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Regulating capitalism's processes of destruction

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1. Introduction

Three large-scale processes of change currently confront regulatory networks and institutions everywhere: eco-processes collapse, techno-processes collapse and financial processes collapse. Collapse, such as the filing for bankruptcy by Lehman Brothers in 2008, is always the product of a process. This chapter focuses on characterising the processes of change with which actor networks either knowingly or unknowingly engage as they attempt to influence the flow of events while being situated, at least in most cases, within a variant of capitalism.

This chapter is not intended to be a piece of forecasting about the outcome of these processes. That is much more a game for futurists employing scenario building or those who have managed to capture real-world processes through their formal models of complex systems. Rather, in this chapter, the goal is to provide a clear statement of the long-term governance challenges facing regulatory capitalism. We begin with a discussion of capitalism and regulation.

1 My thanks to John Braithwaite and Martin Krygier for their comments on this chapter. My thanks also to Jeroen van der Heijden for his patience and reflections as I paced up and down my room trying to explain the ideas of the chapter.

2. Capitalism and regulation

The 42 chapters of this book support the view that regulation by state and non-state actors permeates the activities of state and non-state actors. Actors are, in other words, part of a systems duality and circularity in which they sometimes function as regulator and on other occasions as regulatee. The dual regulator–regulatee role holds true for all actors, irrespective of size. Credit ratings agencies such as Standard and Poor's and Moody's Investors Services, which regulated the credit worthiness of states through their ratings prior to the Global Financial Crisis (GFC), have, post GFC, found themselves on the receiving end of regulatory reform. This happened after their self-interested rating of complex financial instruments was exposed.

The scale and intensity of regulator–regulatee relationships will most likely increase. Information and communications technology (ICT) is delivering rising interconnectedness, creating more opportunity for these relationships to be created. Digital divides still remain, especially in Africa, but, according to the International Telecommunications Union (ITU), 3G mobile broadband now covers 89 per cent of the four billion people living in urban environments and 29 per cent of the 3.4 billion living in rural regions (ITU 2015). It is the pace of ICT's global extension that is impressive compared with communications technologies from earlier eras such as telegraph and radio. If Marshall McCluhan's observation that the medium is the message holds true then perhaps networks will bring a new and global resonance to Heraclitus's observation that 'all is flux'.

The rise and rise of regulation has led to the identification of another species of capitalism: 'regulatory capitalism' (see Levi-Faur, Chapter 17, this volume). Capitalism has turned out to be a system (or systems) for which much has been predicated. One can study capitalism territorially, as Galbraith (1993) did in *American Capitalism: The Concept of Countervailing Power*, or as Huang (2008) does in his *Capitalism with Chinese Characteristics*. Others have distinguished among oligarchic capitalism, state-guided capitalism, big-firm capitalism and entrepreneurial capitalism (Baumol et al. 2012). Hall and Soskice (2001), drawing on the comparative capitalism literature, develop a varieties-of-capitalism approach in which liberal market economies and coordinated market economies occupy opposite ends of a spectrum. In their investigation of capitalisms, the focus is on how firms solve

various types of coordination problems. Another cluster of predicates such as knowledge capitalism, information capitalism and post-industrial capitalism draws attention to the increasing role of knowledge in the production and distribution of services and products in some capitalist economies—a phenomenon first systematically studied by the economist Fritz Machlup (1962). These and many other predications of capitalism seem to bear out Schumpeter's observation that it is 'by nature a form or method of economic change and not only never is but never can be stationary' (1976: 82).

The description of capitalism as regulatory seems oxymoronic, at odds with the idea of capitalism being a method of perpetual change. Perpetual change implies freedom rather than regulation. It suggests that capitalism does best when the state turns itself into a watchman of public order and avoids intervention in the market. This belief drives neoliberal initiatives of privatisation and deregulation, but is it an accurate description of capitalism's evolution?

The first signs that neoliberalism did not offer a good description of what was happening in capitalist systems came towards the end of the 1980s as regulatory scholars began to point out that the Thatcher and Reagan eras had not led to anything like the uniform decrease in regulation in the United States and United Kingdom that might have been expected (Ayres and Braithwaite 1992: 7–12). Small government had seemingly delivered big regulation. This was not following a neoliberal script. Patterns of regulation seemed to follow privatisation and deregulation. When states privatised public assets such as health services, telecommunications, water, electricity, railways and so on, they had to either create or strengthen independent regulatory agencies. The lists of regulators in countries grew longer, especially in the 1990s, a decade in which the impact of the neoliberal privatisation initiatives of the 1980s should have produced a decline in the number of agencies (Levi-Faur 2005: 18–19). Regulation of one kind or another kept breaking out at different levels of governance. Voluntary standard-setting initiatives such as those to be found in fair trade were seeing the emergence of fair trade organisations and certification systems, creating, in effect, regulatory standards with which supermarkets and multinational food producers were increasingly engaging (Hutchens 2009). It appeared as if there was a regulatory version of Newton's third law: for every deregulatory or privatisation initiative, there was an opposite regulatory reaction from somewhere within the system.

