit together as both emphasize a dynamic ('vitalist' in the words of others) notion of matter and both reject a static and essentialist worldview. They emphasize that change is a continuous process. Agency arises not from individuals, but in the interaction between individuals and their

environment. Economic phenomena emerge through the circuit of markets and economic relations. Complexity economists speak of emerging phenomena that can accelerate into unforeseen developments or stabilize into stable patterns and structures. As I will elaborate below, this can be understood parallel to the notions of territorialization and deterritorialization of (Deleuze & Guattari, 1987). Complexity economists can trace the various logics of interrelationship between broad political and economic structures and critically question the complicated causalities that link them to everyday (material) experiences.

An obvious difference between the two conceptions is the novelty that is so specific for Barad's neologism: Barad (over and over again) emphasizes that entities do not (ontologically) exist prior to the interaction, but rather emerge during specific encounters, hence 'intra-action'. Heterodox economists do not explicitly endorse this view. Heterodox economists recognize that non-human or material forces have an important role in notions of change, agency, causality and power. However, from what I found, heterodox economists have not really recognized that these forces are always entangled. This prevents economists from seeing and conceptualizing how these forces jointly affect human and nonhuman agencies. This is an insight recurring in what I present below.

### **Apparatuses, assemblages and systems**

Remember that apparatuses are material-discursive practices that are boundary making practices. These boundaries are formative of matter and meaning, productive of and part of the phenomena produced. Furthermore, apparatuses are themselves phenomena that are dynamic and part of the ongoing intra-activity of the world. Apparatuses have no intrinsic boundaries but are open-ended practices (Barad, 2007). The apparatus of Barad fits with the 'system' of complexity economists. They are similar in that both concepts acknowledge the interrelatedness between different realms of reality such as the social, ecological, economic, political, etc. Ecological economists in particular strive to use system thinking to provide tools to understand the interfusion of the material and the social (Hornborg, 1998). Both concepts emphasize that the world is open-ended. Also system thinking recognizes the ongoing activity of emergence of new (sub)systems out of an existing set of systems as it conceptualizes "the continuous emergence of new levels of organized complexity within society, at which new behaviour can be demonstrated and new interactions with the environment become possible" (Loutfi & Moscardini, 2003). Furthermore, similar to Barad's claim that apparatuses themselves are phenomena that are dynamic and part of the world, it is claimed that the systems themselves, which are looking at interactions between the subject matter and the observer, should be included in the system to be studied (Loutfi & Moscardini, 2003).

Another interesting dimension to evaluate the concepts of apparatus and system is that of their dealing with the connection of micro- and macro level analysis. Barad, of course, does not assume a strict separation between the two as "the

micro- and macro-worlds are entangled with one another, that there is no clean break between the two, and that the same rules apply in both domains” (Barad, 2007, p. 279). Scale is, instead, “an outcome of on-going worldly processes of production, contestation, and reproduction” (Barad, 2007, p. 245). This is in line with that the level of abstract of a (sub)system is seen as something relative rather than absolute and that it is determined in its interaction with other systems (Gräbner & Kapeller, 2017). However, how these relative micro- or macroscales actually arise, does not become so apparent in Barad’s work. In fact, I suspect that this relation between micro and macro is somewhat under-theorized in *Meeting the Universe*. Though this is a suspicion that is shared by some (Tsing, 2015), it might also be that my limited physics knowledge enacted a ‘sub-optimal’ agential cut in the intra-action between Barad’s work and myself. Barad (2007) discusses the connection between microscopic and macroscopic entities, but I did not focus on this.

In any case, when looking at the micro/macro connection, the concept of the system might resonate better with the New Materialist concept of the assemblage. The connection between micro and macro level analysis can be conceptualized in system thinking with the help of sub- and supra-systems (see Loutfi & Moscardini, 2003). Various (open) subsystems can be connected with each other and be part of (various) larger supra-systems. This is in line with the idea of plugging in of one component of the assemblage into another. The concept of the system also incorporates the idea that different phenomena might arise in the interactions (intra-actions) between different systems, or different elements. And both concepts of the system and the assemblage incorporate the insight that specific characteristics arise on the aggregate level that do not correspond to these of the separate elements.

