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2021-09
Southern Centre for Inequality Studies (SCIS)
https://hdl.handle.net/10539/33947
Nathan, D. 2021. Knowledge and inequality: an exploration. SCIS Working Paper Series Number 17. Southern Centre for Inequality Studies, Wits University.

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SCIS WORKING PAPER SERIES

SCIS Working Paper | Number 17

KNOWLEDGE AND INEQUALITY: AN EXPLORATION

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UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

SOUTHERN CENTRE FOR INEQUALITY STUDIES

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Acknowledgements

Thanks to Dipankar Gupta, Srinivasan Iyer and Sandra Harding for comments on an early version of this paper. Raphie Kaplinksy, Gerry Rodgers and Akeel Bilgrami offered detailed comments that helped strengthen the paper. An anonymous reviewer for the Southern Centre for Inequality Studies (SCIS) at the University of the Witwatersrand, Johannesburg, made some very probing comments that have helped me take forward the analysis. And, of course, Govind Kelkar, as always, helped me develop the ideas in this paper through repeated discussions, often with early-morning coffee.

About the Southern Centre for Inequality Studies

The Southern Centre for Inequality Studies (SCIS) is based at the University of the Witwatersrand, in Johannesburg, South Africa. It is host to a interdisciplinary research and policy project focusing on understanding and addressing inequality in the global South. For more information about the SCIS, visit our website at www.wits.ac.za/scis

Recommended citation

Nathan, D. 2021. Knowledge and inequality: an exploration. SCIS Working Paper Series Number 17. Southern Centre for Inequality Studies, Wits University.

Introduction

Many economists writing on inequality have mentioned that the spread of knowledge is a factor in equality. Thomas Piketty held that the spread of knowledge is "the key to overall productivity growth as well as the reduction of inequality both within and between countries" (Piketty, 2013: 20), and even the "principal force for convergence" (Piketty, 2013: 22). On the other hand, knowledge can be seen as a key structural factor in the creation of inequality, usually in globalisation (Tyson and Spence, 2017: 171) and, more specifically, in the context of the contemporary global organisation of production (Durand and Milberg, 2019; Kaplinsky, 2019) in global monopsony capitalism (Kumar, 2020; Nathan, 2020a; Nathan et al., 2021).

Piketty's elegant inequality, $r > g$ – the rate of return on capital (r) is greater than the rate of growth of the economy (g) – should be seen as "dependent on a variety of mechanisms" and not as an absolute logical necessity (2013: 361). Given this possible variety of mechanisms, this paper explores the processes through which knowledge becomes a factor – even a key factor – in producing inequality. In Nathan (2018), unequal knowledge was put forward as the base of imperialism, while Akeel Bilgrami (2020) had added knowledge to the ownership of capital or other properties as a source of inequality. The key process is the formation of a monopoly in the use of knowledge, through the creation of barriers to entry, buttressed by sanctions. This monopoly can be used to generate and capture rents, or excess income, than from non-monopolised knowledge.

These processes are looked at not only in the context of today's global capitalist economy, but even via earlier economic formations such as small-scale gatherer-hunter societies and patriarchal agriculturist societies of indigenous peoples. There are a number of reasons for such a historical exploration. First, it shows that the use of knowledge to create inequality is not a new process, but has evolved over time. Second, it can provide insights into contemporary issues, such as restricting inequality created through the interaction of knowledge economies and social processes, including economic and gender processes.

After setting out the main terms, knowledge, knowledge economies and inequality regimes, the paper outlines the main processes in which knowledge and inequality interact, setting them out in the context, first, of small-scale subsistence economies of indigenous peoples and, next, of large-scale capitalist economies. These two inequality regimes are then compared. After this, I consider how the relationship between knowledge and inequality can be understood as a form of contingent articulation of different social and economic processes. The knowledge-inequality nexus is then seen in the likely patterns of inequality and in the current context of globalised production

through global value chains (GVCs). The penultimate section looks at the important issue of the political economy of knowledge economies, stressing their contingent nature. This is followed by conclusions.

Knowledge and technology

Before going on to the analysis of the interaction of knowledge and inequality, it is necessary to set out how some terms are used and the framework of analysis. It is necessary to distinguish between information, knowledge and wisdom. In this triad, information is the facts provided or learned about someone or something. Knowledge is the ability to process information in order to create a theoretical or practical understanding of a subject. Wisdom is the ability to use knowledge and experience to make good decisions and judgements, according to the Cambridge English Dictionary. To give an example of wisdom, nations have shown wisdom in deciding not to use their knowledge to develop and produce chemical and biological weapons, but they have not shown the same wisdom in continuing to use knowledge of nuclear physics to develop nuclear weapons.

Knowledge, in economic analysis, is usually taken to be what Simon Kuznets called "useful knowledge" (Kuznets, 1965: 85–7), and termed it the base of economic development. Joel Mokyr uses the distinction between propositional knowledge (the "what") and instructional or prescriptive knowledge (the "how") to distinguish between the former as knowledge that is used to create the latter, that is, knowledge of technology or techniques (Mokyr, 2002). In a sense, knowledge can be called the meta-resource that is used to create knowledge of the use of resources.

Thus knowledge is not just one of the resources, as it is in Charles Tilly's list of ten resources over which control can be exerted to create inequality (Tilly, 2005: 114). It is the meta-resource that enables the use of resources. To give an example, the crude oil under the Arabian desert was not a resource until the development of knowledge about using of petroleum as fuel and appropriate technology, particularly internal combustion engines. Knowledge is what turns things into resources and, consequently, is on another level of existence compared to other resources.

While identifying knowledge as a meta-resource, it is also necessary to go beyond the notion of knowledge as restricted to Kuznets' "useful knowledge" or some form of knowledge directly usable in economic-production knowledge. Spiritual and religious knowledge also count as knowledge in many situations. Some of what we identify as spiritual knowledge, such as the chants or various rituals of indigenous peoples, are in fact ways of memorising and transmitting practical knowledge in oral, small-scale societies, as seen in much anthropological literature and well-summarised in Lynne Kelly (2015).

Therefore it is necessary to have a broader definition of knowledge – something that includes not only what is useful knowledge, but also ritual, spiritual and religious knowledge. These, too, can be the subject of processes of monopolisation and the creation of inequality. There may also be interactions among the different parts of knowledge, both in their creation and use. Propositional and prescriptive knowledge interact with each other; as does production and ritual knowledge.

