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Digital Socialism?

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The Calculation Debate in the Age of Big Data

More than a decade after the onset of the financial crisis, capitalist ideologues are eager for good publicity. Once-alluring promises of meritocracy and social mobility ring increasingly hollow. They pine for a slicker, PowerPoint-friendly legitimation narrative—hard to concoct against a background of rising inequality, pervasive tax evasion and troubling omens about the true state of the post-crash global economy, were central bankers to withdraw their overextended support. What real-world developments could underpin such a narrative? What theme could make the idea of capitalism more morally acceptable to the latest batch of Ivy League graduates, who may risk getting drawn to notions like eco-socialism? Despite the growing 'tech-lash' against the faangs, capitalist thinkers still look to Silicon Valley and its culture with a glimmer of hope. For all its problems, the Valley remains a powerful laboratory of new—perhaps, better—market solutions. No other sector occupies such a prominent role on the horizon of the Western capitalist imaginary or offers such a promising field for regenerative mythologies.

A new strand of thinking has begun to address how the global economy might be re-engineered around the latest digital innovations to introduce a modicum of fairness. The 'New Deal on Data'—the term surfaced in a 2009 paper presented at Davos—is the tech world's neoliberal equivalent of the Green New Deal, but requires no government spending.[1] It envisages formalizing property rights around intangibles, so that individuals can 'own' the data they produce. One advantage for its proponents is that this market-friendly 'new deal' could help to forestall alternative attempts at imagining users as anything other than passive consumers of digital technology; they could enjoy their new status as hustling data entrepreneurs, but should aspire to little else. The New Deal on Data has accumulated considerable political support: from the European Commission to the United Nations, many world institutions are convinced that some such 'fairness' initiative is important to guarantee the future of digitalized capitalism.

The Austrian legal scholar and a one-time successful software entrepreneur Viktor Mayer-Schönberger bears some responsibility for planting the dream of 'salvation through data' in the capitalist imagination. His best-selling *Big Data* (2013), the ur-text on the subject, co-authored with an *Economist* writer, had a straightforward thesis: the massive amounts of data now being harvested and analysed by a few far-sighted firms would produce new business models and destroy existing ones; disruption was imminent, profits assured.[2] Five years later, Mayer-Schönberger's latest book, *Reinventing Capitalism in the Age of Big Data*, shares some features with that earlier work. Co-written with another *Economist* contributor, the German business reporter Thomas Ramge, it deploys clear and anecdote-friendly prose to

document another big trend—'as momentous as the Industrial Revolution'—while making pragmatic recommendations for businesses and policymakers. But *Reinventing Capitalism* has far greater ambition, as the book's original German title, *Das Digital*, suggests. *Das Kapital*, they argue, is out of date: once it is efficiently utilized throughout the economy, Big Data will not just reinvent capitalism—the English title is too modest on this point—but end it. 'It may be time to close the door on history and officially eliminate the term "capitalism"', they proclaim.[3] In place of finance capital and firms, data-rich markets will empower humans to work directly with each other. More dramatically, data will supplant the price system as the economy's chief organizing principle.

The price system makes an odd target for what is unmistakably a pro-capitalist book. Market pricing has long been lauded for its ability to enable complex forms of social coordination with little or no central planning. From the 1920s, in what would later be known as the Socialist Calculation Debate, Mises and Hayek had famously argued against their left-wing adversaries that it was the absence of the price system that doomed socialist central planning. Lacking real-time insights into the shifting tastes of consumers, most advantageous deployments of resources and fluctuating supplies of intermediate commodities, central planners stood little chance of adjusting their models fast enough to keep up with the rapidly changing world. Many socialists, especially in the wake of the Soviet collapse, found this argument persuasive, conceding an inherent technological flaw in socialist design. As G. A. Cohen put it in his last book, 'the principal problem that faces the socialist ideal is that we do not know how to design the machinery that would make it run.'[4]

Recent counter-arguments from the left have generally involved pointing out that the most successful modern capitalist enterprises, from Amazon to Walmart, excel at planning; the advent of digital feedback will make such techniques even more widespread. If capitalists can plan, why can't socialists?[5] The opposite argument—that Big Data clogs the operation of the price system—has also been made: some observers go so far as to claim that the price signals of today's data-saturated markets, where venture capitalists, sovereign-wealth funds and deep-pocketed tech platforms subsidize services to the point where no one really knows what they cost, resemble those of the Soviet system in the years before its final breakdown.[6] Hence the moniker 'Gosplan 2.0'. (In its structure, this argument is not dissimilar to the charges of Austrian economists against the distorting effects of quantitative easing on asset prices.)