This brings me to the main dissonances between the concept of a system on the one hand, and the apparatus and assemblage on the other. Both the apparatus and the assemblage focus explicitly on power relations and power dynamics. Agential cuts are made in the intra-action that enact possibilities and impossibilities of what comes to matter, which are materialized in the apparatus. As apparatuses themselves are phenomena, they then enact inclusions and exclusions. Therefore, apparatuses are inherently political. The concept of the system does not seem to recognize that agential cuts are made in the enactment of the system itself. This is in line with the point I made earlier about the limited extent to which the discursive-material practice of economic inquiry itself is conceptualized as a system and drawn into the system analysis.

Doing so, either in terms of systems, assemblages or apparatuses, would yield opportunities for economists, particularly feminist economists, who aim to put the process of economic knowledge production under critical scrutiny. Because of its configuration, an assemblage can be dis-assembled. So it is possible to decompose research machines fairly accurately and with sensitivity to the various affective flows determining its dynamics. For example, by decomposing

research machines, it is possible to assess how a change of data collection, analysis method, or design alters the ‘agential cuts’ made or the political forces at work in the ‘research-assemblage’. This decomposing of research machines stimulates researchers to ask directed questions such as: Which topics are considered as relevant or which inquiry as scientific? Which topics are excluded? Which ‘agential cuts’ were made in the process of knowledge production? Whose interests do researchers serve? Who gains and who loses in the process of research? How are research questions, methods and results influenced by the economists’ dispositions? This type of analysis thus allows to open up what has sometimes seemed like a black box of economic inquiry and to reveal a sophisticated analysis of the politics at work in the research process.

## 4.2 Socially embedded (post)humans

In heterodox economics humans are seen as embedded in a social and ecological environment. Humans are influenced by structural influences, but not determined by them. This is very similar to how Barad conceptualizes human beings, namely as entangled posthuman. Both notions emphasize that humans stand in relation to the world. Both Barad and heterodox economics notions also recognize that humans are multi-faceted or multi-layered. These layers might be complex temporal variables and at times internally contradictory memory lines and experience. Moreover, these different layers result from different interactions with other humans and non-humans in their environment.

Heterodox economists do not push their view of socially and ecologically embedded humans as far as Barad’s does with her entangled posthuman. Though heterodox economists acknowledge that indeed humans are influenced by their environment, they prioritize the social aspects and underemphasize the importance of non-human agency. For instance, Lee’s view on human agency as “embedded in a cultural context and social processes in historical time affecting resources, consumption patterns, production and reproduction, and the meaning (or ideology) of market, state and non-market/state activities engaged in social provisioning” (Lee, 2012, p. 340) neglects the role of non-human agential forces. It does acknowledge that agency is not held by an individual, and rather arises in an interdependent context, but it does not recognize that this context is not only social, cultural or political, but also technological, ecological and physical. Therefore, the perspective of some heterodox economists is centred around humans; it is in other words anthropocentric. Agency of non-human entities is acknowledged in heterodox economics, but only to the extent that it is instrumental to the human condition. Non-human or material aspects are important as far as they contribute to the emergence of human and social practices. Ecological economists may be, or are likely to become, an exception to this. Indeed ecological economists acknowledge that production is not restricted to man-made production, and also occurs in nature. So ecological economists assign value and a certain agential force to nature. Daly & Farley (2011, p. 17) describe this value as ‘natural capital’ which is “a stock [of capital] that yields

a flow of natural services and tangible natural resources”. This suggests that ‘nature’, though granted some agential force, services humans in its production of value and tangible natural resources. Though this might not be the intention of ecological economists, this hints, still, towards both a strict distinction between nature and humans, and a primacy of the latter.

The pitfall here is that heterodox economists still seem to make a clear distinction between what is human and what is not. As a consequence, heterodox economist maintain the idea that everything that is not human exists to be exploited and used by humans. Furthermore, it keeps in place exclusionary practices that arise from the human/nonhuman distinction and associated dichotomies. The notion of the posthuman is in particular of importance for ecological and feminist economists. But also for complexity economists, this more radical notion of the importance of nonhuman agency and the entanglement of nature and culture, or matter and discourse might be helpful. It broadens the focus to causal relations that might be overlooked when social processes are given priority.