Levi-Faur and Jordana coined the term 'regulatory capitalism' to describe a system capable of generating regulation from many actors, at different levels and using a variety of instruments to communicate and enforce their chosen norms (Braithwaite 2008: xi). Regulatory capitalism represents, in contrast to laissez-faire capitalism and welfare capitalism, a shift in governance functions in which the state, broadly speaking, does more 'steering' and business more 'rowing' (Levi-Faur 2005: 16). Welfare states had developed systems for directly provisioning the entitlements of citizens in areas such as education, employment, health, disability and age pensions and child care. Regulatory capitalism reorganises many of the processes of the welfare state. Many social entitlements are delivered through third-party organisations that are paid by governments to provide them. Citizens, as the holders of welfare rights, find themselves entering networked worlds made up of government agencies and third-party providers (Goldsmith and Eggers 2004). Governments spend much more time monitoring, checking, supervising and testing the activities and services of providers.

The reorganisation of regulation across capitalism's many sectors has been achieved through the use of networks. Networks are not a new form of organisation, but their use in markets and by governments has been dramatically accelerated by ICT. Information technologies contribute to their own spread, as well as the spread of other technologies, creating feedback loops of all kinds, and thereby creating a process that 'endlessly amplifies the power of technology' (Castells 2010: 31). Corporations harness information technology networks to develop longer and more complex supply and production networks (Dunning and Lundan 2008: 489–90). In these networks, China often ends up being the final assembly point for a product, the parts of which will have come from other countries that make up the links in a global chain of production (Athukorala and Yamashita 2009). For example, Apple's products begin their life as research and development initiatives in the United States, with parts coming from countries such as Malaysia and Taiwan and software from other multinationals such as Toshiba, with the last stop in the production network being China, from where the finished products are exported back to eager customers in the United States. It is not so much that command and hierarchy cease being characteristics of the firm in this 'post-industrial' or 'informational' age, but rather that corporations have more options to reorganise production and distribution, as well as their tax affairs, using contracts and networks.

Globally dominant corporations are not peculiar to regulatory capitalism. The British Empire was served by one of history's most powerful trading corporations, the British East India Company. Few industries have been dominated by private corporations in the way the oil industry was dominated by the seven majors in the first half of the twentieth century (Sampson 1976). What is different for today's multinationals is the way in which they can rapidly become objects of regulatory strategies formulated by other actors. For example, large companies in the textile, footwear and clothing industries, which, through the clever use of contracts, insulate themselves from the reach of labour laws to generate cost pressures on homeworkers, may find themselves on the receiving end of community-based initiatives such as Australia's FairWear initiative and ultimately supply-chain legislation that imposes liabilities where none previously existed (Marshall 2014). Fossil fuel companies—to take another example of how regulatory capitalism can generate regulation from any quarter—are seeing non-governmental actors developing strategies aimed at encouraging institutional investors to divest their holdings in these companies (Ayling and Gunningham 2015).

Regulatory capitalism is a distinctive system precisely because regulatory initiatives can be generated from any part of its technology-enabled networks. One can see it as the coevolved complementarity to capitalism's restless economic nature in which each new accumulation phase or impulse of capitalism coexists with a regulatory phase or impulse. Through this coevolutionary process, regulatory capitalism generates various public principles of conduct, such as procedural fairness, respect for human rights and restorative justice, that serve to reduce the risk of societal destruction. Such a risk, Polyani (2001) argued, looms over a society in which the principle of the self-regulating market has assumed a tyrannical status, driving out all other principles. This way of describing regulatory capitalism might be taken to imply that it is more adaptive than previous forms of capitalism. Many of the chapters in this book suggest that the problem-solving capacity of regulatory capitalism is superior to its predecessors. Even if one cannot write the regulatory equivalent of QED after initiatives emerging out of regulatory capitalism in fields such as human rights, migration, cybercrime or tax evasion problems, one might nevertheless see them as Pareto improvements or improvements judged by some other criterion.

The remainder of this chapter probes the idea that regulation is a source of capitalism's adaptivity in a little more detail. Towards the end of his book on regulatory capitalism, John Braithwaite (2008) asks whether it is a 'good thing'. His answer, which is based on his identification of regulatory capitalism's systemic capacity to produce global markets in vice or virtue, is that it is a mixed bag. The question being asked here is slightly different. Is regulatory capitalism sufficiently adaptive to cope with the three existential challenges described in the next section? As will become apparent, the labels used to distinguish the challenges represent simplifications of complex and interacting processes, but it is a simplification that is both convenient and necessary for present purposes. The aim here is to show that the adaptivity of regulatory capitalism will be globally tested by different types of processes.

There is little doubt that regulatory capitalism, because of its globalised and networked nature, is in a better position than any previous form of capitalism to uplift regulatory capacities and capabilities from the nodes of its countless networks to develop interventions in its systems. This intervening agency does depend heavily on an entrepreneurship that sees soft-wiring solutions where others see only hardwired structures. Washington lobbyists saw the possibilities for globalising intellectual property rights where government officials saw only treaty impediments (Drahos with Braithwaite 2002). Social entrepreneurs saw opportunities to create fair trade for poor farmers where most saw only domination by commodity cartels. These and many other examples of agency that produce a rewiring of some of capitalism's networks are, however, examples of sector or domain-specific solutions. Our interest here is in the broader adaptivity of the system to existential challenges thrown up by the macro-processes identified in the next section. The purpose is to make clear that the superior adaptivity of regulatory capitalism at sector or domain levels does not necessarily translate to the macro-processes of existential crisis that confront capitalism in this century. Putting it at its simplest, regulatory capitalism's capacity to deal with crises within its parts may fail it when it faces a crisis that affects it as a whole. As we will see, the sources of crisis in capitalism are more varied than those that Marx first identified from his economic data—data gathered from a nineteenth-century liberal capitalism that too often turned a blind eye to what was happening to the women and children trying to survive on its dangerous factory floors. The contradictions between labour practices and the promises of capital were evident enough. Over time, welfare and then regulatory capitalism helped to align these practices with

liberalism's promises of what ought to happen in a society where all were, at least formally, bearers of rights. Regulatory capitalism now confronts processes of collapse on a scale and scope not envisaged by Marx and to which his data do not speak.

