

A Relational Model of Economic Organization: Relations within, between and among economic scales

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Abstract

We propose a *relational* theoretical model of economic organization that offers new insight into the organizing dynamics of economic systems. Neoclassical and complexity economics are, in their Western cultural origins, based on an assumption of the primacy of the discrete individual. Collectivist economic traditions are based on the principle of collective interest rather than self-interest. We attempt a rapprochement of individualist (especially free market) and collectivist (especially centrally planned) economic cultures and traditions by modelling economic organization as arising from individual and collective dynamics and the relationships between them. Structure, process, function, and content are four fundamental inter-related properties of our model of economic organisation. Matter, energy, and information flow into and out of this system as well as between its components. We posit the existence of micro- meso- macro- scales of economic organization in all of structure, process, function, and contents. To operationalize our relational model, the conventional bottom-up process of self-organization is reconceived to involve relationships *within* micro, meso and macro-economic organization. In turn, to operationalize the model, the new concept of socio-cultural organization is construed to involve relationships *between* and *among* economic organization, across micro, meso and macro scales. Our model of relations provides a structure for complex-realist exploration, making cross-scale inter-relationships explicit and by providing a structured language for description of these relationships.

1. Introduction and Background

The frequent failure of neoclassical economics to fully account for real-world economic phenomena has been explained by its lack of incorporation of complexity (Beinhocker 2007; Matutinović 2010; Byrne and Callaghan 2013) and ecological processes (Raworth 2017; Higgs 2015 and 2017). However, the influence of neoclassical economic theory continues to be felt in the academy, economic institutions and in government policy world-wide (Beder 2011). To better approach the complexity of the real world we model economic organization using relations within, between and among all of micro, meso, and macro scales of economic organization.

The scale of economic organisation varies from the individualist (e.g. Smith 1977/1776) to the collectivist (e.g. Lewis 2013). Individualist economic organization is predominantly micro-scale and collectivist economic organization is predominantly macro-scale. The free-market economy is founded on the individualistic principles of economic freedom, self-interest, competition, and private property (Radke 2013). In contrast, the centrally planned or command economy is based on the collectivistic principles of economic equality, collective interest, social cooperation, and public property (Radke 2013). To arrive at a better description of actual economic complexity, we attempt a rapprochement of ‘individualist’ and ‘collectivist’ theorisation of economic organisation.

Individualist economic discourse, as in the neoclassical tradition (Urbina and Ruiz-Villaverde 2019), posits that individual economic agents (individual producers and individual consumers), individual markets, individual economic networks, and individual economic communities (such as local investors) determine the self-organising dynamics of economic systems. Neoclassical theory predicts that

economic systems tend toward a 'general equilibrium' resulting from deterministic processes (Arthur 2013; Schasfoort 2017). Such determinism asserts that economic relationships between individuals, such as between business owners and workers, are the basis for all social and political organization. Through this reductionist focus on the individual, neoclassical economics assumes that the economic actor is 'perfectly rational'. However, 'inductive rationality', with reasoning through pattern recognition by way of metaphor, analogy, and pattern completion, seems closer to reality (Beinhocker 2007). Such reasoning is highly contingent on particular circumstances (Levine, Chan and Satterfield 2015). In addition, emotions can overwhelm any form of rationality in decisions in life, including the economic (Damasio 1994 and 1999).

In neoclassical microeconomics, equilibrium occurs when marginal cost (market supply) equals marginal revenue (market demand). Hence, price and quantity (output) of a good in a market are assumed to be in equilibrium at this conjunction (Sloman, Norris and Garrett 2014). Analogously, in conventional macroeconomics, equilibrium is assumed where aggregate supply equals aggregate demand. The equilibrium level of gross domestic product is the value at which withdrawals from the flow of income equal inputs to the flow of income. Withdrawals consist of net savings, net taxes, and import expenditure. Inputs consist of investment, government expenditure and export income. When withdrawals do not equal inputs, a market-based process is required to return the economy to a state of equilibrium in which withdrawals equal inputs (Sloman, Norris and Garrett 2014). In the Keynesian modification of neoclassical economic theory, this process of correction or adjustment involves government budget manipulation or fiscal policy (Keynes 1936).