In what follows, I will revisit—and, I hope, revitalize—the Socialist Calculation Debate, exploring some of the ways in which the participants conceived the relations between knowledge, price and social coordination, and how their referents may have changed in the age of big data. I will go on to suggest ways in which the development of digital 'feedback infrastructure' offers opportunities for the left to propose better processes of discovery, better solutions for the hyper-complexity of social organization in fast-changing environments, and better matches of production and consumption than Hayek's solution—market competition and the price system—could provide. But first, it's worth dissecting the theses of *Reinventing Capitalism* in more detail, for their very inadequacies are often symptomatic—and therefore illuminating.

1. reinventing capitalism—really?

While the price mechanism has been an effective means of social coordination, Mayer-Schönberger and Ramge argue, it has always had its shortcomings. Digital technology has not only rendered these visible, it has also provided a more efficient alternative method of social coordination. For the price system is a blunt instrument, the authors contend. It compresses the complex, multidimensional preferences of market participants into a single number, often eliminating nuance and detail, which can result in sub-optimal transactions. Consumers

become easy prey to cunning marketers, who manipulate them into buying things they do not need simply because the price, ending in nines, looks as if the product has been discounted. But advances in data and information technology can eliminate these inefficiencies. *Reinventing Capitalism* calls for 'a reboot of the market', fuelled by data. There is no longer any need to compress a myriad of heterogeneous facts into the straitjacket of prices, when computer chips can communicate those facts directly. Market players will increasingly rely on data, not prices, to coordinate their activities, discovering new, previously invisible niches and boosting overall market efficiency.

The authors sketch out the landscape of a data-rich consumerist utopia. The advantage of digital markets over analogue ones is that they allow both sides of a transaction to specify numerous match-making criteria that go far beyond price. BlaBlaCar, for example, the French ride-sharing company, allows passengers to specify the chattiness of their ride—hard to squeeze that information into a price. Recent technological developments that reduce the cost of extracting and categorizing data from complex files like videos have enabled buyers and sellers to find each other more easily. Matching algorithms can now crunch large amounts of data using finely detailed criteria. Machine-learning systems can infer our preferences through observation and correlation, without our having to list them. *Reinventing Capitalism* foresees new applications that will scan our entire data profiles in real time and apply machine intelligence to recommend bespoke merchants, products and services:

Suppose, for instance, you are looking for a new frying pan. An adaptive system, residing perhaps on your smartphone, accesses your past shopping data to gather that you bought a pan for induction cooktops last time, and also that you left a so-so review of it. Parsing the review, the system understands that the pan's coating really matters to you, and that you favour a ceramic one . . . Equipped with these preferences, it then looks at online markets for optimal matches, even factoring in the carbon footprint of the delivery (because it knows how worried you are about that). It negotiates automatically with sellers, and because you are ready to pay by direct transfer it is able to get a discount. With a single tap, your transaction is complete.[7]

Thanks to data-driven credit systems, capitalism's perennial problem of under-consumption will be a thing of the past. If the economy tanks, an 'adaptive system' will be able to obtain a loan for you and buy what you want, assuring investors that consumers have not lost confidence. Beyond this, data-rich markets will benefit consumers by eliminating inefficiencies in, for example, energy markets, where utilities currently pocket hefty fees by exploiting information asymmetries between themselves and their customers.

From finance to data?