3. Three processes of collapse

Ecosystems processes

Early on in *Silent Spring*, Rachel Carson asks what has silenced the voices of spring. The first large-scale study of this and many other environmental questions is not her book, but the 1972 report by Meadows et al. entitled *The Limits to Growth* (*LG*). This study of the world's future relied on what is, by today's standards, ancient computing technology. Around that time, Intel's first processor was capable of processing about 60,000 instructions per minute. Today's processors operate in hundreds of millions of instructions per minute. Despite its age, the *LG*'s analysis of the trajectory of world population, industrialisation, pollution, food production and resource depletion has proved to be much more robust than one might have anticipated, especially since its formal world model plots these trajectories to 2100. In 2008, Graham Turner published a paper in which he compared three key *LG* scenarios with independently obtained historical data from 1970 to 2000. Of the three scenarios, the scenario described by *LG* as the standard run (where the world system follows a business-as-usual path) lined up well with the actual historical data. In the standard-run model, food production, industrial output and population grow exponentially, consuming non-renewable resources to the point where resource extraction consumes too much investment and the industrialised food system collapses, bringing about eventual population decline.

Since *LG*, we have much more understanding and evidence concerning processes of ecological change. The work of the Intergovernmental Panel on Climate Change (IPCC) is well known. Equally important, but less well known, is an initiative known as the Millennium Ecosystem Assessment that was launched in 2001.[2] Involving more than 1,360 scientists from 95 countries, it produced a series of technical studies

2 See: www.millenniumassessment.org/en/index.html.

and reports on changes in ecosystems and the likely consequences for human wellbeing. Economic growth has impacted on these ecosystems to the point where some 15 out of 24 major systems are in global decline (Millennium Ecosystem Assessment 2005: 1).

Obviously, ecosystems processes can be described in scientific terms in many different ways, but, for our purposes, we will say that these are nonlinear processes containing feedback loops and exponential growth patterns. Exponential functions played a critical role in the systems modelling done in *LG*.

Techno-processes collapse

Large-scale extinction of humans through a technological process may be an accident or intentional. The world became much more conscious of intentional extinction after 'Little Boy' and 'Fat Man' exploded over Japan in 1945. Some of the scientists who had built these atomic bombs formed an organisation called the Atomic Scientists of Chicago. Through a publication called the *Bulletin of the Atomic Scientists of Chicago*, they began to inform the public of the dangers of nuclear energy. In 1947, the bulletin showed on its front cover a clock set at seven minutes to midnight, with midnight being the moment of apocalypse.[3] Since 1947, the bulletin has warned of two other riders of the apocalypse: carbon technologies leading to climate change and biological developments that threaten biosecurity. Technological developments continue to open up new scenarios. The cheap printing of millions of war robots would enable aggressors to launch wave after wave of attack against carefully chosen key economic centres—something both difficult and costly to defend against.

How might one characterise the processes of techno-collapse? One obvious feature of these processes is to say that they are examples of innovation. Clearly, this raises the rather large issue of how best to characterise innovation. Over the past few decades there has been within economics a shift towards analysing innovation using various kinds of evolutionary models (Foster and Metcalfe 2001). The evolutionary economics literature on innovation is large. For present purposes, we draw on the idea advanced by Richard Nelson (2001) that technology and institutions are characterised by a coevolutionary relationship.

3 The *Bulletin of the Atomic Scientists of Chicago* is available at: thebulletin.org/.

Technologies do not arrive courtesy of Promethean delivery, but rather are endogenous, their future path dependent on institutional responses to them.

Financial processes collapse

The GFC of 2007–08 was a reminder that capitalism's markets of financial intermediation bust as well as boom. How do we characterise the processes that lead to financial crises? Marx believed that crisis was a structural property of capitalism, linked to the tendency of profit to fall and ultimately to a contradiction between the forces of labour and capital. One can label this a dialectical process, but, ultimately, there is not much specificity in the idea, especially when compared with the models of financial behaviour being developed within economics. Much more sophisticated models have emerged within economics to explain the instability of capitalism's financial systems. An early example of this is Minsky's financial instability hypothesis, which is based on the idea that instability is linked to expectations generated during euphoric phases of the economy (for a formal model, see Keen 1995). For present purposes, the processes behind capitalism's fluctuations or instabilities can be roughly characterised as belonging to the family of nonlinear dynamics in which system chaos plays a prominent role.

Summing up, the governance systems of regulatory capitalism face three distinct existential challenges: ecosystems collapse, techno-collapse and financial systems collapse. These challenges are best thought of as ongoing processes of change to which regulatory capitalism is currently responding and to which it will have to continue to respond adaptively if it is to survive in the long term. In the case of ecosystems, capitalism has to confront nonlinear dynamics containing exponential functions; in the case of techno-collapse, there are processes of coevolution in which institutions play a crucial role; and, in the case of financial collapse, we have nonlinear dynamics characterised by chaotic behaviour.

Section 2 suggested that regulatory capitalism, through its many networks of regulatory intervention and governance, has increased rather than decreased its adaptive capacities. Section 5 discusses in more detail the question of how these improved adaptive capacities fare in the face of the processes of change described in this section. Before moving to this, the next section identifies a core feature of capitalism that will shape its systemic responsiveness to these processes: commodification.