Complexity economics and ecological economics have provided two major critiques of neoclassical economics. Complexity economics emerged in the 1980s and 1990s to challenge the neoclassical depiction of the economy as deterministic, predictable, and mechanistic, arguing that economies are process-dependent, organic, and emergent (Arthur 1999 and 2018). Complexity economics is a response to the failure of neoclassical economics to adequately explain or predict real-world economic volatility and inequality. Arthur (1999 and 2014) thus argues that economies are non-equilibrial, in a state of dynamic nonlinearity (see also Schasfoort 2017). A key driver of this nonlinearity is the psychological reality, acknowledged by Smith (1759 and 1776) in the 18th Century, that humans are both seekers of their own pleasure and cooperative and 'moral' members of society (Hodgson 2012).

A constant state of change is due to 'fundamental uncertainty' or intrinsic openness in market and economic outcomes, 'technological innovation' or ongoing economic adjustment (Schasfoort 2017). To deal with uncertainty, economic agents (individuals and institutions) address problems by surmising, making guesses, and using past knowledge and experience. This causes the local, sub-national and national economies to be in 'permanent disruptive motion' as agents explore, learn, and adapt (Schasfoort 2017). Novel technology is an ongoing generator and demander of further technologies (Schasfoort 2017), though this may be contested by Schumpeterians (Evangelista 2018). However, technological novelty or innovation is not free from socio-political choice and agency. Furthermore, there is a time delay between actions and feedback. The time delay between an action and its response means that an actor may progressively overshoot or undershoot, oscillating around a desired point (Beinhocker 2007). For instance, the time lag between a manager

receiving a report of an increase in consumer demand and implementing an increase in productive capacity means by the time the capacity has adjusted demand may have changed, causing a mismatch.

The economic complexity literature, while united by its critique of neoclassical determinism, is diverse and contains its own tensions. Beinhocker (2007), for example, views the economy as a 'complex adaptive system' (see also Plummer and Armitage 2007; Rammel, Stagl and Wilfing 2007). Beinhocker's (2007) approach to complexity economics is more at the 'restricted' than 'general' end of Byrne and Callaghan's (2013) complexity theory continuum, although Beinhocker acknowledges the role of social processes such as cooperation in the behaviour of economic agents. It is our interpretation of Byrne and Callaghan that 'restricted' complexity arises spontaneously from the 'self-organizing', bottom-up interactions of individual agents, while 'general' complexity emerges from nested and interpenetrated systems of relations of micro and macro scale phenomena, individual and collective behaviour, and the structure and agency of relationships. Thus, the popular reductionist and micro-emergent complexity concept of 'self-organization' (Mitchell 2009) pertains to more restricted complexity theory (Byrne and Callaghan 2013).

Ecological economics studies the temporal and spatial interdependence and coevolution of human economies and natural ecosystems (Xepapadeas 2008). It is a field that also encompasses diversity and controversy. A steady state economy is an economy that is relatively stable or mildly oscillating in size. An economy can attain a steady state after a period of growth or after a period of decline. Herman Daly (1991) defines the steady-state economy as an economic system made up of a constant store of physical wealth (capital) and a constant store of people (population), both stores to be sustained by the movement of natural resources

through the system. Pirgmaier (2017) argues that steady-state economics does not radically depart from neoclassical theory and, hence, is internally inconsistent between the ‘old’ economic paradigm and ‘new’ ecological ideas, an argument not accepted by Farley and Washington (2018). Alternative steady-state models are likely to be closer to reality than neoclassical growth models. In steady state economies, there can be ‘dynamic complexity growth’ (our term) or multiple sustainable paths (Krutilla and Reuveny 2006), with the economy passing through multiple, alternative steady states. The conceptual framework in Section 4 below, seeks to reflect this complex realist ontology.

Individualist and collectivist cultural *values*, norms and beliefs play a role in the production and reproduction of sociocultural and economic systems (e.g., Narotzky 2001). For example, Groysberg et al. (2018) have identified styles of culture applying to both organizations and individual leaders. Since social norms maintain social order through cooperation, studies on their emergence and dynamics have focused on ‘cooperative’ (and/or individual) norms of honesty, loyalty, reciprocity, and promise-keeping (Bicchieri, Muldoon and Sontuoso 2018).

A third way or ‘mixed’ economy model (e.g., Sloman, Norris and Garrett 2014) integrates the free-market economy, with its culture of individualism and self-interest (Smith 1977/1776) and the centrally planned economy, with its culture of economic collectivism and state ‘protection of the powerless’ (Cheung and Leung 2007). The free market and central planning are ideal types. Counterposing them as two extremes may not be instructive because economic reality seems to be subtler, more diverse, dialectical, and complex (e.g., Mazzucato 2015; Schumpeter 2013). Contemporary capitalist economies are all mixed, with the government share of national GDP ranging from 30 – 60 % between nations (OECD 2020). Indeed,

capitalism has benefited from government intervention in situations such as the Great Depression, the 2008 global financial crisis and the present COVID-19 pandemic-induced recession.