I have identified knowledge as a meta-resource, that is, a resource that enables the use of resources. However, once a thing has been transformed into a usable resource, that resource gets an economic existence of its own. For instance, once the Windows monopoly of computer operating systems is established, the resulting monopoly profit becomes a resource by itself. In the terms used by Piketty, income earned through work can become inherited wealth (Piketty, 2013). This wealth could be used to buy access to knowledge. This is not an organic manner of acquiring knowledge but inorganic, through acquisition, such as of WhatsApp or Instagram by Facebook. In an earlier age, royal courts could secure the use of various types of specialised knowledge holders, for instance the knowledge of the Brahmin in caste India.

Thus it is necessary to study the manner in which knowledge and other resources interact in the creation of inequality. This is a very brief statement of a complex issue, but obviously something that must be part of any research programme on knowledge and inequality. However, it is the hypothesis of this paper that, in this interaction, knowledge is the primary force in creating inequality, though not the only force.

Knowledge economies

Knowledge is produced in various social and economic processes. It may be turned into a monopoly, thereby enabling it to gain prestige or an economic return. Knowledge, which is the base of technology, exists in every human society, and in non-human animal or even tree groups, as argued by Peter Wohlleben (2016) and Suzanne Simard (2016). Of course, there is a difference in the extent or intensity of knowledge use in various living groups.

In contrast to the conceit involved in declaring that the current era of IT-based technology alone is a knowledge economy, one needs to recognise that all human societies are knowledge-based and have their own ways of creating, distributing, accessing and using knowledge. All societies have a knowledge economy, comprising, "the ensemble of its social institutions and processes producing and reproducing the knowledge at its disposal, and, in particular, the knowledge on which its reproduction as a society relies" (Renn, 2020: 7).

A knowledge economy includes the manner in which knowledge is created, diffused and utilised. How is the knowledge on which a society's reproduction depends acquired and used? In a preliminary manner, I would categorise knowledge economies on the basis of the learning and training required to acquire and utilise particular forms of knowledge. For instance:

1. transmission of knowledge of gathering, hunting, agriculture and domestic housekeeping through the young participating with elders, girls with women and boys with men;
2. learning specialised rituals and knowledge, whether of seed selection, the timing of agricultural operations, or other matters of environmental interaction, crafts or social rites, including cultural and religious products, through apprenticeship and long years of training;
    a. in small-scale societies, what we otherwise term indigenous societies, specialised learning was also oral;
    b. in state formations the specialised learning also involved literary transmission of knowledge;
3. formal schooling for the whole population in industrialised societies;
4. extending formal schooling to tertiary education, as in the current IT-based knowledge.

In the above schematic manner, it is possible to identify the intensity of effort required to acquire or use knowledge in a society and to distinguish them, as above, on the basis of increasing intensity of knowledge. Subsistence economies, with no or sporadic surpluses, have oral systems of knowledge; a combination of 1 and 2a above. Economies with oral and literary knowledge systems are economies under state systems, such as feudal Europe or caste India. Their knowledge system is a combination of 1 and 2b above, where many sections of the population have long periods of formal learning for acquisition of knowledge. Finally we have capitalism, with a combination of 3 and 4. There is both the requirement of universal literacy and numeracy and long periods of formal learning for the acquisition of knowledge. In the post-Covid-19 situation, digital literacy has been added to the earlier relatively straight-forward forms of literacy and numeracy as a requirement for reasonable functioning in a capitalist economy.

A turning point in this increasing intensity is that of capitalist development. Why? Based on market competition, capitalism, as Marx (1958) pointed out, brought about the constant revolutionising of the means of production. This revolutionising, termed creative destruction by Schumpeter (1967), incessantly brought about the growth and destruction of monopolies. The monopolisation of the new methods of production, based on the monopolisation of the technology developed by the application of knowledge, earned rents or surplus profits

above the usual competitive rate of profit. It is not that societies before capitalism were technologically stagnant, but there was not that constant revolutionising of technology that capitalism brought about. Since revolutionising technology depended on the application of knowledge, there is a sustained demand for the development of knowledge itself in the competition between firms and countries to get ahead and stay ahead.

In the analysis of the knowledge economy there is a crucial difference between tacit and codified knowledge, first put forward by Michael Polanyi (1966). Codified knowledge is easily transmitted and thus it is difficult to restrict its use. Of course, formal intellectual property rights could result in restriction of the use of codified knowledge in order to create a monopoly. Tacit knowledge, on the other hand, is difficult to transmit and thus its use can be easily controlled (though the advent of artificial intelligence is said to threaten the exclusivity of various forms of tacit knowledge). Turning technology which is based on codified, and thus easily transmittable, knowledge into an exclusionary device, through intellectual property laws, is a widespread feature of the capitalist economy.

Inequality regimes

The knowledge economy interacts with the political-economic formation to create different forms of inequality. These different forms of inequality can be characterised as inequality regimes. Joan Acker first used the term 'inequality regime' in the context of inequality in organisations. She defined an inequality regime as "loosely interrelated practices, processes, actions, and meanings that result in and maintain class, gender, and racial inequalities within particular organisations" (Acker, 2006: 443). Thomas Piketty extended this concept to the macro-level when he defined an inequality regime as "a set of discourses and institutional arrangements intended to justify and structure the economic, social, and political inequalities of a given society" (Piketty, 2020: 2). These give us two areas of analysis: institutions that produce a structure of inequality and discourses justifying inequality. I would add a third area of analysis: political economy analysis is necessary to understand why certain inequality structures arise and how they change.

Processes of creating inequality

What are the main processes involved in a knowledge economy becoming a factor in inequality? Six processes have to be analysed.

1. The process of turning a good whose consumption is non-rivalrous (Romer, 1990) or non-subtractable (Ostrom et al., 1994) into one whose consumption is excludable: in brief, this is the process that restricts access to knowledge and turns it into a monopoly – a situation where access to some forms of knowledge is available only to those who belong to a defined group, whether it be defined by gender, caste, guild, class, or corporation. Even where persons have acquired the competence to use certain forms of knowledge, they may still be constrained in their use of that knowledge by social exclusions such as gender. Through all the above processes, knowledge monopolies create what Tilly (2005) termed "durable inequalities".
2. The sanctions or punishment for those who transgress the boundaries: the punishment is a way of protecting boundaries, though such attempts may often be futile and boundaries become porous.
3. Social valuation: from durable inequalities in the access to or use of knowledge, we proceed to the process of social valuation, which provides a higher valuation for production that is based on certain monopolised forms of knowledge, while according lower valuation to production based on non-monopolised and therefore widely spread forms of knowledge. The differential social valuation must be manifest in some forms of differential returns or inequalities in the economic, social, or political realms.
4. The justification of inequalities: as Piketty points out, every society has to have a manner of justification or ideology of inequalities.
5. The ways of dealing with inequalities: this can include ways of preventing them from rising and also of dealing with them after they have risen.
6. The political economy analysis of different inequality regimes: what coalition of forces brought about a particular inequality regime and how did it or can it change?