Reinventing Capitalism admits that the current monopoly ownership of the 'feedback data' generated in transactions between matchmaking platforms and their customers is an obstacle to the 'momentous transformation' in democratic consumerism that Big Data should bring. The information remains in the hands of just a few big companies, even though it has immense value to other economic players. The authors propose to solve the problem by another variation of the 'New Deal on Data': tech firms should be forced by law to share (some) feedback data with other startups and public actors. 'A progressive data-sharing mandate', they write, 'would ensure a comprehensive but differentiated access to feedback data and would maintain choice and diversity in decision assistance.'[8] This idea was well-received in Mayer-Schönberger's native Austria, where the right-wing övp–fpö government made it one of their signature proposals during Austria's 2018 presidency of the European Council.[9]

As for the elimination of 'capitalism', this turns out to refer mainly to the activities of consumer-facing financial institutions, which the authors claim will be disrupted by data-rich

startups. Wall Street needn't tremble. Indeed, *Reinventing Capitalism* has remarkably little to say about the dynamics of actually existing capitalism, preferring to depict it as a mere aggregation of activities pursued by 'financial capitalists'—that is, institutions like old-school banks which thrive on money, not data. The newer, nimbler institutions are presumed to operate differently; their activities are subsumed under 'data capitalism'. The authors claim that 'as markets turn data-rich, there is less need to signal with money'—and, when money no longer 'plays first violin', banks and other financial intermediaries will need to refocus their business models, bringing about a shift 'from finance to data capitalism'. Indeed:

With the market economy advancing with the help of data, we may no longer label the future 'capitalist' in the sense of power concentrated by the holders of money. Ironically perhaps, as data-driven markets devalue the role of money, they prove Karl Marx wrong, not Adam Smith.[10]

Capitalism, on this reading, is merely a list of what capitalists do. There is scant sense in this analysis of capitalism as a system, with a history, a present and a perceptible logic—of competition—that imposes significant constraints on its future paths.

Reinventing Capitalism is one of several recent books that purport to read the massive changes unleashed by the rise of new, data-intensive business models against the broader analytical background of contemporary capitalism. Shoshana Zuboff's *The Age of Surveillance Capitalism* may be the most prominent example; another is *World After Capital,* self-published online by German-American venture capitalist Albert Wenger (cited quite favourably by Mayer-Schönberger and Ramge).[11] Lacking a robust, theoretically and historically grounded conception of capitalism, these texts follow the same narrative trajectory: the authors begin by choosing some prior stage—'financial capitalism' for Mayer-Schönberger and Ramge, 'advocacy capitalism' for Zuboff, 'industrial age' capitalism for Wenger—and then proceed to roll out the *deus ex machina* of information technology, Big Data, machine learning, or even (in Wenger's case) 'the universality of computation at zero marginal cost'. All three conclude that the current stage of capitalism—'data capitalism' (Mayer-Schönberger and Ramge), 'surveillance capitalism' (Zuboff), 'Knowledge Age' post-capitalism (Wenger)—is a stark departure from the previous one, and that drastic changes in information technology explain the transition. They turn to recent history only very selectively, mostly to bolster their presentist two-stage schema. The analytical and political consequences vary. Zuboff has little positive to say about the age of 'surveillance capitalism', whereas *Reinventing Capitalism* concludes with an almost religious reading of the therapeutic power of data and information, which will heal the ills of contemporary capitalism and restore market efficiency.

FinTech and capitalist competition

Whether this fable of data-rich consumerism will prove effective as a legitimating ideology remains to be seen. Analytically, however, it is extremely weak, which forces the authors to misrepresent the positions of their mooted adversaries. Thus *Reinventing Capitalism* claims Marx held that money rules the world; now that data rules the world, their reasoning goes, Marxist analyses no longer apply. Marx, of course, argued nothing of the kind. Quite to the contrary, he believed that the imperative of capital accumulation in the face of constant competition was the key, not money as such. Money was an unavoidable stage in the process of accumulation: it never 'played first violin'; capital did. For Marx, capital accumulation was unthinkable without commodity production. Even accounting for the novelties of today's global capitalism, where complex financial products seem to have lost their referent in the real economy, one would be hard-pressed to conclude that the proliferation of data-intensive

digital commodities and services fundamentally alters the terms and dynamics of capital accumulation.

To prove Marx wrong, *Reinventing Capitalism* would need to show that the world of data capitalism and 'FinTech' startups—tech-based financial services; for instance, digital-only loan originators that use personal data to determine creditworthiness—is not subject to the same pressures as the traditional financial sector it supposedly displaces. The authors make no such attempt, and it's not hard to see why: there are few developments in the FinTech world that cannot be explained by the imperatives of capitalist competition, as even a cursory examination of the relation between the two sectors confirms. The big banks—heavyweight ambassadors of supposedly outdated finance capitalism—are spending large sums on tech: Citigroup's tech budget was $8 billion in 2019; Wells Fargo's, $9 billion; Bank of America's, $10 billion; jp Morgan's topped out at $11 billion. These are impressive figures, on a par with the tech giants themselves. Indeed, the top ten us spenders on technology last year were banks and tech firms, with the addition of Walmart.[12] jp Morgan has launched a well-staffed ai team in New York and a 1,000-person FinTech campus in California, suggesting it's on the cutting-edge of innovation. Palo Alto now also hosts BlackRock Lab for Artificial Intelligence.