### **Divergences in notion of power**

The conceptions of how power works seems to diverge between Barad’s view and what I identified in various heterodox schools. This might have to do with that the view on power among heterodox economic currents is not unified. What heterodox economic currents share is their acknowledgement that power is important for economic phenomena, processes and outcomes. I have however not found much similarity in how these notions of power are understood and how power is incorporated in their research.

Some heterodox currents, such as Marxian and feminist economics seem to rely on dichotomies, such as capital-labour or male-female, for their power analysis. Various feminist economist have employed this analytical tool rigorously to many domains of economic inquiry and the economy (England, 1993; Marçal, 2016; Nelson, 2003). This has brought valuable insights. However, it might be fruitful for these currents to view power in a more ongoing, always at work, dynamic or emerging way. As the formulation of strict essential categories is avoided, relying on an a more dynamic notion of power will avoid issues of identity (politics). Furthermore, this dynamic notion of power can simultaneously be at work in different directions, i.e. power is never completely restraining, but is also always something enabling. Recognizing and putting at work these enabling forces of power will foster the constructing positive or affirmative alternatives for unjust situations economists recognize in the economy and society.

Institutional economists do have a more dynamic notion of power that resonates better with the performative notion of power of Barad. Ostrom’s (2011) framework for institutional analysis and design acknowledges that both material and discursive practices influence collective and human decision making, resulting

in certain outcome patterns. These patterns arise out of the interaction between various elements (institutional, biophysical and situational factors). This is where Ostrom's framework departs from that of Barad. Ostrom's institutional analysis conceptualizes material and social forces as two distinct and separable forces. She prioritises social forces, as the 'attributes of community' are constitutive for how we see the world. Furthermore, Ostrom's ultimate concern is to conceptualize individual agency in the context of social interaction and their environment. This suggests that Ostrom's framework has an anthropocentric bias. Therefore, it does not fully align with Barad's posthumanism and its associated forms of agency.

Ostrom's framework diverges from Barad in that for Barad agency is not merely about the potential to affect outcomes, but also the capability of a full material-discursive practice to set the 'rules of the game', or the conditions through which the process certain outcomes are reached. This not directly apparent in Ostrom's framework. However, Ostrom's framework is a meta-theoretical framework in that it is not a specific theory about a specific situation. In principle, the framework does not directly dictate an emphasis on individuals, agency or their interactions. More importance could be assigned to material forces. A further, more careful and detailed 'diffractive' reading of Ostrom's framework, with Barad's notion of 'apparatus' would be interesting and helpful to find out how these specific 'intra-actions' between the different components Ostrom describes emerge and how that can be incorporated further in the framework.

### 4.3 Economic knowledge production

Perhaps both heterodox economics as well as Baradian style philosophies make some people fear academic mayhem. Perhaps some fear that these types of intellectual movements will lead to a relativist or anarchistic academic state in which anything goes, where there are no rules, no academic integrity, and where academic findings become trivial, or most apocalyptically where academia loses its authority and credibility in the production of knowledge in society.

However, both heterodox economists and Barad search to revitalize academic integrity by suggesting ways to deal with the close entanglement of the researcher, the research and the researched. What is more traditionally known as scientific objective standards does not have sufficient resources for detecting widespread cultural assumptions, values and interests. However, good method works by identifying particular 'agential cuts' made in the process of coming to (economic) knowledge. An understanding of how the results arise as they did becomes crucial. So, Baradian inspired research does not introduce political assumptions, values and interests into research fields that are otherwise value-neutral; it identifies the ones that are already there. This approach rejects the relativist stance that is usually seen as the only alternative to conventional standards for scientific objectivity as it stimulates a scholarly engagement with responsibility, care, social justice and seeing oneself as part of a world. So no ni-

hilistic, relativist ‘anything goes’ approach, but new academic values that could then include, for instance, self-accountability, relationality, openness, reciprocity and disclosed partiality.

### **Historically specific situated economist**

Changes in what ‘good science’ is perceived to be are already at work in economics. This can, for instance, be seen in the increasing recognition that economic knowledge is historically and geographically specific instead of universal. It is a move away from abstract theorizing that is presumably independent of time and space. Historical specificity implies that economists account for the specific conditions provided by modern capitalism on how certain phenomena arise. It acknowledges that these phenomena arise contingently. It requires that economists describe and situate both the economy and economic theory in the specific contemporary capitalist system. It recognizes what Barad describes as ‘agential cuts’; in and exclusions have to be made in the process of formulating economic knowledge.