Therefore, the process of exclusion or monopolisation, the ways of protecting boundaries, social valuations, differential remuneration related to social valuation, justifications of inequality, ways of dealing with inequality, and the political economy of different inequality regimes are the foci of analysis. These factors and processes create a system of inequality, or an inequality regime.

In what follows, I will look at these processes in the context of two kinds of economies: the relatively-subsistence economy of indigenous peoples, and the accumulative economy of capitalism. This is not the full range of types of economies. As mentioned above, there is at least also feudal Europe, caste India and Mandarinate China. My insufficient knowledge of these economies forces me to confine myself to the subsistence

and accumulative economies of indigenous peoples and capitalism respectively. These economic forms exist not only historically but also in contemporary times.

This exploration of knowledge and inequality starts by looking at the processes linking certain forms of knowledge to inequality.

Small-scale indigenous economies

In this section, I consider all the processes listed above and see how they operate in the context of small-scale subsistence economies of indigenous peoples.

Creating a knowledge monopoly

Knowledge is essentially non-subtractable, by which is meant that its consumption by any person does not diminish its availability for consumption by another person. This makes it a public good. How then is knowledge turned into a private good? Apart from being non-subtractable, knowledge is also excludable, so it is possible to exclude some people from access to that public good through forms of social exclusion. These forms of social exclusion turn a public good into a private one. There have been a number of forms of exclusion in history. Some of them are dealt with here.

Gender exclusion is one form of exclusion to knowledge. In the process of the formation of patriarchy (the domination of men over women in key economic, religious, and political spheres), there has been a gendered exclusion of women from these key spheres. For instance, in indigenous Mundari agriculturist societies in central India, women are forbidden from knowing the names of clan spirits or from participating in various rituals (see Kelkar and Nathan (2020) for an extended analysis of this phenomenon). In other small-scale societies, there is mention of certain types of performance of music from which women are excluded (Godelier, 1991). To cite another example, among the Warlis of western India, women are forbidden to overhear men learning ritual chants and prayers (Munshi, 2001). These are all gendered exclusions, creating the categories of men with access and women without access to specific parts of social knowledge.

A second form of exclusion is that of maintaining secrecy. Business secrets exist, not only now, but also in history, in small-scale societies. The author recalls a discussion with a Hani woman in Xishuangbanna, China, a traditional doctor famous for treating bone injuries. When asked how her knowledge did not spread, she said that

she had two practices to keep her knowledge secret. One was to take back any unused materials from a patient. The other was to add some harmless and useless materials, so that the patient would not get any idea of what really worked. Thus she maintained her monopoly on the specialised knowledge of treating bone injuries, a secret she would pass on to her daughter-in-law or daughter.

Studies of Native American societies, such as those summarised by Lynne Kelly (2015), point out that there is institutionalised secrecy in the acquisition of certain forms of knowledge, such as knowing about phases of the sun or about seed types. Among the Pueblo, for instance, knowledge of the many types of corn seeds was stored in ceremony and song and reproduced through ritual practices of the clan elite. Even though there were hereditary ranks, members of the elite were required to acquire the restricted knowledge of these ritual practices which were kept secret from others. As Hopi specialists stated, "Power talked about is power lost" (Couch, 1981, quoted in Kelly, 2015: 28).

A third form of exclusion works through the cost of acquiring knowledge. To be a Bobolizan (a village priest and leader among the Rungus of Sabah, Malaysia) required a woman to put in many years of apprenticeship to learn the performance of intricate two-day rituals, which needed to be conducted without a single mistake (Porodong, 2001). Learning these required the woman to abstain from productive labour, owing to which not all households could support women wanting to learn these rituals. These are exclusions working through the simple operation of the economic mechanism of cost of acquisition.

A related form of exclusion is that of knowledge which has a high implicit knowledge content. In Africa, in early agriculturist societies, specialists such as iron smelters or medicine men had knowledge of their craft that was both "complex and esoteric" and, consequently, not accessible to others (Kelly 2015, 22).

Punishment for transgression of boundaries

The exclusions discussed earlier are forms of social exclusion based either on gender or social position. There are social sanctions that follow any attempts to transgress these exclusions. A woman who tried to acquire knowledge of the rites and rituals of men could be denounced as a witch (Kelkar and Nathan, 2020). The threat of being denounced as a witch was a powerful deterrent to women trying to learn knowledge forbidden to them.

So far, we have seen that knowledge can be turned from a public into a private good by excluding certain social groups from its access or use. The process of exclusion could be through the formation of social norms; it

could also be through the straightforward economic means of cost. Social or legal exclusion is a strong from of exclusion, while exclusion through cost would be a weaker form of exclusion.

Social valuation

The next question would be: Are there any benefits of such monopolisation of knowledge? In the absence of such benefits, it would be difficult to argue a case for *durable inequalities* being created by the monopolisation of knowledge. The benefits could be economic (higher income), or social (greater prestige), or political (more hierarchical power). Before coming to the benefits of monopolisation of knowledge, we need to see if there is a social valuation by which monopolised knowledge is valued more highly than non-monopolised knowledge.

Societies have different forms of valuation. Take the relation between production and ritual knowledge in a small-scale agriculturist community. Ritual knowledge is difficult to acquire, often requiring many years of apprenticeship, while production knowledge is more easily acquired through working with elders. Ritual knowledge is monopolised while production knowledge is spread widely, though in differing degrees. More importantly, ritual knowledge is supposed to be the condition for the fructification of production knowledge manifested in labour. Without the former, the latter is considered to be unproductive. Whether it is the village priest (*pahan*) among indigenous peoples in central India or the Brahmin priest in caste-based villages, without ritual observances, production is regarded to be at risk of not bearing fruit. This gives ritual knowledge a higher social valuation than mundane production knowledge. It becomes "an incarnated sign" (Appadurai, 1984, 2013: 42), which makes it "a special class of intellectual property" (Harrison, 1992: 226). Such knowledge, as intellectual property, becomes a source of power. "The ethnographic evidence is consistent across a range of unconnected non-literate societies: oral specialists in small-scale cultures maintain power through the control of knowledge," (Kelly, 2015: 24).