A closer analysis, however, reveals that the lion's share of the banks' tech-related expenditure goes into maintaining legacy systems, rather than genuine research and development. After multiple mergers and system migrations, their existing hardware and software packages have become prohibitively expensive, prompting further mergers to reduce tech investment costs. This was a major factor in the recent $66 billion tie-up between SunTrust and bb&t, which according to Citigroup's ceo was 'predominantly driven by the need for scale around the ability to invest in and implement technology'. Citigroup, by contrast, already had that scale.[13] Predictably, a recent study of tech spending shows that bigger banks not only invest more than their smaller rivals, but also tend to spend more on advanced technology, as opposed to maintenance—due not least to their scale and greater reserves of free cash.[14] Nothing in this landscape, save for the technologies themselves, would look foreign or strange to Marx.

Consider, too, the business dynamics of the FinTech world. According to one estimate, FinTech investment in 2018 grazed a record-breaking $112 billion.[15] It's not hard to guess why: the sector promises profits that might one day be as astronomical as those of traditional banks—jp Morgan posted net profits of $32.5 billion in 2018, still slightly higher than Alphabet's $31 billion—but at considerably lower costs, as there will be no need to pay for the integration and maintenance of outdated tech systems. Overall profitability rates should therefore skyrocket. While *Reinventing Capitalism* recognizes the importance for the FinTech sector of not carrying high legacy costs, the authors mistakenly attribute it to the unique stage of 'data capitalism'. But invasions by newcomers armed with swifter and cheaper technologies have been a regular feature of capitalist competition, with cloud computing and data infrastructure being what one strand of Marxist economics would recognize as the 'regulating capital' of this particular industry.

Not surprisingly—and fully in line with Marx's own theory of market competition—the incumbent firms do their best to defend themselves against such assaults, often by buying up the younger challengers. jp Morgan's 2017 acquisition of WePay, a leader in digital payments, was exactly what a firm of its size would be expected to do in these circumstances. Today's FinTech disrupters will themselves be challenged in the not-too-distant future by the arrival of even more efficient techniques of production and their weaponization by the next generation of startups. At that point, Mayer-Schönberger and Ramge will probably have to invent yet a third stage—a post-data capitalism of some kind.

Why do all this, when the existing concept of capitalism, in all its analytical richness, already allows for such transitions? Perhaps because to operate with that concept would mean conceiving of capital as a system and as a social relation—and not just a stock of physical and immaterial goods available for production, as neoclassical economists tend to imagine it. Given the unwillingness of Mayer-Schönberger and his ilk to do so, even against a background of growing anxieties about the direction of the capitalist system, we are likely to see further flurries of books that are nominally about the future of capitalism, but offer, at best, depictions of observed regularities in how capitalist firms expand their stocks of capital to include data. The future behaviour of these firms, we are invited to believe, amounts to nothing less than the future of capitalism itself. If this is somewhat better than the fairytales of perfect competition and market equilibrium spun by neoclassical economists, the practical and political use of such insights is minimal, as they ignore the fundamental drivers that shape the behaviour of even those individual capitalist firms that their theories purport to explain.

Reinventing Capitalism's first major dichotomy—'data versus money'—appears untenable. But what about its second dichotomy, between prices and information? Here the evaluation is a bit trickier, and will require an excursus through classical and neoclassical economics, with their contrasting ideas of information, prices and competition—and in particular, an attentive reading of Hayek. *Reinventing Capitalism* is very light on economic theory, and it's never quite clear just which framework—classical, neoclassical, Austrian?—informs the authors' insistence on the obsolescence of price and the ascendance of data. One can, nonetheless, try to deduce it.