Economists, like the economy itself, is always embedded in a certain historical, cultural, social and economic context. The notion of situated knowledge has found its place in economics through the work of, among others, Harding (1995). The situatedness of economists affects the research interest, methods as well as scientific findings. This insight, in line with Barad’s emphasis on the examination of conditions for knowledge production, has stimulated feminist economists to analyse the way through which economic knowledge production arises. They found that the process through which economic methodologies arise are dependent on, and influenced by the specific material circumstances in which these methodologies arise. For instance, Nelson (1996; 2003) notices that characteristics that are included in the ‘apparatus’ of economic knowledge production are hardness, exactness, detachment and abstraction at the exclusionary expense of methods that would be soft, intuitive and engaged.

So both the notion of historical specificity, as well as the situated knowledge resonate well with Barad’s notion of the apparatus. Feminist economists and economic methodologist can now drive home (more clearly) the point Barad makes with her ‘ethico-onto-epistemology’. That is, the entanglement of the economist with both the ‘object’ of study and the methodology and larger apparatus of economic knowledge production makes that, necessarily, the actions of economists are ethical and political. Feminist economic epistemologists, such as Harding and Nelson, are already very well aware of this point. Also it is manifest in the political engagement and strive for social and ecological justice of many heterodox economists. However, the realization that economists are indeed (partially) responsible for how our world is shaped does not seem to land fully. Though the literature on performativity in economics is cited increasingly, it still seems to be more for methodological enthusiasts, not for practicing economists. I have not encountered ‘applied’ economic research in which this

notion of performativity is acknowledged and accounted for.

### **Diffractive methodological pluralism and transdisciplinarity**

Diffraction is a process of being attentive to how differences are made and what the effects of these differences are. Diffraction can be used to acknowledge the influential role of the knower in knowledge production and particularly how we learn about ‘material configurations of the world’s becoming’ (Barad, 2007, p. 91). Diffractive methodology is not setting up one approach or text or even disciplinary body of knowledge against another but rather a detailed, attentive and careful reading of the ideas through another, leading to more generative ‘inventive provocations’ (Van der Tuin & Dolphijn, 2010). For instance, in this thesis, my aim is not to indicate what heterodox economists are doing wrong or right by taking Barad as a benchmark or mirror to look at economics, or as a framework that can be imposed on or applied to economics. I do not aim to criticize economics. Rather, I attempt to read the insights of various heterodox economists with the insights of Barad, in order to recognize and contribute to an affirmative formulation of a novel way of doing economics.

A diffractive approach resonates well with the interdisciplinarity of heterodox economics. Heterodox economists acknowledge that economic problems are always at the same time also ecological problems, and political problems, and social problems, and technological problems. In order to address these problems, the discipline must lose its strict boundaries with other academic fields of inquiry. Therefore, heterodox economic currents (as well as some more standard approaches such as behavioural economics) operate on intersections of ‘disciplinary’ boundaries. Combinations between different fields of knowledge are encouraged to come to a more complete understanding of particular phenomena. So both a diffractive and interdisciplinary approach acknowledge and account for the partiality of knowledge, and that all of reality cannot be captured through one method or methodology. Yet, the two notions do not stand on the same level. Interdisciplinarity is merely the combining of various ‘disciplinary’ knowledges to come to a broader and better understanding of certain phenomena. It (implicitly) holds on to the disciplinary boundaries of knowledge production. Diffraction is a way, or a mode of combining various fields of knowledge that does not necessarily hold on to disciplinary boundaries.

The reading of these interdisciplinary efforts with the new materialist notion of transversality might be helpful here. Transversality does not only look at combining knowledge from different fields, but also at reworking the very boundaries of the given disciplines. This does not suggest that heterodox economists, nor Barad for that matter, aim to overthrow disciplinary boundaries all together. Rather, economists should become more aware what the boundaries of their (disciplinary) knowledge is and that these boundaries are not definitive and up for negotiation. This is fruitful for heterodox economists who are sometimes accused of ‘not being economists’. It might provide tools for economists (active

in social movements such as Rethinking Economics) to rework what the boundaries of economics are and what questions and (societal) issues are appropriate for economists to address. The notion of transversality, or Barad's work more broadly, could then function to reveal exclusionary practices and work as an emancipatory tool for (heterodox) economic currents that aim to gain academic and social influence.