In the present paper, we aim to integrate individualist (Smith 1977/1776) and collectivist (Lewis 2013) economic cultures and model interrelationship between micro-economic organization and macro-economic organization. Our model is broadly consistent with 'general' complexity theory and with the general objectives of the field of ecological economics (Xepapadeas 2008). Furthermore, our model of relations provides a structure for complex-realist exploration, makes inter-relationships that need to be explored explicit and provides a structured language for description.

2. The Historical and Contemporary Settings for Economic Relationships

Through the last five centuries of political, economic, technological, cultural, and ecological transformation, sustained capital accumulation has become the globally dominant goal of economic organisation. Western-capitalist historical processes have made economic growth not an assumption but an imperative inherent to a global system of organisation (Wallerstein 1979). This imperative has been encapsulated in two commonly deployed metaphors: 'as the economic pie gets larger so there are more slices'; and 'a rising tide lifts all boats.' That is, it is assumed that unemployment, debt, poverty, and even environmental degradation itself can all be reduced by economic growth. Increasing wealth (capital) drives increased human capital (education) which increases the technological problem-solving capacity that more than compensates for any decline in natural capital (see Costanza et al. 2012 for 'sustainable and desirable' economic growth).

Many have now argued that the capitalist objective of sustained economic growth has put much of humanity on an ecological 'collision course' (Higgs 2015) on a finite planet. Instead of focusing on delivering economic growth that is achieved through extractive and social-environmentally depleting industries (Korten 2015), ecological economists argue that developing ecologically sustainable communities requires a steady-state economy (Cobb and Daly 1990; Daly 1991; Dikken 2015; O'Neill 2012; Murtaza 2011).

The steady state advocates approach, but do not fully embrace, a steady state *non-equilibrium* economy. A steady state non-equilibrium economy may involve 'circular and cumulative causation' (Berger 2009), with positive feedbacks from technological change. In the contemporary fourth industrial revolution (Schwab 2016) and the cybernetic revolution (Grinin and Grinin 2020), an economy may be steady state by active strategy or design, and it may be by open systems exchanges of matter, energy, and information (Miller 1973) that are in a quasi-reproducible steady state.

3. A Relational Model of Economic Organization

The concept of '*organisation*' relates to conditions for the creation of entities. This section presents a model of economic organisation in which structure, process, function, and contents are understood as the basic elements of economic systems (Figure 1). Thus, the term 'economic organization' encompasses the spectrum from entire economic systems, such as global capitalism, to an individual organization, such as MacDonald's family restaurants. *Structure* is 'the quality of being organised'; *process* is 'a series of actions or steps taken to achieve a particular end' or a flow such as supply chains; *function* is 'an activity that is natural to or the purpose of a person or thing'; and *contents* are 'the things that are held or included in something'.

To illustrate terms, from a complexity and ecological perspective, *structure* involves systems such as hierarchy and networks, including social-ecological systems. *Process* includes emergence and self-organisation such as ecosystem adaptation. *Function* involves individual agency, such as charisma in a leader and involves collective agency, such as in economic ‘revolution’. *Contents* involve “knowledge” or epistemology and “data” or ontology, the latter as an encounter with reality.

Insert Figure 1 about here

The properties of an economic organisation operate in open relation with the external socio-spatial-temporal environment, involving exchanges of energy, matter, and information (Byrne and Callaghan 2013). Information, as well as energy and matter, flows across boundaries varying in permeability or ‘openness’. Policy, managerial, and operating types of decision-making bring information into the system (Brown 1966). Agents within the organisation integrate and evaluate this information (Brown 1966). The openness of economic systems contributes substantially to the motivation for complexity theory. In these open systems, agency and multi-agency generate complexity (Heylighen, Cilliers and Gershenson 2007). Multi-agent systems may study the behaviour of different economic agents such as consumers, households, companies, corporations, or countries. It may provide a deeper understanding of the economic behaviour of agents occurring at the micro or macro-scale (Tucnik et al. 2013). Multi-agent systems theory asserts that agents are the basic components of complex adaptive systems (Heylighen, Cilliers and Gershenson 2007). The theory assists modelling and simulation of the self-organizing and adaptive bases of economic agency (Tucnik et al. 2013). Local actions of agents have emergent global consequences, that is, they cannot be