2. information and the price system

The neoclassical framework makes some rather dubious assumptions about prices and information—a consequence of its surreal view of competition. A perfectly competitive market, free from any barriers to entry, is presumed to be divided between price-taking sellers and buyers, all of whom possess perfect knowledge. 'Competition', on this reading, is not a process unfolding over time but merely a descriptive label or a snapshot, used to designate an existing equilibrium. Under perfect competition, additional information cannot play any role in market exchange because everything knowable is already known—market players possess perfect knowledge. Prices, in this framework, suffice, even though they remain something of a mystery—the product of the exotic process of *tâtonnement*, or trial and error, which establishes a match between supply and demand (originally introduced into economic theory by Léon Walras in the 1870s).

The neoclassicals have long conceded that competition can be imperfect: barriers to market entry, for example, or the emergence of monopoly firms, might render competition 'imperfect', though these complications will not give the neoclassical notion of 'competition' any more dynamism. There can also be deficiencies related to information flows. Over the last fifty years this insight has spawned an entire field, known as 'information economics', which studies how various asymmetries of information—that between sellers and buyers of used cars being the most famous example—undermine market efficiency. Once those asymmetries are resolved, through public policy or private contracting, the existing inefficiencies should fade away, bringing competition closer to its 'perfect' equilibrium condition.

How are information and prices related under 'imperfect competition'? Sellers might know more than they let on about the condition of a used car (a 'lemon', in car-dealer parlance); it's because they withhold this information that the market price can be as high as it is. For most economists, the problem is markets that are data-poor, not data-rich. The authors of *Reinventing Capitalism*, on the other hand, find the novel, data-rich dimension of market transactions to be a permanent feature of all economic exchange; such data bonanza does not

emerge *only* in imperfect conditions. Rather, it is present in the course of everyday transactions where no information asymmetries are said to be present. But if, in the absence of any imperfections, the price of a commodity does not fully reflect its utility to a group of eccentric consumers, the pull of market forces should, in theory, bring it to the right level.

To argue for the existence of an entirely new dimension of market exchange, previously unrecognized by neoclassical economic theory, requires a radical departure from some of its fundamental but limiting assumptions. This would seem to leave the authors with just one place to go—a theory of competition which neither assumes perfect knowledge nor obsesses about equilibria. This, of course, is the classical theory of competition familiar to Smith, Ricardo and Marx, and recently revised and updated by Anwar Shaikh in *Capitalism: Competition, Conflict, Crises*.[16] Hayek, as it happens, subscribed to many of the postulates of this theory. In his last decades, he even used it to elevate competition to a universal governing device through which new knowledge—such as the latest consumer tastes or production techniques—gets 'discovered'. Before this political turn, though, Hayek wrote many pages, most of them during the Socialist Calculation Debate, exploring the exact nature of the relationship between prices and information. Most of his socialist opponents in Vienna were firmly in the neoclassical camp. If Marxism, as they believed, furnished capitalists with the theoretical apparatus for grasping the existing dynamics of capitalism, then neoclassical economics, with its penchant for rational mathematical analysis, would provide social democrats with the intellectual resources for engineering the future dynamics of socialism.[17] Hayek's disagreement with his socialist counterparts was thus not just ideological but also methodological; on matters of competition, his views, shaped by the classical tradition, were closer to those of Marx than those of, say, Oskar Lange.

In *Reinventing Capitalism*, Hayek features as the poster child of economists' obsession with the price system as an efficient conveyor of information. A cursory reading of Hayek's famous 1945 essay, 'The Use of Knowledge in Society', might suggest as much. In arguing that the price system allows disparate economic actors to coordinate their activity, wasn't he singing a paean to the superiority of the price system over central planning? 'Hayek's deep appreciation for price rests on the fact that, as transaction partners negotiate, they have to take into account all the information they have at hand, including their priorities and preferences, and condense them down to a single figure', claim Mayer-Schönberger and Ramge. It's against these presumed views of Hayek that they mount their own argument that technology can now furnish more information than prices, because it's no longer necessary to condense information—one can just use it.