Furthermore, and relatedly, transdisciplinarity encourages different instigations of research plans. For instance, project-based research fits transdisciplinarity very well. Economic research could also arise from (real world) socio-politico-technico-ecological problems. Once an issue is identified, the experts can be flown in. This is a new way of conducting and initiating research. The danger is that researchers (academic and professionals) have nice round-table meetings and chats, but cannot really come to any synthesis as they view the world differently and speak different academic language. Tools should be developed to guide transdisciplinary research. Barad's work is a contribution to this. Her agential realist account is, in its transgression and synthesis of quantum physics, critical theory and feminist philosophy, simultaneously an illustration of how transdisciplinary work can materialize and a theoretical toolkit that can facilitate transdisciplinary endeavour.

#### 4.4 Conclusion

A diffractive reading of the commonalities I identified among various heterodox schools along with Barad's agential realism materialized in some interesting insights. The main worldviews from heterodox economists resonate well with Barad's onto-epistemological framework. A very central concept here for heterodox economists is the notion of embeddedness. This indicates the interconnectedness between the economy and social and ecological spheres, but also the situatedness of the economist and the body of economic knowledge. This interconnectedness is also of crucial importance for Barad's work. She often indicates this with the term 'entanglement' and it appears in all of her key concepts.

Generally, Barad pushes this entanglement further towards a truly posthuman perspective, where heterodox economic theorists often maintain a more anthropocentric view. The novelty of Barad's neologisms such as 'diffraction', 'intra-action' and 'onto-epistemology', namely that entities do never pre-exist each other, but have always already been entangled, is what is maybe germinating in/between some economic theories, but is not always fully at work (yet). Heterodox economists acknowledge that autonomous individual human agency is (perhaps increasingly so) an untenable notion as ecological, social, cultural, political and economic forces jointly give rise to agential force and continuous change. However, they do seem to assume that all of these forces are somewhat separable from each other. I have not encountered heterodox theorists who show how these forces are entrenched and how they always mutually influence each other. Barad's framework might, in this aspect, be particularly helpful for

heterodox economists to fundamentally think through the connection of human and nonhuman forces.

Furthermore, Barad's notion of power as the capacity to influence outcomes, but also as the capacity to change the rules of the game, of what is included and excluded (which agential cuts are collectively supposed to be made) in the process of adequate knowledge formation, is not fully at work. This misses an opportunity to recognize that heterodox economists and their apparatus are themselves part of the world. This in turn, is a missed chance to draw economists themselves and the economic apparatus into the research and under (critical) scrutiny. Barad's framework might therefore be very helpful for movements such as Rethinking Economics, whose very aim it is to put the disciplinary body of economics under critical examination in order to reform it. Also, many heterodox economist would agree with Barad that indeed (economic) research is inevitably ethical and political. Barad's account here might help in finding ways how to deal with this responsibility in academic context, but also in the pursuit of social and ecological justice of these politically engaged heterodox economists.

So could there be a novel economics emerging that is mindful of the entanglement of matter and meaning? My findings in this chapter suggest that the 'intra-actions' between philosophical frameworks such as Barad's and developments in (heterodox) economic thinking are very fruitful. I recognized many instances where concepts converge, and other where they diverge. They indicate suggestions of directions in which both Barad and heterodox economists could (re)consider the 'agential cuts' made in formulating their theories, methodologies, frameworks or general 'apparatus'. Complexity economics and their system theory seem to resonate well with Barad's framework in terms of their conceptualization of the dynamics of development of certain phenomena. What is perhaps not so present in these theories are explicit treatises of how these dynamics are expressions of power. Expertise of other heterodox schools, such as feminist, Marxian or institutional economics might be helpful here to make these complexity economics more substantive in their dealings with power. Another issue that is still underemphasized in heterodox economics is the drawing of the economists in the research and acknowledging the responsibility and accountability of economists in the process of economic production. This is also manifest in the relative little engagement of heterodox economists with the work on performativity in economics. A true 'e(thi)co-onto-episto-nomics' would have to work out the 'ethico' aspect a bit further.