The last step we need to take for knowledge to yield inequality is that there must be a higher return (in some form or the other) for monopolised knowledge than for non-monopolised knowledge.

In non-market economies, the yields to the holders of monopoly knowledge could also bring in higher economic returns. For instance, the village priest among indigenous peoples in central India usually has a somewhat fertile piece of land. In addition, he also gets a higher share of sacrificed meat, including the prized heads of goats. The Hani woman who specialised in treating bone injuries commanded a premium over the rates paid to other healers.

The higher return for monopolised knowledge, however, is limited by the overall productivity of the economy. In a subsistence economy, there is a narrow limit to the extent of economic inequality. "When mean income is just above subsistence level, an increase in more than a small extent of inequality will threaten existence, triggering Malthusian responses" (Milanovic, 2016: 52). With higher overall productivity in economies after the industrial revolution, the extent of inequality can also increase.

With narrow limits to inequality, more important than these economic rewards is the higher social regard for priests and healers, especially in non-market economies. Turnbull pointed out that among indigenous people in Australia, "knowledge is the primary mark of status and an item of exchange" (Turnbull, 2000: 34). Along with an increased social status, there were also economic returns from trading in monopolised knowledge, even in small-scale societies. In Australia, songs, dances and even entire ceremonies are traded in exchange for desired goods, including ceremonial artefacts (Kelly, 2015: 29). In Africa too, songs were traded (Goody, 1977: 42).

Justifying inequality

While we have seen that knowledge-based monopolies have existed in different areas and times among small-scale societies, it is also necessary to look into the social justifications for created inequalities and the limits of allowable inequality.

Among the Mundari tribes in Jharkhand, central India, the village priest (*pahan*) who conducts all the village rituals, whether they be for gathering (taking the first fruit of the season) or agriculture (clearing the land, sowing, harvesting), is allotted some of the better land. He also gets the prized portion of sacrificed animals, the head. The justification for these relatively limited inequalities is the time he spends on non-production activities – in a sense, a reward for investment of time and effort in acquiring and using the necessary knowledge for propitiation of the spirits.

These activities were all considered socially useful and remunerated at least for the time spent in performing the rituals, which also means less time spent on their own production activities. The village priest and headman would also be allocated some of the more fertile land in the village.[i]

There is also a gender inequality in the distribution of household income. The women are forbidden from being given any part of the head of sacrificed animals.

Dealing with inequality: levelling mechanisms

Along with higher returns for monopolised knowledge, societies also have some redistributive levelling mechanisms to deal with inequalities. Levelling mechanisms can be of two types. The first type seeks to reduce inequality after it has occurred. There can also be institutional arrangements that seek to eliminate the monopoly of knowledge itself, altering the knowledge economy. There can be a change in the knowledge economy, not allowing the monopolisation of knowledge and thus pre-empting inequality.

In small-scale oral societies, oral specialists, priests, and village heads who acquired higher consumption rights also had greater social obligations than ordinary members of the society. These social obligations would have used up any surpluses. Furthermore, they were counter-balanced by levelling mechanisms based on redistributive consumption. In the agriculturist tribes in central India, any family that became better off would be forced to redistribute its surplus through forms of feasting (Kelkar and Nathan, 2020). The Native Americans of the north-west coast of North America had their well-known competitive feasting (*potlatch*) systems.

Knowledge and inequality in capitalism

Next we look at the knowledge-inequality processes in the context of large-scale capitalist economies.

Creating a knowledge monopoly

In contemporary capitalism, there is legal exclusion from using production knowledge through the intellectual property rights (IPR) regime. With the spread of global production organised though the system of the World Trade Organisation (WTO), with its requirement that all participating nations subscribe to the restrictive Trade-Related Intellectual Property Rights system (commonly known as TRIPS), there is a fairly uniform exclusion in the manner in which knowledge is manifested in technology.

Punishment for transgression of boundaries

In current-day capitalism, there are no legal barriers to the acquisition of knowledge as such, though there are gender-based and other social barriers, such as caste or race. The critical economic barrier is in the unlicensed use of technology developed from that knowledge. Transgressions of IPR law can be punished by fines and other legal actions.

Social valuation

In a capitalist economy, the ranking of knowledge is straightforward and even banal. The knowledge that is prized is that which yields more income or higher returns. Money, overcoming all other forms of valuation, is the measure of all goods, including knowledge, in a capitalist economy.

As before, the last step we need to take for knowledge to yield inequality is that there must be some form of return for monopoly knowledge which is higher than for non-monopolised knowledge.

Benefits of monopolisation

In a capitalist economy, monopolised knowledge yields a higher return than non-monopolised knowledge. Firms founded on a knowledge monopoly can be price-setters in the market, while those founded on non-monopolised knowledge are not. The former can – due to this price setting power – earn monopoly profits, usually called rents. The latter only earn competitive profits – lower profits which are necessary to remain in business.

Justifying inequality

While we have seen that knowledge-based monopolies have existed in different social formations, it is also necessary to look into the social justifications for created inequalities. Issues related to the social and economic justification of inequalities and the limits of allowable inequality need to be dealt with before one can take up discussions of policies for dealing with inequalities and growing knowledge-based monopolies.

The French Rights of Man of 1789, quoted by Piketty, declared that "Social distinctions can be based only on common utility" (Piketty, 2013: 1). The social justification usually given for inequalities is that they are important as incentives for innovation or are rewards for investment of time and effort in acquiring the necessary knowledge. What these justifications assume in the background is Rawls's "difference principle", in which the justification for inequality is that it benefits those who are worse-off in society (Rawls, 1993: 5-6).

The possibility of earning large monopoly returns is what drives Schumpeter's creative destruction as the engine of capitalist development. It is likely that much smaller inequalities were sufficient incentives for the development of specialised knowledge in the small-scale societies considered earlier in this paper. However, the justification for incentives for current knowledge monopolies is, to say the least, vastly overblown. The main point

is that much of the investment in developing and, as Marianna Mazuccato (2011) points out, commercialising technologies, is provided by public money. For example, key technologies of the iPhone, such as the touch screen and the personal assistant Siri, were developed with public money for the US Department of Defence.