Non-price knowledge

How accurate is their description of Hayek's views? First of all, the idea that prices are set in an orderly dialogue between two transacting partners—and not as a result of myriad market forces and considerations—is the Walrasian heresy that Hayek would never have endorsed. Second, *Reinventing Capitalism* repeats the error of many neoclassical economists in response to Hayek's 1945 essay, in failing to see that his dynamic view of competition is not the same as their static version. Hayek's conception allows for the practices and institutions that shape the competitive battle *before* a sale is made and the associated price recorded. Neoclassicals often assume that, for Hayek, the price system is the only place where information can reside: it's there—or it's nowhere. This gets Hayek wrong twice: first, in treating the price system as merely the 'conveyor' of information, and, second, in assuming that it's the only such conveyor in the capitalist system. Both are common misinterpretations that arise from a highly selective reading of Hayek's oeuvre, in most cases limited to 'The Use of Knowledge', and ignoring everything else he wrote on competition.

Does the price system 'convey' knowledge? Not really. A more fitting title for Hayek's famous essay would be 'The Non-Use of Knowledge in Society', for he insists that the price system works so well precisely because economic actors do not need to know much about the world to act effectively in it.[18] Prices do not convey knowledge, at least not from one end of the market to the other. Nor do they have to: as long as one economic actor discovers a set of facts that changes their evaluation of a commodity, the effects of that revaluation propagate throughout the system—driving the commodity's price up or down—without anyone else needing to know what the new facts actually are. If the price system conveys anything, it's the current positions—many of them based on erroneous perceptions of the present and the future—of all economic actors with regard to one another: it's like an aerial snapshot of an ongoing military battle. It's trivially true to state that this snapshot contains and communicates 'knowledge', but that 'knowledge' is certainly not a total sum, to be disaggregated and rearranged at will, of the individual 'knowledges' of those partaking in the battle.

Such an elegant and information-light arrangement as the price mechanism can only work because much of the actual complexity of competition is handled and reduced elsewhere in the economic system. First, it relies on the broader norms, customs and rules of capitalism, long internalized by market participants—for example, the understanding that cost-cutting is an important tactic for surviving in a competitive market. This narrows the scope of potential responses and smoothes social coordination: as long as the quest for profitability remains the overarching objective of the entire system, everyone knows what to expect. Of course, if this condition does not apply, the price system immediately loses its coordinating magic, for changes in price become illegible—much as the aerial snapshot of the battlefield becomes unintelligible if one side suddenly professes pacifism. The price system can accomplish so much with so little precisely because economic actors do not need to reach for a manual or consult their therapist to know what to do when prices change. When Austrian economists respond to today's defenders of central planning by noting that any non-capitalist system—even one rooted in the power of Big Data—could only beat the efficiency of the price system if it also created new behavioural modes and frameworks of meaning, they have a point.

Second, in addition to the price system, capitalist society also has systems for communicating broader non-price knowledge, which shape the dynamics of competition *before* market exchange takes place. Hayek pointed to the role of advertising and the press, as well as more informal mechanisms. 'Competition', he wrote, 'is in a large measure competition for reputation or goodwill'—it is 'essentially a process of the formation of opinion: by spreading information, it creates that unity and coherence of the economic system which we presuppose when we think of it as one market.'[19] The knowledge system—this secondary channel of communication—is what ensures social coordination even when our familiarity with the actual commodities is scarce or non-existent. If this sounds like the 'data-rich' dimension of markets 'discovered' by the authors of *Reinventing Capitalism*, it's because it is: the existence of the knowledge system could only be a surprise to neoclassical economists who build their models by ignoring the crucial stage of economic activity where such 'data-richness' is of paramount importance. Read from a Hayekian perspective, the digital economy simply formalizes and improves earlier processes of opinion formation, making the reputations of market participants easier to update in real time, or simply alerting customers, via a notification on their phone, to the launch of a new taxi service where the driver would be happy to whistle the client's favourite tune.

To argue that there's a choice to be made between the price system and the knowledge system—or that the latter, in the form of Big Data, is now supplanting the former—is to fundamentally misunderstand Hayek's view of how the capitalist system works. That prices

have informational meaning for market participants—meaning which is itself contingent upon them internalizing the basic laws of capitalism—doesn't stop them acquiring other forms of information, prior to the moment of exchange, during the crucial phase of 'real competition'. Like the neoclassical economists, the authors of *Reinventing Capitalism* eliminate this prior stage from their conception of exchange. They therefore claim that prices must condense all the information to hand—which, of course, they cannot. The book's entire premise is the logical consequence of trying to fit Hayek's dynamic view of competition into a static neoclassical framework—and, on discovering that it doesn't fit, postulating that we need another, information-friendly term for 'capitalism'.