inferred by rules governing agents' behaviour (Heylighen, Cilliers and Gershenson 2007). Furthermore, there is mutual adaptation among agents. While small fluctuations can be amplified by positive feedback or 'autocatalysis' to create globally unpredictable changes from locally deterministic processes, feedback may also be negative, with large perturbations suppressed and perhaps stabilising the global configuration (Heylighen, Cilliers and Gershenson 2007). As well, economic agents are responsible for crucial economic activities, for instance, consuming, producing, and transporting (Tucnik et al. 2013).

Economic structure may be a centrally controlled or planned economy, mixed economy, free-market economy, or barter economy (Sloman, Norris and Garrett 2014). Economic processes include the act of production and the act of consumption. Economic function relates to the exchanges of goods and services and exchanges of wealth or income as well as fiscal policy roles of government. Finally, economic contents comprise market or industry 'knowledge' and economic 'data' such as data on growth, inflation, employment, and balance of trade (Sloman, Norris and Garrett 2014).

Figure 1 is our model of the interaction of economic organisation *properties* and their *outcomes* and *context* independent of society and environment. Of course, with a relatively malleable and permeable boundary between the organization and the context, organizational inputs derive from both the context and as feedback from the outcomes. Economic outcomes, such as economic growth, partly result from organization of the economy. The economic context is the local, sub-national, national and international settings. *Economic organisation* involves interactions *within*, *between* (2-way) and *among* (3-way and more-way) structure, process, function and content as well as evolving inter-relationships with context and

outcomes. For example, a 'between' interaction is a process-structure (Wheatley 2006) such as a dissipative system (Prigogine and Nicolis 1977), which involves the 'structure of the process', such as *double-loop* learning in economic organizations. It also involves the 'process of the structure' such as an economic entity engaging in learning and adaptation through relations between part and part, part and whole and whole and whole.

4. A Conceptual Framework

Tables 1, 2 and 3 address economic organization in turn across micro, meso and macro scales. Micro-economic-organization relates to the local to sub-national scales of the economy as economic organization, meso-economic-organization relates to sub-national to national scales and macro-economic-organization relates to national to international scales. The framework is multi-scalar and multi-relational. Moreover, it incorporates the 'middle-ground' between the classical micro-economic and macro-economic theories as well as depicting within (single-way), between (2-way) and among (3 or multi-way) relations across scales.

Our framework resonates with the multi-level perspective on transitions (MLP), a processual framework for understanding transitions in socio-technical systems. It proposes that *niche* innovations build internal momentum, *landscape* changes place pressure on the *regime*, and that destabilisation of the regime diffuses niche innovations and aligns the regime processes for substantial transformation and disruption (Geels 2020). Similar to our framework, MLP involves relations within-between(-among) system trajectories and processes and relations in levels or scales such as the micro-macro relations and relations of the individual – collective, especially of individual and collective 'agency' (e.g. Geels 2020). In the

social construction of technology approach, socio-technical transitions are evolutionary processes (open-ended, nonlinear, and uncertain), interpretive or sociocultural processes, and conflictual or contested processes. Furthermore, 'organization' of the economy, as a set of relations of structure, process, function, and contents, may entail inside-out processes ('values' externalization – e.g., a political party's platform expressed in their economic statements) and outside-in processes ('values' internalization – e.g., economic news being absorbed in financial markets) as well as bottom-up and top-down processes.

There may be emergent properties across scales and relations in Tables 1–3 (below), with properties emerging from interactions within the system (Müller and Nielsen 2008). There are connections within, between and among scales in the system, and there may be emergence of organization properties such as economic structure, process, function, and contents involving downward, upward and lateral causation. Further, as suggested in Figure 2 (below), emergent properties might be more characteristic of self-organizing economic systems. Indeed, it is argued that there may be an increase in complexity in shifts from the 'individual' to the 'cooperative' to the 'associative' in Table 1 (micro economic scale), from the 'individual' to the 'cooperative' to the 'national' in Table 2 (meso economic scale), and from the 'national' to the 'bilateral international' to the 'multilateral international' in Table 3 (macro economic scale).