4. The tragedy of commodification

Ever higher levels of commodity production and exchange are a fundamental characteristic of capitalism. Marx, in explaining capitalism as a distinctive system of commodity production, borrows a distinction from Adam Smith between use value and exchange value (Fine 1984: 20–3). Some things, such as ecosystems, have a use value without necessarily having an exchange value. Capitalism, as a system of commodity production, relies on property rights in the process of converting things that have use values into commodities—that is, things with exchange values. It is through new property rights that capitalism expands the horizons of its commodification possibilities (Drahos 1996). For example, mathematical algorithms have use values (think of the algorithm of addition that underpins your checking of the restaurant bill), but they do not have an exchange value until property rights are defined in ways that allow for their appropriation (for example, by allowing the patentability of algorithms).

Piketty (2014), in his recent treatment of capitalism, draws from Marx the 'principle of infinite accumulation'—the idea that capital necessarily accumulates and concentrates in fewer hands. For our purposes, it is important to emphasise that continued capital accumulation is only possible if capitalism keeps on generating new commodification possibilities. The generation of these possibilities depends most deeply on the institution of property. New forms of property rights such as intellectual property rights create new asset classes and these assets become part of financial capitalism, underpinning, for example, the price values of new financial instruments such as different types of derivatives. Property along with contracts constitute processes of propertisation that are fundamental to capitalism's method of change and expansion. While one can identify many different types of capitalism, the one thing that unites them is the expansion of their commodity horizons through propertisation. One can think of the propertisation process of capitalism as a bias or weight in the system, meaning it will tend to land on a commodity rather than commons solution more often than not. This bias manifests itself in various ways, including in the influential idea associated with Hardin (1968) that the commons leads to a 'tragedy' of destructive overuse—a tragedy that the propertisation of the commons can prevent. The problems of this propertisation bias are too great to explore here, but, among other things, it ignores the role of the intellectual commons in serving multiple generations of creators

and its function of diffusing knowledge (Drahos 1996). Solutions based on the blind application of property rights risk another kind of tragedy: the tragedy of commodification.

5. Capitalism and processes of collapse: Some reflections

As indicated at the outset, this final chapter is not an attempt at forecasting. It does not present a model of any kind, but simply sketches the essential characteristics of regulatory capitalism and identifies the deeper processes of change with which its systems of networked governance must engage. This final section of the chapter looks back to some historical examples of how well networked governance has coped with the processes of change. However, as any financial adviser would point out, past performance is not necessarily a guide to future performance. That said, the historical performance of networked governance might offer some insights into how this form of governance responds to the three types of processes described earlier. We begin with processes of techno-collapse.

Obviously, for a system to respond to a doomsday technology, it must have some warning of its existence or imminent arrival. Where knowledge of a technology is dispersed throughout the nodes of a network, there are at least more sources from which a warning might be sounded. Historically, scientific nodes have acted as a warning system. For instance, soon after the invention of recombinant DNA technology in 1975, which allowed for a gene from one organism's sequence to be cut out and spliced into the genetic sequence of another, a conference of concerned scientists held at Asilomar, California, produced some guidelines for the experimental use of the technology. Recently, more than 1,000 researchers involved in artificial intelligence projects issued an open letter warning of the dangers of an arms race driven by the increasingly rapid developments in artificial intelligence (Gibbs 2015).

The responses to nuclear technology were shaped by various social movements such as the peace, antinuclear and environmental movements, their influence aided by nuclear accidents such as those at Three Mile Island and Chernobyl. These accidents were also important in catalysing other networked regulatory responses. Three Mile Island, for example, led to the formation in 1980 of the Institute of Nuclear

Power Operations, an industry body aimed at promoting safety in the industry, with a global version in the form of the World Association of Nuclear Operators, established in 1989 (Braithwaite and Drahos 2000: 301). The detonation of a nuclear bomb in 1952 by the United Kingdom showed the United States that a strategy for dealing with a doomsday device based on the premise of central control by a single actor was unlikely to work. Instead, the history of nuclear power regulation, beginning with President Eisenhower's 'Atoms for Peace' program, has been one of creating and strengthening networks for the control of technology for both military and civilian purposes. The coevolutionary relationship between these regulatory networks and nuclear technology has, in the case of nuclear power operators, led to the adoption of a strong safety culture (Rees 1994), along with decades of investment in the development of safer and more fuel-efficient reactors. In the case of nuclear weapons, the nonproliferation regime has been an important regulatory accomplishment, especially if one keeps in mind that in the 1960s there were predictions from people such as President John F. Kennedy that, by the 1970s, there could easily be 15 to 25 nuclear powers in the world (Mueller 2010: 89–90). Today there are nine countries with stockpiles of nuclear weapons (Kristensen and Norris 2016).

In the military sector, the coevolutionary process, this time between military-industrial security networks and nuclear technology, has produced large stockpiles of different types of weapons. One might plausibly argue that the probability of techno-collapse scenarios involving nuclear war has been reduced because of decades-long initiatives such as the strategic arms limitation talks and agreements concluded between the United States and the Soviet Union (and later Russia), but, given the continued existence of large stockpiles of nuclear weapons along with their much greater explosive power compared with earlier generations of weapons, it is clear that this probability has not been reduced to zero. Pakistan, for example, which appears to be increasing its nuclear stockpile at a faster rate than India, is seen as an outlier in the global nuclear order (Dalton and Krepon 2015) and reports of it agreeing to supply Saudi Arabia with nuclear devices continue to appear (Kaye 2015).