In the case of justifying pharmaceutical patents, reference is made to the need to remunerate corporations for the high costs of product development. The cost of a new drug was $473 million in 1991 – a cost that went up to $802 million in 2001 (Di Masi et al., 2003). Had all or much of that $800 million been private money, there could possibly have been a case for a drug price that would allow a reasonable return on investment. However, a combination of government and public programmes, along with tax subsidies, accounted for as much as 84.2% of the $52.7 billion spent on basic research. With another $3.85 billion provided by charitable foundations, just 12% of the research funding came from industry sources (Light, 2006).

Supposed incentives for knowledge creation and application become a way of justifying the outsize returns from the commercialisation of knowledge-based technological innovations funded by public money. In a profit-enhancing arrangement, the US National Institutes of Health carry out the basic research, license the results to the pharmaceutical majors, and allow them to earn the monopoly profits based on the commercialisation of monopolised knowledge. The state works to subsidise the creation of monopolised knowledge, via which the monopolies generate inequalities.

The just deserts of merit?

Rawls's difference principle justifies inequality (only?) when it is necessary, probably as an incentive, to subsequently provide benefits to the worse-off. There is another justification for inequality as resulting from apportioning rewards for merit – receiving one's just deserts. But, as Amartya Sen (2004) points out, merit is necessarily instrumental in character. There is no intrinsic merit; rather, merit can only be seen in terms of what is considered good, or what is socially valued.

Merit-based reward pays attention to agency in the knowledge economy. But does it also simultaneously overstate the individual's responsibility for, and thus claim over, rewards? There are two problems in thus relating merit and reward. One is regarding the measure of reward. Merit makes a moral judgement about what people deserve (Sandel, 2020: 126). And in arguing for what is deserved, it is very easy to slip into the neo-classical equation that what is earned on the market is morally deserved, ignoring that this is also a matter of power and monopoly. In Mankiw's justification of supposed merit payment, "People should get what they deserve. A person

who contributes more to society deserves a higher income that reflects those greater contributions" (Mankiw, 2010: 16). And how is contribution to society measured? By contribution to GDP, or the income earned. This is followed by the moral judgement that the income earned is "rightfully his" (Mankiw, 2010).

The other problem is the attribution of merit solely to an individual. Rawls had rejected "just deserts", arguing that natural talent is a "common asset" and thus it is necessary to share in the benefits of the talent-based distribution of income (Rawls, 1971: 102). In dealing with talent or merit, there is a line to be drawn between recognising an individual's agency and negating collective contributions to the work of individuals.

How to reward agency through merit-based recognition is an enduring problem for all economies that an analysis of knowledge and inequality will have to deal with. The solutions under discussion range from the collectivist approach of Rawls, which has antecedents in indigenous peoples' and some Asian and African attitudes that deny a woman agency in the use of her own income (see Chapter 11 of Kelkar and Nathan, 2020), to the market-fundamental analysis, that glorifies the market determined distribution of income as having a moral basis.

From a society's point of view, the problem with merit-based rewards is that the meritocracy becomes self-perpetuating, a new class. Merit played a role in dismantling the old aristocratic elites in Europe and America. However, as discussed briefly below, the same has not quite happened in India where the old ascriptive hierarchy of patriarchal knowledge-bearers has been recreated in the new form of merit, as reflected in the title of Ajantha Subramanian's book *The Caste of Merit* (Subramanian, 2019). At the same time, India's system of caste-based affirmative action, in the form of reservation, has certainly had some effect in supporting the rise of some from the former low or untouchable castes to become modern knowledge producers.

However, the new meritocracy pass on their privileges to their children, by equipping them with the advantages that determine success in the meritocratic society (Sandel, 2020: 166; See also Markovits, 2019). Pierre Bourdieu's (1984) concept of academic capital as the product of the combined efforts of cultural transmission by the family and the school allows an analysis of the mechanisms whereby the meritocracy becomes a class, as well as how caste privilege can be transformed into and continued as merit.

"Meritocracy has created a competition that, even when everyone plays by the rules, only the rich can win" (Markovits, 2019). Worse than the resulting economic inequality, however, is the denigration of those who do not make it. If what a person achieves is due to merit, then what about those who are excluded? Do they not possess any merit? "Meritocracy frames this exclusion as a failure to measure up, adding a moral insult to economic

injury" (Markovits, 2019). Or, as Michael Young, the creator of the term meritocracy, put it, "In a society that makes so much of merit, it is hard to be judged as having none. No underclass has ever been left as morally naked as that" (Young, 2001).

The analyses referred to above are of the meritocracy in countries of the global North. The trajectories in the formation of the meritocracy in the mainly post-colonial countries of the global South are likely to be somewhat different and require analysis of the factors influencing these trajectories. In India, the upper castes transformed their "caste capital into modern capital" (Deshpande, 2013: 33). Subramanian's (2019) book shows, through its detailed analysis of the Brahmins of Tamil Nadu, how the upper castes were able to utilise the Indian Institutes of Technology (ITTs) to turn caste privilege into merit, with mass examinations and global market success playing their roles in this transformation. As in the case of those excluded being judged as having no merit, those who secure admission into the IITs through reservation are the "other" who are "supposed not to have the intellectual capacity to do well" (Dutt, 2019).

The manner in which the knowledge economy is constructed and transformed through merit and how this interacts with policies of affirmative action, such as in independent India or post-apartheid South Africa, needs to be looked at to understand the transformation and re-creation of meritocracies.

Levelling mechanisms

I noted earlier that redistributive levelling mechanisms can be of two types: reducing inequality after it has occurred, and pre-emptive measures.

In contemporary capitalism, levelling mechanisms are much weaker and are of the taxation variety. There may be progressive taxes on income or property taxes on inheritance. These have been applied differentially. They have been more effective in restricting inequality in the Scandinavian countries, but least effective in the USA. Taxes feature as a critical feature of redistributive mechanisms to reduce inequality, whether in Piketty or in Oxfam's influential inequality reports (Oxfam, 2021).

These measures are all post-facto mechanisms to eliminate or reduce inequality after it has come about. There are also mechanisms that seek to eliminate the monopoly on knowledge and prevent the development of inequality before it occurs. The open-source software system is one such mechanism to prevent advanced knowledge from becoming a monopoly that exists and even grows.