My results here are valuable as a first hinge to where various similarities or convergence between the fields arise. However, as stated earlier, my findings are based on quite general descriptions of what is happening in and between various heterodox economic currents. It would be interesting to make a more careful analysis and further diffractive reading of the specific heterodox frameworks with Barad's onto-epistemological concepts. For instance, a diffractive reading of Ostrom's framework of Institutional Analysis and Design with Barad's appa-

ratus would yield interesting insights, and more refined ones than I could give here, in how power dynamics are at play in various (institutional, economic) situations. The same applies to ecological economics, as a more careful reading of Daly & Farley (2011) with Barad could yield interesting insights about the specific conceptualization of the entanglement of human and nature. Also other specific frameworks or theories in other heterodox currents could benefit from a similar reading. An intra-action of complexity economics work on the emerging and spread of knowledge and innovation (e.g. Malecki, 1997) with Barad's apparatus would provide insight in how complexity economics deals (and could deal) with notions of power.

## 5 Final conclusion

Admittedly, I am slightly surprised how well Barad's work resonates with some insights in heterodox economics. When I started this project, I thought I started an, if not impossible, at least farfetched mission in trying to connect fields that were, I assumed, located miles apart and did not have to do much with each other. My hinge was that Barad's work could be introduced to, or applied to economics. Of course this demonstrates that I maintained the presupposition that the different intellectual fields of 'economics' and 'philosophy' are separable and separated fields. From my intra-action with Barad, I started to recognize during the process of writing that this presupposition was mistaken. In 'retrospect' I realize that indeed these different concepts and (living) bodies of knowledge have always been entangled and part of and developed within the same wider intellectual movements or dynamic material-discursive practices of the recent years. It then is logical that the novelties that arise in these fields more or less point at the same direction and that similar characteristics of our 'episteme' or contemporary material-discursive practices will appear in various intellectual traditions. It was then not so much that I could introduce Barad's work to economics, but rather that I could recognize that and how her work was already at work in many instances of heterodox economic thinking.

From all of these characteristics, embeddedness and complexity might be one of the central ones. Complexity theory is perhaps misnamed, as it is not a theory, but a movement across intellectual fields that studies how the interacting elements in a system create overall patterns, and how these overall patterns in turn cause the interacting elements to change or adapt. It is therefore perhaps not surprising that I found complexity economics to resonate most with Barad's account of agential realism as the 'apparatus' of complexity theory has probably been intra-acting with both Barad and complexity economists. Moreover, insights from complexity economics are incorporated in many different economic currents, both currents which I labelled for the sake of this exercise as heterodox, and these that are considered more standard approaches.

That I found that and how Barad's agential realism is at work in practices of various heterodox economic currents is not to say that her concepts are not at work, or not emerging or intra-acting at all with economic currents in the more standard approaches. A diffractive reading with more standard approaches in economics with Barad's work would certainly be possible. It is simply an undertaking that I did not take up in this thesis. A reason for why I did not choose to make this 'agential cut' here, is that I suspect that more dissonances would appear in such a reading than arise in my reading with heterodox currents. I am interested in recognizing these instances of similarities and movements that reinforce each other affirmatively. Therefore, I prefer riding the wave of politi-

cally engaged research and academic inquiry that is looking to find alternatives ways to adequately address urgent contemporary issues, such as environmental degradation and social injustices, rather than breaking the wave or going against the stream by looking for differences and inconsistencies.

The urgent challenges that we face require complex transitions, such as energy transitions, mobility transitions, housing transitions and consumption transitions. All these transitions have economic aspects, but it would be insufficient to only think them through in terms of their economic dimension. Both the economy (think circular economy) as well as the economic discipline need to be rethought and reconceptualized in order to adequately deal with these complexities. Barad's framework provides ample entry points as to how to deal with these complexities. First, she provides the tools to justify, for those who are still doubted, that indeed a rethinking is needed. Barad's work shows that not only all the former issues are intertwined, so that knowledge from only 'pure' economists will never suffice to come to a proper understanding of how to deal with them. Furthermore, her posthuman performative account shows that 'theory' and 'practice' are intertwined; knowledge arises both from empirical problems, such as in the addressing of these complex transitions (as well as from abstract reasoning) and economists are responsible for both addressing the issues.