Perhaps—and it is only a perhaps—a networked governance that is dense with globally connected research networks, as well as civil society actors that track dangerous technologies, does increase the probability of early warnings about the emergence of doomsday technologies. The history of nuclear power regulation also suggests that networked

governance can globalise a safety culture in a way that command-and-control regulation cannot. However, the case of nuclear technology also demonstrates that coevolutionary processes can dramatically increase the scale of consequences of a technology. Military-industrial networks have been the institutional drivers of an evolution from simple bombs and planes to nuclear weapons systems of great power and flexible delivery. The networked governance of capitalism will, within its networks, have coevolutionary processes that will for the foreseeable future continue to deliver an ever greater variety of forms of destructive technological capability. Moreover, states will continue to compete to acquire such capabilities, suggesting that the rate of these coevolutionary processes is not likely to decrease.

Before we move on to consider financial collapse, we should note that capitalism's capacity to deal with processes of techno-collapse will also be affected by propertisation. The Asilomar conference of 1975 around the dangers of DNA was a good example of how scientists were able to start a self-regulatory process that ultimately led to the greater involvement of states in the regulation of gene technology. Since Asilomar 1975, however, biotechnological research has become more intertwined with commodification through the patent system (Palombi 2009). Paul Berg, one of the organisers of the 1975 conference, has suggested that it would be much more difficult to organise an equivalent conference today because at that time most of the attending scientists were working for public institutions whereas today 'many scientists now work for private companies where commercial considerations are paramount' (2008: 291). Berg has a point. The capacity of states to manage the risks of pandemic influenza in 2004–05 was significantly weakened by patents over key medicines (Lokuge et al. 2006).

More abstractly, the propertisation bias of the system works against the warning-call function of some nodes in the network. One might counter argue that it is improbable that the propertisation process would capture all the nodes and so losing some nodes would not be a problem as long as there were some left to sound the call. The problem with this line of thinking is that it does not recognise the importance of having many warning nodes. Asilomar 1975 was influential precisely because it represented a consensus among leading public researchers working on DNA technology. Having a large number of uncompromised nodal actors potentially available to assess technologies in a public-minded

way is critical to dealing with the risk of techno-collapse. The warning call of one bird is easy to miss in a world full of noise. One is less likely to miss a screeching flock.

Turning now to financial collapse, if one looks to financial history, crisis and collapse seem to be permanent features of global capitalism. The Great Depression, the Organization of the Petroleum Exporting Countries (OPEC) inflation shock of the 1970s and the international debt crises of the 1980s that began with Mexico's inability to service its debt are all examples of crises with large-scale repercussions. In fact, it is difficult to find decades in the twentieth century without significant financial crises. The 1990s saw Mexico take the lead with the peso crisis of 1994, then there was the East Asian crisis of 1997 and the Russian rouble crisis of 1998 saw out the decade. The first decade of the twenty-first century opened with the collapse of the dot.com bubble and Argentina, a crisis stalwart, ran into severe problems in 2001–02 with its currency peg to the US dollar. The effects of the GFC of 2007–08 continue and the eurozone crisis, which ended the first decade, looks set to dominate the next if it is not surpassed by a new Asian crisis with Chinese characteristics. This is far from being a complete list of crises in these decades. Moreover, if we added the many high-profile individual banking failures that have occurred over the decades, such as the Herstaat Bank in 1974, BCCI in 1991 and Barings in 1995, or the lingering banking crises such as the one that beset the Japanese banking system from around 1990, one can plausibly claim that crisis is a multilevel feature of capitalism's financial systems. And, of course, as Kindleberger (1978) has shown, crisis and contagion in financial systems form part of capitalism's earliest history.

Any given financial crisis tends to trigger a debate about the virtues of heavy versus light-touch regulation. Our interest here is more abstract. Capitalism's financial processes are part of the family of nonlinear dynamics with chaotic properties. The history of financial regulation suggests that such a characterisation is not unreasonable. Economic systems exhibit a degree of chaos without being examples of extreme states of chaos (Potts 2000: 87). History also shows that the system has, despite its many multilevel crises, not randomised. Put simply, while we can point to many cases of dramatic perturbations, such as falling currency values, capital flight, bank runs and crashing stock markets, we also see recovery and stability. The hypothesis here is that, over time, capitalism has developed a networked governance approach to global

financial regulation that is characterised by the integration of more nodes into regulatory networks and the evolution of independent nodes that have developed tools for the management of perturbations. It is this networked regulatory governance that has acted to stabilise the chaotic properties of the system. An example of nodal integration in the financial system is the incorporation during the 1990s of key developing countries into the Bank for International Settlements (BIS).[4] Formed in 1930, the BIS is the single most important forum for cooperation among central banks. Other examples of nodal integration include the integration of banking supervisory authorities from key developing countries such as Brazil, China and India into the Basel Committee on Banking Supervision, the principal international forum for cooperation on matters of banking supervision.