Articulation: the interaction of knowledge and social processes

There are a number of ways in which the interaction of knowledge economies and social processes can be analysed. One of the ways, which is characteristic of mechanical materialism, is to see knowledge as a superstructure merely reflecting the economic base. It was about this kind of analysis that Marx remarked that materialism neglected the analysis of the active element in development. Looking at the role of knowledge and the creation of monopolised knowledge in the creation of an inequality regime obviously brings the active element of knowledge into the analysis of inequality. However, knowledge does not work as an auto-generating system to influence social processes; there is an interaction between the two.

Another way of looking at the interaction of knowledge and inequality is through the concept of articulation, where there is a need to establish and not assume two-way links between knowledge economies and other spheres of society. Initially formulated by Harold Wolpe (1980) in the context of economic relations between different modes of production – kinship-based reserve economies that produced labour power and the industrial mining sector in apartheid South Africa – the concept of articulation was extended to inter-relations between culture and other social spheres by Stuart Hall (1985). In articulation analysis, the product – say, an inequality regime – is the product of both the knowledge economy and the initial social and economic conditions. Even with some knowledge being available and accessible, the results of its interaction with an economy also depend on that economy's own internal relations or structures. As Amy Kapczynski (2010) put it succinctly, "knowledge is not an object that can be simply downloaded from North to South" (2010: 47). This also makes knowledge economics more complex than information economics.

This kind of analysis has mainly dealt with the impact of knowledge on the economy in the form of developments in inequality regimes. However, there is also a reverse interaction, where social developments, whether in the polity or economy, influence the direction of the development of knowledge.

For instance, there is the analysis of what is called the military revolution in Europe in the early modern or pre-industrial revolution period from the fifteenth century to the end of the seventeenth century (Parker, 1988). The military revolution involved both armaments and tactics-cum-formations. This was argued to have been developed during this period of incessant warfare between European states, while comparatively less warlike Asian empires in India and China went through a period of a low-level competence trap (Sharman, 2017: 498) – or, as one might say, a low-level knowledge trap. Was it this inequality in military knowledge[ii] that enabled Europe

to dominate the seas even before the Industrial Revolution – a historical inflexion point that further increased the knowledge gap between West and East?

The development of knowledge and its application as technology, however, are not just a matter of endogenous development and that, in turn, of national development alone. Given the geographically well-connected Eurasian landmass, knowledge travelled well across European and Asian countries. It also travelled across countries and regions in Africa. Further, the development of knowledge itself depended on the social valuation or, in terms of evolutionary theory, fitness criterion on the basis of which types of knowledge and resulting technology developed.

An example of this connected (but also uneven) development of technology from the early modern period is the Mysorean rockets deployed in the Anglo-Mysore wars. These were taken back to England and then developed as Congreve rockets in the Woolworth Arsenal (Anievas and Nisancioglu, 2017), and applied with devastating effect in the Anglo-Chinese wars.

However, in the uneven application of knowledge, it is necessary to take note of the demand for knowledge from different parts of the connected regions. For instance, in the contemporary organisation of global production through the splintering of production segments across countries, Rodrigo Arocena and Judith Sutz (2010) distinguish among different demands for knowledge created by the division of labour between lead firms in the global North, which have product monopolies, and the manufacturing suppliers in the global South. There is a high demand for advanced knowledge from lead firms in the form of design and branding as they compete over market share, while there is a relatively low demand for advanced knowledge in the supplier countries of the global South. The demand for advanced knowledge is measured by the proportion of research and development to GDP and of research and development to firm revenues; in both ratios, there is a marked difference between the global North and the global South (Arocena and Sutz, 2010) The fact that there is a weak demand for the use of advanced knowledge in the global South is also noted by Mario Cimoli, Giovanni Dosi and Joseph Stiglitz (2009: 12).

Inequality patterns

The interaction of knowledge with inequality can take place at the firm (micro) level or industry (meso) level. This depends on the extent to which a firm established monopoly in knowledge as technology. How does one explain the interaction of knowledge and inequality at the macro-level, both national and international?

Piketty's theory of macro-economic inequality is that capital, with $r > g$, brings about an inexorable rise of inequality, other than the special performance in the period 1918 to 1980, when a combination of political-economy factors (such as war, taxation, the competition with socialism and the New Deal social contract which increased the share of wages) reduced inequality within the developed capitalist countries. Nothing happened within the knowledge economy that moderated or increased inequality. Could one extend this approach to the inter-country level, where inequality would be based on differences in the amount of capital per person in different countries?

In contrast to this, Branko Milanovic proposed neo-Kuznetsian waves of rising and falling inequality. He sees rising inequality in the eighteenth and nineteenth centuries, followed by the decline in inequality between 1918 and 1980, and then another increase in inequality after that. The current rise in inequality, however, needs to be decomposed into two parts. One is the decline in international or between-country inequality, largely brought about by the increase in per capita income in China and, to a much lesser extent, in India and other populous emerging economies, such as Indonesia (see Nayyar, 2019, on the rise of Asia). The second is the rise of within-country inequality, again, typified by the rise in inequality within China, India and other emerging economies.

An important point for the analysis of inequality is that it is a connected or relational history spanning countries and continents. The analysis needs to explain both inter-country and within-country inequality. It needs to explain both the "Great Divergence" and the current "Great Convergence" (Baldwin, 2017; Nayyar, 2019) and the continuing inter-country inequality. The analysis also needs to explain the concurrent rise of inequality in converging countries of the global South such as China and India.

Thinking of waves of inequality immediately draws attention to Kondratieff long waves, reformulated by Carlota Perez (2002, 2012) on the basis of technological revolutions or developments in general purpose technologies, as great surges of development. New technologies do not just appear randomly. Rather, interlinked technologies are created in linked waves of technological revolutions. These interlinked technologies in a technological revolution have a base in the same areas of propositional knowledge in science and prescriptive

knowledge in technology. Perez identifies five key technological revolutions in capitalist development from the 1770s to 2000s: the industrial revolution; steam and railways; steel, electricity and heavy engineering; oil, the automobile and mass production; and the current information and telecommunications technology.