Then given that indeed the academic knowledge production of economics needs to be rethought, Barad provides emancipatory tools to address exclusionary practices that are at work in the very process of coming to an agreement of what an adequate way of coming to economic knowledge production is. Her 'apparatus' could help to recognize where conflicting interests arise and where and how power relations are at play. Finally, Barad then provides suggestions of what this 'new' way of economic thinking (but also the economy) could be. Her agential realism thoroughly reconceptualises the way we look at causality, agency and power.

Diffractively reading Barad's work with developments in heterodox economics therefore gives rise to many (potential) benefits, both in terms of emancipatory power for heterodox currents as well as to provide directions and possible fertile 'intra-actions' between various economic currents and other fields of knowledge. My project is certainly part of this very process. Recognizing commonalities among various economic currents and reading them with Barad's work helps in constructing a positive constitution of a so-called heterodox economic thinking. Indeed my findings show that, though diverging in some points, various heterodox currents share many of their philosophical underpinnings. Reading them with Barad simultaneously shows that these philosophical underpinning resonate with a prominent onto-epistemological framework and it provides tools for heterodox economics to further refine and enrich their apparatus. The former shows that heterodox economics, though it may just be a temporal strategically-politically constructed category, indeed has a serious affirmative alternative to

offer to the standard.

A final note. The agential cut that was enacted in 'intra-action' between Barad's work and myself, has materialized in this thesis. Simultaneously the agential cut enacted my very self, or it contributed to the 'becoming' of myself. I am cut together-apart with and from my thesis in this agential cut. Neither my thesis, nor myself pre-existed separately before our intra-action with Barad's material-discursive practices. Intra-acting with Barad changed how I relate with(in) the world. I can only wish my thesis will go off and have similar fruitful and inspiring intra-actions with its readers.

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## Appendix

Diffraction	Reflection
<p>diffraction pattern marking differences from within and as part of an entangled state</p>	<p>mirror image reflection of objects held at a distance</p>
<p>differences, relationalities objectivity is about taking account of marks on bodies, that is, the differences materialized, the differences that matter</p>	<p>sameness, mimesis objectivity is about reflections, copies that are homologous to originals, authentic, free of distortion</p>
<p>diffractive methodology</p>	<p>reflexivity</p>
<p>performativity subject and object do not preexist as such, but emerge through intra-actions</p>	<p>representationalism preexisting determinate boundary between subject and object</p>
<p>entangled ontology material-discursive phenomena</p>	<p>separate entities words and things</p>
<p>onto-epistem-ology knowing is a material practice of engagement as part of the world in its differential becoming</p>	<p>ontology   epistemology binary knowledge is true beliefs concerning reflections from a distance knower   known binary seeing/observing/knowing from afar</p>
<p>intra-acting within and as part of</p>	<p>interacting of separate entities</p>
<p>differences emerge within phenomena agential separability real material differences but without absolute separation</p>	<p>inside/outside absolute separation no difference interior/exterior</p>
<p>diffraction/difference pattern intra-acting entangled states of nature cultures</p>	<p>words mirror things social   natural binary nature   culture binary</p>
<p>about making a difference in the world about taking responsibility for the fact that our practices matter; the world is materialized differently through different practices (contingent ontology)</p>	<p>about representations about finding accurate representations about the gaze from afar</p>

<p>phenomena are objective referents  accountability to marks  on bodies  accountability and responsibility  taking account of differences  that matter</p>	<p>things are objective referents  accountability entails  finding an authentic  mirror representation  of separate things</p>
<p>ethico-onto-epistem-ology  ethics, ontology, epistemology  not separable</p>	<p>ethics   ontology   epistemology  separate fields of study</p>
<p>reading through (the diffraction grating)</p> <p>transdisciplinary engagement  attend to the fact that boundary  production between disciplines  is itself a material-discursive practice;  how do these practices matter?</p> <p>subject, object contingent, not fixed</p> <p>respectful engagement that attends to  detailed patterns of thinking of each;  fine-grained details matter</p>	<p>reading against (some fixed  target/mirror)  privilege one discipline  read other(s) against it</p> <p>subject   object fixed</p> <p>reify, simplify, make  the other into a separate object  less attentive to and able  to resolve important  details, dynamics,  how boundaries are made</p>
<p>Summary  accounting for how practices matter</p>	<p>reflecting on representations</p>

Figure 2: (Barad, 2007, pp. 89-90)