Insert Table 1 about here

Insert Table 2 about here

Insert Table 3 about here

While our conceptual framework is mainly descriptive, it is asserted that the foregoing consideration of the MLP framework and the possible role of emergent processes may provide a more processual, dynamic-oriented contextualization for interpretation. Further, the ‘values’ externalization process (e.g., economic plans or ‘structures’ expressing political or general cultural values) and ‘values’ internalization process (e.g. consumer preferences evident in market offerings or ‘contents’ by business) are relevant in this respect.

To clarify terminology, in Tables 2 and 3, national – national economic relations are confined to bi-lateral trade, while the term ‘international economic system’ is defined as economic blocs with 3 or more members.

5. Conceptual Clarification and Organization, Emergence and Evolution

As a bridge between the preceding conceptual framework and the following explanatory account, several sets of concepts need clarification. The first is the distinction between ‘restricted’ complexity theory and ‘general’ complexity theory (Byrne and Callaghan 2013). The restricted theory views complexity as the emergent product of the interactions of simple agents. In contrast, the general theory view posits an ‘emergent social’ process, more than the product of individual action. General complexity theory sees both *structure* (with causal power) and human *agency* to transcend narrow or restricted rules for behaviour (Byrne and Callaghan 2013).

The second set of concepts relates to scale. In our model there is a classification within a continuum from ‘micro’ scale to ‘meso’ scale to ‘macro’ scale. The boundaries between these are essentially arbitrary, but correspond generally to local, subnational, and national levels (Tables 1-3).

The third set of concepts partitions the continuum between the ‘individual’ and the ‘collective’. Intermediate between the individual and the collective we include the ‘group’. In the relational model, there is a partial conceptual overlap between the micro-scale and individual phenomena, between the meso-scale and the group, and between the macro-scale and the collective. Similarly, there a broad conceptual coincidence between the self and the individual, between the social and the group and between the cultural and the collective.

Sixth, the concept of *adaptivity* relates or connects complexity systems (Peter and Swilling 2014) with social-ecological systems (Olsson, Folke and Berkes 2004). It is conjectured that the concept of adaptivity involves *gradual* emergence and evolution in economic organization (e.g., Figure 2 and see the definition of the concepts of emergence and evolution below).

Insert Figure 2 about here

We now attempt a systematic explication and relationship of the concepts of ‘scale’, ‘relations’, ‘self-organization’, ‘socio-cultural organization’, ‘emergence’ and ‘evolution’ in our relational model. Figure 2 suggests that human self-organization, as in economic dynamics, is a ‘*within* relations’ phenomena. Alternatively, and to operationalize the model, Figure 2 also suggests human socio-cultural organization in economic dynamics may be regarded as a mixture of *between* and *among* relations. It is suggested that in economic dynamics the concept of emergence relates to social complexity and social change at shorter time scales and over more local spatial scales. In contrast, it is suggested that in economic dynamics the concept of evolution relates to social complexity and social changes at longer time scales and over more global spatial scales. However, there may be spatially

translocal and cross-scale change effects (e.g., remote effects) filtering through the system.

Furthermore, it is proposed that in complex systems the concept of adaptability relates to the concepts of growth and evolution. In turn, the concept of transformability relates to the concepts of change and revolution. Adaptability may pertain to more gradual change in systems and organization such as in the economy, and transformability may pertain to more rapid, system-altering change in systems and organization such as in the economy. Indeed, resilience theory distinguishes between adaptability or adaptive capacity and transformability (Walker et al. 2004; Folke et al. 2010).

The phenomenon of emergence is portrayed as a more micro (and meso) than macro scale process, while contrary to some writers (e.g., Beinhocker 2007 on 'endogenous evolution'), the phenomenon of evolution is conceived as a more macro (and meso) than micro scale process. Moreover, self-organization is suggested to be essentially emergent and relatively spontaneously generated. Thus, the concept of self-organization partly overlaps with the concept of emergence (Figure 2).

In turn, socio-cultural organization is a combination of emergence and evolution, thus, being partly bottom-up spontaneously generated and partly top-down goal-oriented, deliberate design. Human (economic) organization, as an interaction of the self and the socio-cultural, an interaction of the micro, meso, and macro scales, and an interaction of the organization processes of emergence and evolution, involves both spontaneous and intentional/goal-directed forces. Of course, there are interactions within, between and among these interactions in complex adaptive-ecological human (economic) organization.