Reminding ourselves that all technology is based on knowledge, would there tend to be rising inequality in the first phase of development of a technology, when its use is restricted by intellectual property protection or the complexity of the knowledge required for its operation, and a declining inequality when there is a diffusion of that general purpose technology, both between countries and within countries? This is a hypothesis well worth considering. For instance, the golden age of capitalism after the Second World War was based on both the spread of mass production and a full-employment, high-wage social contract, while the reduction in inter-country inequality between countries of the global South and global North from the 1990s onwards was based on the diffusion of standardised or commodified manufacturing technologies across East-Southeast Asia and, to a lesser extent, in South Asia. At the same time, the reduction in inter-country inequality has been accompanied by an increase in within-country inequalities in countries of the global South, such as China and India.

The development and application of new technologies would increase productivity and, thus, push outward the inequality possibility frontier (Milanovic et al., 2011) but not determine the extent of inequality. The hierarchical distribution of profit rates, higher for monopolised technology and lower for commoditised or non-monopolised technology, along with policies that affect wage rates and middle-class incomes, would determine the inequality trajectory in each segment of Perez's great surges of development. The manner in which knowledge-based technological revolutions interact with international diffusion of technology and, in each country, with wage and other policies to create inequality waves, is a pattern well worth analysing. It could explain both inter-country inequality and within-country inequality over long periods of time within a capitalist mode of production.

Contemporary global inequality

I next turn to look at how differences between the power and returns of firms based on monopolised knowledge and firms based on widespread, commoditised knowledge can be seen in the way global value chains (GVCs) function. GVCs are the characteristic form of organisation of global production, with GVC-based trade accounting for 70% or more of international trade in 2017 (OECD, 2020).

In a stylised representation, GVCs consist of lead firms from the global North and supplier firms from the global South. The lead firms are monopolies in the product market, with their monopolies protected by intellectual property rights of various types. These monopolies then appear as monopsonies in the market for inputs and manufactured goods and services produced by supplier firms. The combination of monopoly-cum-monopsony provides super-profits to the lead firms, while the suppliers, functioning with relatively easily acquired knowledge and technology, earn just about the profits needed to remain in business.

To summarise data on profit rates in GVCs, Apple (in consumer electronics) and Ralph Lauren (in garments) secure profit rates in excess of 50%. Electronics contract manufacturers, such as Hon Hai (better known as Foxconn) secure profit rates of less than 5% (Raj-Reichert, 2018: 38-9). Indian garment manufacturers' profit rates lie between 8% and 10% (Nathan et al., 2021). As expected, monopoly-based lead firms earned high profits, while suppliers' profits were not more than one-fourth of lead firms' profit rates.

However, not all GVC relations are of this strict monopsony type. Where input suppliers have established their own intellectual protection, including that of establishing brands, they are able to secure higher rates of return. Indian IT service suppliers have established a degree of monopoly through their brand reputations, in addition to IP protected products such as their banking software (TCSbancs or Infosys' Finnacle). With their brand reputations, the major Indian IT service suppliers, such as TCS and Infosys, are able to secure margins of around 23% to 25% and they do not accept contracts with lower margins.

A higher level of knowledge protection is that of Microsoft, with its Windows operating system having a virtual monopoly in personal computers. Similarly, some auto component suppliers, such as Bosch in spark plugs, have their own patented products. The point is that a producer – whether of a final product or an intermediate input – becomes a price setter (and is thus able to earn a higher return) to the extent that it is able to establish IPR protection for its product.

What the above shows is that contemporary international or inter-country inequality has a critical knowledge dimension. Supplier firms with low rates of return for their non-IP protected manufacturing systems are mainly located in the global South. Lead firms with their IP-protected products are mainly located in the global North. Product segments with non-IP protected technology are easy to enter; while product segments with IP-protected technology are difficult to enter. This results in product monopolies also becoming monopsonies in the input market. Knowledge incarnated in IP-protected technology then becomes a key factor in contemporary inter-country inequality.

In the contemporary world, this IP-protected knowledge has been able to utilise the new global economies of hyper-scale (Nathan, 2020b). Platforms such as Google with its protected search engine and Facebook or Amazon have established themselves as monopolies in more than one sector. Amazon is not only the largest retailer in the world, but also the biggest operator in cloud computer services. The platforms, with their combination of IP protection and global scale, have resulted in what has been called a 'winners take all' economy (Giridhardas, 2018) and, as a consequence, become a new source of an increase in inequality.

Before proceeding, it should be mentioned that some countries of the global South, mainly China but also, to some extent, India, are developing their own lead firms. This development too, however, is through the route of developing or acquiring IP-protected technologies and brands.

Comparison of inequality regimes

We saw above that a monopolisation of knowledge has existed and exists in small-scale agricultural societies of the type nowadays referred to as indigenous peoples and in contemporary large-scale capitalist economies; and that these monopolies of knowledge can be used to create inequalities of class (incipient or full-blown), of gender, and even between countries. But that does not mean that the extent or nature of inequality would remain the same across both small-scale and large-scale economies. A number of factors – such as the overall productivity of an economy, the existence or otherwise of increasing returns to scale, and the system of dissipation-cum-consumption of surpluses or their accumulation –can influence the extent of inequality. Below we look at these factors in the context of small-scale agriculturist and large-scale capitalist economic systems.

In the first place, the extent of inequality is constrained by the available production possibilities. The inequality possibility frontier (Milanovic et al., 2011), based on the overall productivity of an economy, constrains the extent of inequality. In a subsistence economy, such as that of gatherer-hunters or hoe cultivators, there cannot be much permanent consumption inequality without jeopardising the existence of the group as such.

In an economy of plough agriculture plus livestock herding, where the overall productivity increases and there are fairly regular surpluses, there can be a greater extent of inequality, as evidenced in feudal Europe, caste India or Mandarinate China. There can even be some centralisation of surpluses through the state, resulting in magnificent temples, mosques and cathedrals.

The productivity of these technologies, however, is constrained by the relatively constant returns to scale in production. It is when we come to technologies that can harness not just human and animal energy but also mechanical and then electrical and chemical energy and advanced forms of knowledge, as with IT, that we get increasing returns to scale – meaning that doubling inputs gives more than a doubling of output. With production organised with increasing returns to scale in a capitalist economy, we even get a continuous outward shifting of the inequality possibility frontier. Of course, the inequality possibility frontier sets limits on the extent of inequality; it does not determine the actually existing inequality.

The next factor in determining the extent of inequality is the manner in which surpluses are used. The presence of a levelling mechanism in small-scale agriculturist economies would distribute surplus through consumption and prevent any accumulation. In the medium-scale economies of feudalism (including caste India and Mandarinate China) there was some accumulation in production, but also the use of surpluses to build monuments and fight wars.