The evolution of independent institutions of central banking is perhaps the single most important regulatory accomplishment of financial capitalism. The anteroom of the Bank of England may look like a London gentlemen's club of an earlier era, but it and other central banks have become repositories of data and experience concerning the management of global systems. Whatever one thinks of the successes of central banks in managing crises, history suggests that they are better than the alternative of having political hands on the tiller of complex systems. Each new crisis has brought experience with tools of intervention, from which central banks have been able to learn. The Bank of Japan's use of quantitative easing procedures in 2001 provided the US Federal Reserve with some valuable learning when it came to launching its own quantitative easing program in 2008. Regulatory capitalism's networks of financial governance have been able to stabilise systems in crisis and to generate periods of stability, although, as many Greek citizens would no doubt point out, choices about techniques of stabilisation are still error prone, affected by politics and come at great social cost.

Turning now to ecosystems collapse, here, regulatory capitalism's networked governance also confronts processes belonging to the family of nonlinear dynamics with an emphasis on feedback loops and exponential functions. Based on the evidence coming from sources of aggregated scientific data such as the IPCC and the Millennium Ecosystem Assessment, regulatory capitalism's greatest challenge may well be survival governance in the face of accelerating rates of ecosystems

4 For the dates, see: bis.org/about/chronology/1990-1999.htm.

collapse. In core form, the problem is how quickly networked governance can respond to processes with exponential trajectories. The obvious variable here, which the *LG* study highlighted in all its various models, is time. In cases of exponential growth (and decline), time can rapidly run out, as it does in the case of the French story about a lily in a pond that doubles in size every day, meaning it would cover the pond in 30 days. On the twenty-ninth day, with the pond half covered, those looking after the pond have one day to save it. Many climate scientists would say that, because of the feedback effects they are already observing, we have little time in which to act to stop the earth system from shifting to an equilibrium likely to be disadvantageous for mammalian life.

One of the strengths of regulatory capitalism is that its interventions can begin from anywhere within its networks and then, through diffusion mechanisms, can quite rapidly globalise. The system is not dependent on one actor for initiating regulatory responses. Even if individual governments fail to act, other nodal actors from other parts of the system's networks, such as those in business or social movements, may initiate responses to the dangers of ecosystems collapse. Naturally, this still leaves the question of whether regulatory capitalism can scale a response to processes occurring at the earth system level. Regulatory capitalism offers a better chance of success than previous capitalisms, but prospects of it saving the twenty-ninth day may not be high.

Turning now to the possible effects of propertisation on ecosystems collapse, we saw earlier that propertisation creates a bias in capitalism's evolutionary operation, pushing it into the expansion of its commodity horizons. This may well be an important advantage when it comes to financing adaptive responses to ecosystems crises. The movement to encourage investors to divest from fossil fuel needs the complement of investment in renewable energy technologies. This has been happening for some time, with the World Bank issuing green bonds in 2008 (World Bank 2015). More recently, the lure of tax equity financing has seen multinationals such as Google partner with renewable energy companies—the incentive for Google being the tax benefits that accrue to the renewable energy company (Martin 2015). Innovative financing, which is underpinned by propertisation, will be critical to scaling responses to avoid ecosystems collapse.

However, propertisation also creates a drag on the speed of network responses within regulatory capitalism. Schumpeter's metaphorical description of capitalism's 'creative gales of destruction' is beguiling

but quite inaccurate. Industries that have globalised are not swept away overnight by gales, leaving a cleared building site for use by the next generation of entrepreneurs. Globalised industries such as oil and gas build up huge capital stocks that they continue to deploy for their survival and expansion. As the fracking revolution in the United States has shown, these companies continue to invest successfully in innovation (Downie and Drahos 2015). Propertisation is crucial to entrenching these companies within regulatory capitalism's networks of economic production. The response of the state has been to regulate these global industries, but the regulation is much more the product of joint negotiation than it is unilateral declaration by the state. The entrenchment of fossil fuel industries in capitalism's networks of production means that changing capitalism's energy systems from fossil to renewable fuels is much more likely to be a long, drawn-out affair involving complex contests among networks than a rapid, smooth transition to new renewable energy systems. Gales of destruction will arrive, but they are more likely to be products of changing earth system dynamics than entrepreneurial agency.

6. Conclusion

Networked actors have always been important to capitalism's evolution. The glaring gaps between the 'is' and 'ought' of capitalism were already being decreased during Marx's time, and continue to be narrowed, by networked actors. Examples of such actors in the early phases of capitalism include the various abolitionist movements that progressively ended slavery in European and other states, trade unions and the suffragettes. Examples of other movements that have caused capitalism to pivot globally in a direction different to the one it might have taken are the environmental and consumer movements. Cometh the moment of crisis, cometh the networked actor, or so it seems in the case of capitalism. As we have seen, regulatory capitalism appears to be reaching new heights of adaptivity and resilience through information technology networks. New ideas for strengthening it, for making it work better and for saving it can emanate from any one of its many nodal centres and diffuse to other parts of its networks. Specialist movements, such as the free software movement, the access to medicines movement, indigenous peoples' movements, peoples' seed movements and so on, function as

countervailing agencies creating contests with corporate capital where none existed before. Capitalism's networks—now much more neural in character—hum and crackle with ideas and contests about its future.

This is one, admittedly optimistic, view of regulatory capitalism's capacities to generate and uplift into its regulatory systems the ideas needed to improve and save it. In this view of capitalism's networks the future is much more plastic, less path-dependent, something that can be shaped through concrete ideas and interventions. And so it makes sense and is a practical public good for leaders in ideas about regulation such as Neil Gunningham to continue to identify and synthesise the best innovative practices in environmental regulation or for Christine Parker to show how corporate self-regulation might be improved if the corporation is made sufficiently permeable to outside influences that shift it from the amoral profit-maximising fiduciary to a fiduciary that has internalised social duties. These ideas and the many others described in the chapters of this volume—such as meta-regulation, smart regulation, responsive regulation, restorative justice and nodal/networked governance—show the beauty and importance of ideas about regulation. Generated at low cost, they can generate massive lifesaving and system-saving returns. There is everything to play for.