'Self'-organization may entail 'bottom-up' organization or an economic system emerging 'naturally' from the 'simple', local interactions of a population of economic agents (Epstein and Axtell 1996). 'Self'-organization includes the 'power' of the individual. In counterweight, the concept of 'socio-cultural' organization means an *intentional* (more deliberate), holistic, harmonious, and integral organization set of forces. There is macro-micro organization and horizontal 'micro-micro', 'meso-meso' and 'macro-macro' organization. As well, there are meso-micro and meso-macro organizational relations.

However, it is argued that free markets are mediated by institutions (e.g., Ostrom 1990 on economic governance of common resources). The institutions-as-rules approach regards institutions as the rules of the game. In particular, there are "formal" rules such as constitutions and laws imposed by the state, and "informal" constraints such as codes of conduct, norms of behaviour, values and beliefs, and social conventions, enforced by members of a specific group (e.g., Greif and Kingston 2011). Alternatively, the institutions-as-equilibria approach focuses on how interactions among purposeful economic agents create the structure providing each agent the drive to act in a way facilitating the structure (Grief and Kingston 2011).

6. Explanatory Account for the Relational Model and Conceptual Framework

6.1 Economic organization: Emergence and Identity, the Market and the State

The purpose of this section is to introduce and outline the ideas of emergence and identity and the role of the 'self-organizing' market and of State design as they contribute to understanding economic organization. There is a contrast between the process of 'emergence' and the outcome/s of 'identity'. Identity relates to having characteristics held by no other person or thing and, thus, to sameness or oneness,

constancy and stability. Emergence provides flexibility, while identity affords organization persistence and predictability. Moreover, emergence relates to the creation of radical novelty and of wholes maintaining themselves over time. Emergence also has a property of "wholeness", is a product of a dynamical process, and is "ostensive" or perceived (Comins 2002).

To understand 'identity' In resilience theory, resilience is defined as the capacity to absorb disturbance and reorganize while keeping the same function, structure, and feedbacks, or the capacity to change but maintain the same identity (Folke et al. 2010). We suggest that there is bottom-up 'predictable unpredictability' whereby macro-organization 'identity' (predictability) emerges from 'chaotic' (unpredictable) interactions within, between or among micro-organization/s. An example is Epstein and Axtell's (1996) computer simulated economy, *Sugarscape*, that emerges from bottom-up interaction of its economic agents. Analogously, it is proposed that there is top-down 'indeterminant determination' whereby micro-organization 'identity' (determination) evolves from macro-organization ('indeterminate') openness and flexibility. An example is the introduction of a new Government economic policy where the intended and unintended public (individual/personal) consequences are either pre-figured (intended) or not pre-figured (unintended), being played out in a flexible and open way.

Redmond (2010) recognizes that the market is a self-organizing system, with rules and roles by and for actors (such as sellers and buyers). Rules can be the informal culture of the market as a self-regulating system of norms and conventions, and can be formal, such as state laws and regulations. The social and cultural environment in which the market is embedded is a factor determining whether formal and/or informal rules co-exist or prevail (Redmond 2010). However, across the world

there are significant differences in economic organization. Indeed, in many contexts across the global south informality is a *norm* and takes precedence over formal systems, especially where these systems are absent, dysfunctional or deeply iniquitous (e.g., Skinner and Watson. 2017).

Regarding roles, these involve market position, including a firm's power, reputation and leadership and involve expectations from an organization's past relationships and current strategies (Redmond 2010). However, in practice, rules and roles in the market are intertwined (Redmond 2010). We do not contest Redmond's (2010) view that the market as self-organizing or informally governed can be more (economically and socially) flexible and efficient than formally governed state design or intervention. But we contend that state design, to correct market "imperfections" such as economic inequality and environmental destruction, is needed, in interrelationship with the market, for economic effectiveness and social justice (e.g., Kuttner 1987; Li, and Wang 2020).

The concept and theory of self-organized criticality (SOC) began in physics (Bak, Tang and Wisenfeld 1987) with the key finding that complexity in nature *emerges spontaneously* from local interactions. Similarly, the concept and theory of highly optimised tolerance (HOT) also began in physics (Carlson and Doyle 2000) with the idea that HOT states may emerge in complex systems through deliberate design or through natural selection, enabling high performance structures in the context of environmental uncertainty. HOT systems may be "robust" to common perturbations but be especially "fragile" to rare events. While SOC and HOT may be too mechanical to apply to the social-relational complexity of the socio-economic system, they point to the mechanism of *self-organization* and the mechanism of *design* (by institutions/the state) in economic dynamics (e.g., Matutinović 2006). In