It is only with capitalist production that we come to sustained accumulation. As Marx put it, "Accumulate! Accumulate! That is Moses and the Prophets" (Marx, 1958: 595). Accumulation itself is made possible by the capture of surpluses through the capital-wage labour relationship, and driven by competition among firms that strive to secure competitive advantage. Economies of scale in production, combined with compound interest through accumulation, turn the generation of inequality into a non-linear process, currently exemplified by the spectacular share values of platform firms such as Amazon and Alibaba, and the wealth of their main shareholders. The world has moved from small- and medium-scale to large- and now hyper-scale enterprises. Operating on hyper-scale, such as with Facebook's two million members, and sucking up even a few cents per transaction amounts to billions of dollars every month. The hyper-scale of global enterprises has been accompanied by extremes of inequality.

The actually existing extent of inequality, however, depends on the political-economy factors at play at any time, which can even change, from time to time, within the same economic formation. How this political economy could work out is seen below in the specific context of the knowledge developed to deal with the HIV-AIDS pandemic.

Political economy of knowledge economies

The next point in this exploration is to look at the political economy of different knowledge economies. This is important for understanding how knowledge economies are set up and how they might change.

There are two key concepts in political economy analysis: that of rents, or the deals space, as Lant Pritchett, Kunal Sen and Eric Werker (2018) call it, and the political settlement, which is about how to utilise the rents. The deals space would be related to the inequality possibility frontier. The extent of productivity of the economy, or of the intervention being considered, would determine the deals space. However, there is a need to treat the political settlement as not just one between sections of elites, such as between landlords and capitalists in the repeal of the corn import duty in mid-nineteenth England. In electoral systems in particular, it is necessary to bring non-elite actors into the analysis. In an electoral system, voters play a crucial role in influencing the political settlement. In international matters, ethics-based organisations can also play a role in modifying a political settlement or even in arriving at a very different political settlement. The resulting political settlement, which would include elites and non-elites, would be part of what can be more broadly called the social contract.

One can look at the political economy of knowledge in the case of drugs, especially that of anti-retrovirals (ARVs) used in the treatment of AIDS. The manner in which knowledge-based monopolies operated during the AIDS pandemic became an issue of international politics. As mentioned earlier, the US knowledge economy relied on basic research on new drugs carried out by the public sector National Institutes of Health, and then the resulting patents were licensed to the pharmaceutical majors, who would commercialise and market the drugs. In the case of ARVs to treat AIDS, in this publicly-funded but corporate monopoly knowledge economy, the cost of original treatment came to more than $10,000 per person per year. This was clearly something that put the drug out of reach for treatment in Africa, the epicentre of the AIDS pandemic, and also other countries of the global South.

At that point, when India only had process but not product patents, Indian pharmaceutical firms reverse-engineered the ARVs. They also carried out some innovations in reducing the cost of production (Athreye and Godfrey, 2009), and developing paediatric dosages and fixed-dose combinations (Waning et al., 2010). The Indian ARVs were sold at less than $150 per patient per year compared to the $10,000 per patient per year in the USA.

Under WTO rules, these generic ARVs could be sold within the country of production, India, but could not be exported. Being able to export the Indian-produced generic ARVs was crucial to saving lives in Africa and

elsewhere in the global South. The US and EU pharma majors blocked exports of Indian generic ARVs. The matter went to the WTO, which, in the Doha Declaration of 2005, allowed, on public health grounds, the export of generics for communicable diseases.

There are a couple of points to note about the political economy of knowledge-based monopolies and the WTO decision to allow world-wide exports of cheap generics, at least in the restricted case of communicable diseases. The first is the original political settlement, based on market-fundamentalist principles of allowing whatever price a monopoly producer could secure. Secondly, a coalition of emerging countries and generic producers in the global South, in alliance with ethics-based civil society organisations, was able to change the pharmaceutical knowledge economy to allow the production and export of generics.

What this episode demonstrates is that the interaction of the knowledge economy with broader social processes can result in various outcomes. There is not just one fixed outcome in this interaction. There is a variability of outcomes in the interaction between knowledge economies and the economic and social processes, giving scope for agency in determining the actual outcome.

Conclusion

In this paper, we see that knowledge or the technology based on knowledge can be turned into a monopoly and that this is a factor creating or exacerbating inequality. This knowledge-based inequality is not something new, only developing with what James Boyle (2003) named the ongoing "Second Enclosure Movement". It existed even in pre-state, small-scale, agriculturist indigenous societies. A knowledge-based division of labour is the production basis of India's caste system, where it is combined with social valuations that give unequal returns for different types of knowledge. In the capitalist system, there is also a long history of knowledge-based monopolies earning much higher profit rates than firms using non-monopolised knowledge.

Although forms of monopolisation of knowledge have existed in this broad range of economies from small-scale subsistence to large-scale accumulative economies (and everything in between, including European feudalism, the Hindu caste system and the Chinese Mandarinate), the impact of knowledge monopolies on inequality is quite different. Productivity, scale and the production motive, from providing subsistence to accumulation, all make a difference to inequality. The political economy alliance existing at any time would then create the actually existing inequality.

What is set out in this note is, in a sense, a research programme for looking into the nature and role of knowledge-based monopolies and the creation of inequalities in different social formations. Such a research programme would link the process of the creation of knowledge monopolies and ways of protecting the boundaries created by the monopolies with the social valuations that provide differential returns to monopolised and non-monopolised knowledge or to different types of knowledge economies and their articulation with inequality regimes in different socio-economic formations. This approach could be used to study both inter-country and within-country inequalities. It could also be used to study a specific inequality, such as that of gender inequality, relating women's exclusion from acquiring or using forms of knowledge to the inequalities created by knowledge in interaction with other factors, such as gender roles. The analysis would draw attention to ways of dealing with inequality, not only in terms of ex-post-policy for income and wealth inequality, but also with ways of modifying the functioning of the knowledge economy itself.

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[i] Thanks to Sanjay Bosu-Mullick for discussion on these issues.

[ii] In an email exchange in 2018, Gerry Rodgers had asked whether, in my analysis in Nathan (2018), knowledge had replaced gun-boat diplomacy as the base of imperialism. To this I had replied that unequal knowledge was the base of gunboat diplomacy. The military revolution analysis pushes this unequal development of military knowledge to the early modern period, from the fifteenth to the seventeenth century.

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