How does the propertisation bias of capitalism affect this optimistic reading of its future? As we have seen, propertisation does compromise the warning-call function of nodes in capitalism's systems and, more worryingly, does set up the possibility of tragedies of commodification. The continued deepening globalisation of intellectual property rights sets up a system of private taxes on future generations of innovators and, as already pointed out, property rights are being used by industries to entrench themselves in ways that make Schumpeter's idea of creative destruction by entrepreneurs look fanciful. The coal and oil industries need to be managed out of existence in the next two decades, if the world is not to descend into a struggle for survival, its states crowded around resources like dying animals around a shrinking waterhole. And yet, under the cloak of property rights, networks of corporate capital continue to invent new monopoly privileges for the purpose of entrenching themselves ever more deeply in networks of production, thereby compromising the adaptive function of free markets. The cold logic of commodification is about obtaining resources and maximising the rent extraction process. Public goods and assets are there to be raided.

The effects of these raids on equality, equity and the environment are something over which the weak can wring their hands. Marx's insights into this dimension of capitalism remain valid today.

The answer to the question 'what is to be done?', perhaps somewhat predictably from someone who has been at the Regulatory Institutions Network for a long time, is to continue to develop the countervailing regulatory ideas to capitalism's commodification logic. A global discourse of information environmentalism that exposes commodification logic is needed (Cunningham 2014). Histories of innovation not dependent on commodification have to be spread to create the realisation that there are alternative paths of innovation (Shao 2013). A positive inclusive version of the intellectual commons in which people are included by design has to replace access regimes in which access is dependent on winning a game of legal rights (Drahos 1996). And, closer to home, scholars should oppose university managers who think that the mission of the university is to be a propertised knowledge factory, churning out paid-for commodities instead of what it should be: a communal place for creating radical and free ideas that allow people to choose different futures. There truly is everything to play for.

Further reading

Braithwaite, J 2013. 'Strategic socialism, strategic privatisation and crises', Australian Journal of Corporate Law 28: 35–59.

Drahos, P 2011. 'Six minutes to midnight: Can intellectual property save the world?', in K Bowrey, M Handler and D Nicol (eds), *Emerging Challenges in Intellectual Property*. Melbourne: Oxford University Press, pp. 30–45.

References

Athukorala, PC and Yamashita, N 2009. 'Global production sharing and Sino–US trade relations', *China & World Economy* 17(3): 39–56. doi.org/10.1111/j.1749-124X.2009.01149.x.

Ayling, J and Gunningham, N 2015. 'Non-state governance and climate policy: The fossil fuel divestment movement', *Climate Policy*, 23 October. doi.org/10.1080/14693062.2015.1094729.

Ayres, I and Braithwaite, J 1992. *Responsive Regulation*. Oxford: Oxford University Press.

Baumol, WJ, Litan, RE and Schramm, CJ 2012. 'The four types of capitalism, innovation, and economic growth', in DC Mueller (ed.), The Oxford Handbook of Capitalism. New York: Oxford University Press, pp. 115–28. doi.org/10.1093/oxfordhb/9780195391176.013.0005.

Berg, P 2008. 'Meetings that changed the world: Asilomar 1975—DNA modification secured', *Nature* 455: 290–1. doi.org/10.1038/455290a.

Braithwaite, J 2008. *Regulatory Capitalism: How it Works, Ideas for Making it Work Better*. Cheltenham, UK: Edward Elgar. doi.org/10.4337/9781848441262.

Braithwaite, J and Drahos, P 2000. *Global Business Regulation.* Cambridge: Cambridge University Press.

Castells, M 2010. *The Rise of the Network Society*. 2nd edn. Chichester, UK: Wiley-Blackwell.

Cunningham, R 2014. *Information Environmentalism: A Governance Framework for Intellectual Property Rights*. Cheltenham, UK: Edward Elgar. doi.org/10.4337/9780857938442.

Dalton, T and Krepon, M 2015. *A Normal Nuclear Pakistan.* Washington, DC: Stimson Center and Carnegie Endowment for International Peace. Available at: stimson.org.

Downie, C and Drahos, P 2015. 'US institutional pathways to clean coal and shale gas: Lessons for China', *Climate Policy*, 29 October. doi.org/10.1080/14693062.2015.1094730.

Drahos, P 1996. *A Philosophy of Intellectual Property*. Ashgate, UK: Aldershot.

Drahos, P with Braithwaite, J 2002. *Information Feudalism: Who Owns the Knowledge Economy?* London: Earthscan.

Dunning, JH and Lundan, SM 2008. *Multinational Enterprises and the Global Economy.* 2nd edn. Cheltenham, UK: Edward Elgar.

Financial Services Authority (FSA) 2009. *The Turner Review: A Regulatory Response to the Global Banking Crises*. London: FSA. Available at: fsa.gov.uk/pubs/other/turner_review.pdf.

Fine, B 1984. *Marx's Capital*. 2nd edn. Basingstoke, UK: Macmillan. doi.org/10.1007/978-1-349-07538-6.

Foster, J and Metcalfe, JS (eds) 2001. *Frontiers of Evolutionary Economics: Competition, Self-Organization and Innovation Policy*. Cheltenham, UK: Edward Elgar.