the present paper, we use the concept of socio-cultural organization as equivalent to Matutinović's concept of 'design'. In the free-market economy, the *market* is relatively self-organizing or involves autocatalytic networks (Matutinović 2010). In the centrally planned economy, the *state* is relatively socio-culturally organizing or 'designing' (e.g., Matutinović 2006), involving societal and cultural values, norms, ethics, and beliefs. In the 'mixed' economy there is a blend of both self-organizing and socio-culturally organizing economic structures, economic processes, economic functions and economic contents. Thus, we contend that economic dynamics are partly self-organizing and partly socio-culturally organized and that a full view of economic dynamics requires understanding of both, and the ways that they operate individually and interactively.

Both self-organisation and socio-cultural organisation in economic systems can reflect power relations. These power relations are multidimensional, encompassing political, economic and cultural expressions of power (Stahl 2019; van Heur 2010). To recognise the role of social power in economic organisation, self-organization *within* individual economic and political systems and individual economic and political actors can be classed as being 'with intent' or 'without intent' (Walker et al. 2004). Self-organization *with intent* includes active governance of individual organizations such as a discrete business or discrete government entity. Self-organization *without intent* involves market and social forces arising from the interactions of individuals in the local to global economy. In turn, socio-cultural organization *between or among* collective economic and political systems and collective economic and political actors (e.g., economic and political institutions) can be classed as 'deliberate' or 'forced' (Folke et al. 2010).

6.2 Support-Control Systems Dynamics Underlying Economic Organization

Figure 3 is a schematic of the support system-control system dynamics of human organizations, which underlie our relational model of economic organization. Relating to support systems in the context of the economy, decision support systems (DSS), as information systems supporting organization decision-making, are widely used in advanced economies and have a foundation in behavioural economics (Arnott and Gao 2019). Pertaining to control systems in the context of the economy, it has been argued that the economy is a distributed, learning control system (Heylighen 1997).

Support systems are based on positive feedback, that is, of ‘more and more’ or of ‘less and less’. Moreover, self- and socio-culturally reinforcing ‘support’ systems may involve *virtuous* or *vicious* behaviour. As Figure 3 indicates, there can be more or more economic growth, more and more economic degrowth, less and less economic growth, and less and less economic growth. Control systems are based on negative feedback, that is, ‘more’ negating ‘less’ or ‘less’ negating ‘more’. As Figure 3 shows, there can be more economic growth and less economic growth, more economic degrowth and less economic degrowth, less economic growth and more economic growth, and less economic degrowth and more economic degrowth. The dampening influence of control systems on support systems means that an organization’s support behaviour oscillates or ‘wanders’ across a ‘basin’ between upper and lower bounds (e.g., Boeing 2016). In turn, the amplifying influence of support systems on control systems means that the control behaviour of an organization fluctuates around the homeostatic point, rarely settling on an exact ‘equilibrium’.

Moreover, Figure 3 shows 'swings and roundabouts', that is, positive feedback (support systems) feedback driven upswings (A and D) and downswings (B and C), and negative feedback (control systems) in circularity around the homeostatic point. A, B, C, and D in Figure 3 assumes that the economic system experiences an economic shock or 'crisis' such as the COVID-19 pandemic. However, the pattern of A, B, C, and D is only one trajectory from a set of possible trajectories. Further, homeostasis is defined as the long-run average annual economic growth. Therefore, while homeostasis appears fixed in Figure 3, in practice it is dynamic or changing. A socioeconomic system endeavours to approach its homeostatic stability in a context of diverse or variable political and cultural factors. An example is the conceptual law of supply and demand, with the interaction of supply and demand keeping market prices reasonably stable (Rodolfo 2000).

Insert Figure 3 about here

To illustrate the dynamics in Figure 3, an example of self-control is less (more) personal debt and a better (worse) credit rating. An example of socio-cultural control is less (more) government spending (budget deficit and debt) and more (less) scope for personal and company tax cuts. An example of self-support is more (less) savings and more (less) investment/s. An example of socio-cultural-support is more (less) government/bureaucratic red-tape and more (less) 'cost' to business and individuals.