Galbraith, JK 1993. *American Capitalism: The Concept of Countervailing Power.* New Brunswick, NJ: Transaction Publishers.

Gibbs, S 2015. 'Musk, Wozniak and Hawking urge ban on warfare AI and autonomous weapons', *The Guardian*, 27 July. Available at: theguardian.com/technology/2015/jul/27/musk-wozniak-hawking-ban-ai-autonomous-weapons.

Goldsmith, S and Eggers, WD 2004. *Governing by Network: The New Shape of the Public Sector*. Washington, DC: Brookings Institution Press.

Hall, PA and Soskice, D (eds) 2001. *Varieties of Capitalism*. New York: Oxford University Press.

Hardin, G 1968. 'The tragedy of the commons', *Science* 162: 1243–8. doi.org/10.1126/science.162.3859.1243 .

Huang, Y 2008. *Capitalism with Chinese Characteristics: Entrepreneurship and the State*. Cambridge: Cambridge University Press. doi.org/10.1017/CBO9780511754210.

Hutchens, A 2009. *Changing Big Business: The Globalisation of the Fair Trade Movement*. Cheltenham, UK: Edward Elgar. doi.org/10.4337/9781848447356.

International Telecommunications Union (ITU) 2015. *ICT Facts and Figures*. Geneva: ICT Data and Statistics Division, ITU. Available at: itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2015.pdf.

Kaye, Y 2015. 'US officials: Saudis set to buy nuclear weapons from Pakistan', *International Business Times*, 17 May.

Keen, S 1995. 'Finance and economic breakdown: modeling Minsky's "financial instability hypothesis"', *Journal of Post Keynesian Economics* 17(4): 607–35. doi.org/10.1080/01603477.1995.11490053.

Kindleberger, C 1978. *Manias, Panics, and Crashes*. Basic Books: New York. doi.org/10.1007/978-1-349-04338-5.

Kristensen, HM and Norris, RS 2016. *Status of World Nuclear Forces*. Washington, DC: Federation of American Scientists. Available at: fas.org/issues/nuclear-weapons/status-world-nuclear-forces/.

Levi-Faur, D 2005. 'The global diffusion of regulatory capitalism', *The Annals of the American Academy of Political and Social Sciences* 598: 12–32. doi.org/10.1177/0002716204272371.

Lokuge, B, Drahos, P and Neville, W 2006. 'Pandemics, antiviral stockpiles and biosecurity in Australia: What about the generic option?', *Medical Journal of Australia* 184(1): 16–20.

Machlup, F 1962. *The Production and Distribution of Knowledge in the United States*. Princeton, NJ: Princeton University Press.

Marshall, S 2014. 'How does institutional change occur? Two strategies for reforming the scope of labour law', *Industrial Law Journal* 43: 286–318. doi.org/10.1093/indlaw/dwu017.

Martin, C 2015. 'Google is making its biggest ever bet on renewable energy', *Bloomberg Technology*, 27 February. Available at: bloomberg.com/news/articles/2015-02-26/google-makes-biggest-bet-on-renewables-to-fund-solarcity.

Meadows, DH, Meadows, DL, Randers, J and Behrens, WW 1972. *The Limits to Growth*. New York: Universe Books.

Millennium Ecosystem Assessment 2005. *Ecosystems and Human Well-being: Synthesis*. Washington, DC: Island Press.

Mueller, J 2010. *Atomic Obsession: Nuclear Alarmism from Hiroshima to Al-Qaeda*. New York: Oxford University Press.

Nelson, RR 2001. 'The coevolution of technology and institutions as the driver of economic growth', in J Foster and JS Metcalfe (eds), *Frontiers of Evolutionary Economics: Competition, Self-organization and Innovation Policy*. Cheltenham, UK: Edward Elgar, pp. 19–30. doi.org/10.4337/9781843762911.00008.

Palombi, L 2009. *Gene Cartels: Biotech Patents in the Age of Free Trade*. Cheltenham, UK: Edward Elgar. doi.org/10.4337/9781848447431.

Piketty, T 2014. *Capital in the Twenty-First Century*. Cambridge, Mass.: The Belknap Press of Harvard University Press. doi.org/10.4159/9780674369542.

Polanyi, K 2001. *The Great Transformation: The Poltical and Economic Origins of Our Time*. Boston: Beacon Press.

Potts, J 2000. *The New Evolutionary Microeconomics: Complexity, Competence and Adaptive Behaviour*. Cheltenham, UK: Edward Elgar.

Rees, J 1994. *Hostages of Each Other: The Transformation of Nuclear Safety Since Three Mile Island*. Chicago: University of Chicago Press. doi.org/10.7208/chicago/9780226706894.001.0001.

Sampson, A 1976. *The Seven Sisters.* London: Hodder & Stoughton.

Schumpeter, JA 1976. *Capitalism, Socialism & Democracy.* 5th edn. London: Routledge.

Shao, K 2013. '*Zizhu Chuangxin* and China's self-driven innovation: Calling for a holistic perspective', *Cardozo Law Review De Novo*: 168–94.

Turner, GM 2008. 'A comparison of The Limits to Growth with 30 years of reality', *Global Environmental Change* 18(3): 397–411. doi.org/10.1016/j.gloenvcha.2008.05.001.

World Bank 2015. *Green bonds attract private sector climate finance*, Brief, 10 June, The World Bank, Washington, DC. Available at: worldbank.org/en/topic/climatechange/brief/green-bonds-climate-finance.

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