6.3 Support and Control in Self-organization and Socio-cultural Organization

To fully understand how self-organisation and socio-cultural organisation behave we need to comprehend the contribution of support and control systems. It is contended that 'self'-organization involves self 'control' such as self-regulated and

self-governed economic behaviour across local, subnational, national, and international spheres. An example of self-regulated behaviour is self-reporting or self-disclosure of tax details by individuals and business/companies in the Australian tax system. Of course, self-regulation and economic deregulation by government may negate or dampen the need for top-down governance and promote a sense of engagement and economic tailoring to local needs and circumstances. As well, self-organization involves self 'support' such as the building of a good economic reputation by economic entities (e.g., government and business) at the local, subnational, national and/or international scales. Of course, building an economic reputation is self-reinforcing, so a good economic reputation fosters a good economic reputation (e.g., by positive word-of-mouth) and a bad economic reputation foments a bad economic reputation (e.g., by negative word-of-mouth).

Socio-cultural organization entails societal and cultural 'control' or regulation such as government (fiscal) policy, laws and rules, business organization strategy and community organization mission and vision. Examples are the budgets of local, sub-national and national governments. Of course, overarching budgeting may negate or dampen socio-cultural-economic inequality and injustice as well as facilitating economic harmonization and integrity, community-building (funding in health and education, for example) and an 'ecological civilization' (Korten 2017). 'Socio-cultural'-organization also involves societal and cultural 'support' such as government 'safety net' support of the economically and socio-culturally disadvantaged or 'poor', for example, Medicare as universal health care in Australia. As well, societal and cultural 'support' covers government service delivery (e.g., Centrelink in Australia) and industry associations or groups (e.g., in Australia, the Australian Chamber of Commerce and Industry, Business Council of Australia and

the National Farmers Federation). Additionally, there is socially responsible or ethical investing by business or philanthropy by charities, not-for-profits in the community sector or wealthy individuals. Of course, 'investing' economically in the community (e.g., local, state, and national libraries in Australia, for instance) strengthens the societal 'fabric' and promotes cultural harmony. Yet, disempowerment of the under-privileged and/or the 'abuse' of privilege by the wealthy or powerful can lead to a breakdown of the social 'fabric' and cultural resentment. But socio-cultural tensions or conflicts can be virtuously or viciously reinforcing. There can be peaceful public demonstration and there is socio-cultural disorder from the 'black' or 'illicit' economy.

7. Conclusions

This paper has presented a model, conceptual framework and explanatory account that is relational, with systematic interrelations such as of part with part, part with whole and whole with whole. In this way it is intended that the best aspects of existing complexity theory, especially the economy as a self-organizing and complex adaptive system, are maintained. The concept of socio-cultural economic organization is introduced to overcome the perceived theoretical weaknesses or limitations in the extant writing, which has been overly individualist and self-organization focused (e.g., Byrne and Callaghan 2013). There is dynamic nonlinearity in economic organization as the coevolution of economic and environmental systems (Caravaggio and Sodini 2018), with emergence of identity and identity in emergence as well as learning and adaptation by economic agents. In consequence, the economy evolves through alternative or multiple steady states, including cycles of economic upswings and downswings, as bottom-up and top-down controls and supports play out.

The dynamics of self-organization and socio-cultural organization identified in our model are conceptually separate. However, they are interdependent in practice, with each partly composed by and composing the other. The ‘emergent’ or changing nature of one and the ‘stabilizing’ or constant characteristics of the other interpenetrate, thereby developing a dynamic balance or mix of stabilizing and emergent qualities.

Our relational approach to economic organization can be used in theoretical debates to move beyond the individualist-collectivist divide and provide a conceptualisation of how economic systems are created, reproduced and transformed that better accounts for economic realities. While the conceptual framework articulated in this paper is presently abstract, it is offered as being suited for concrete, empirical testing and application.

Our ‘general’ complexity account of economic organization is intended to address the lack of correspondence between extant theory and economic reality, as Byrne and Callaghan (2013) have aptly identified. Thus, this paper provides a more complete picture of economic organization, with part-part relations (‘within’ all of subnational, national and global economy or the ‘self’ of self-organization), part-whole relations (‘between’ all of local, subnational, national and international economies or the ‘social/societal’ of socio-cultural organization) and whole-whole relations (‘among’ all of subnational, national and international economies or the ‘cultural’ of socio-cultural organization) than has been previously available. Economic organization and its components emerge and evolve through relations of local to global economy with the socio-spatial-temporal context as well as emerge and evolve recursively through *relations* of local to global economy with outcomes. Our model of relations provides a structure for complex-realist exploration of particular

problems by making inter-relationships that need to be explored explicit and by providing a structured language for description.

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