From socialist planners to market technocrats

Hayek's 1945 essay had a profound effect on the development of modern economics.[20] Until its appearance, the Socialist Calculation Debate was widely believed to have been won by the socialist opponents of Mises and Hayek—Oskar Lange chief among them—who advocated a mixed approach, whereby individual factory managers would be allowed to find the 'right' price to charge for their products via trial-and-error learning through the market, while the Central Planning Board would set the prices of inputs. In fact, Mises and Hayek had not really altered their arguments over the course of the debate. But their social-democratic opponents, wedded as they were to neoclassical economics, initially took their case to be about the difficulty of *computing* the appropriate price levels, based on the given data—and not about the challenge of *gathering* and *updating* the data, which is never automatically 'given'. Mises and Hayek, with varying degrees of clarity and emphasis, had been emphasizing this all along, but it took Hayek's essay to drive the point home.

Nevertheless, neoclassical economists still misconstrued Hayek's essay. Their theoretical preconceptions of perfect competition led them to conclude that Hayek merely meant that the price system could gather and process the data needed to operate an economy much more effectively than one based on central planning.[21] But for Hayek, it was not just a matter of how well or efficiently each system could collect the same data. There was no equivalence between the data processed by the two systems: the price system worked so efficiently only because capitalism did the rest. Such misinterpretations of Hayek, frequent among social-democratic neoclassical economists in the postwar period, aimed to formalize his insights about the informational role of the price system within the neoclassical framework. These formalizations eventually allowed the successors to Oskar Lange and Abba Lerner to show that the price system was only as efficient as Hayek had claimed under very specific conditions.

The task of these progressive planners, now comfortably embedded in Cold War academic institutions, thus shifted from the earlier bold objective of designing non-market environments to the more pragmatic task of redesigning market environments in order to make them more efficient. Planners would no longer be busy setting input prices or output quotas, as earlier generations of socialist economists might have advocated; instead, they would be drawing upon advanced mathematical techniques and game theory to act upon the newly discovered informational dimensions of economic activity so as to bring about the optimum conditions. If, for example, some market players had good reasons to hide their true preferences, preventing a possible market transaction from happening, what kind of advanced institution—an auction, perhaps—could be designed in order to reveal them?

Such insights about the informational malleability of markets gave rise to completely new research agendas with names like 'mechanism design' and 'market design'. What did any of this have to do with socialism? Very little: all that was left from the earlier radicalism was the figure of the planner, who, without any real planning to do, was now reborn as the

technocratic economist who could build markets on demand. While Hayek, in his earliest contribution to the Socialist Calculation Debate, drew an explicit distinction between the economist—the protagonist of a market economy—and the engineer—the protagonist of a centrally planned one—the post-Hayekian consensus in neoclassical economics has yielded an odd blend of the two.[22] And as the world has become increasingly digitized, building new markets, as well as fixing existing ones, has gotten easier and cheaper: acting upon the informational dimensions of market exchange can now be done remotely, by means of digital platforms.

Reinventing Capitalism belongs squarely in this intellectual tradition of 'market design'—a fact the authors vaguely acknowledge by situating their argument in relation to the work of the Stanford economist Alvin Roth, the Nobel Prize-winning practitioner of 'market design'. His short, non-academic book on the subject, *Who Gets What—and Why* (2015), has further helped to popularize the field. Read carefully, it provides useful hints about where digitally-mediated market designers are likely to take us.[23] Celebrating 'the growing ability of economists to be engineers', Roth, too, fashions himself as a disciple of Hayek, claiming that the Austrian economist 'understood that there is a place for economists to help in understanding how to design markets'. But why bother designing them at all? Because, argues Roth, in real life all sorts of unexpected factors might derail the Walrasian process of *tâtonnement*: some market participants might arrive too early and leave before a match is found; too many might arrive at once, causing market 'congestion'; some might be afraid to share their true preferences; some might be prevented from using the price system to settle transactions—for example in organ exchanges, which do not allow for sales.

Effective markets are 'thick' (they feature many participants) and well-structured (they resolve potential conflicts due to time mismatches, concerns about security or 'incentive incompatibility' between different participants). The task of the economist-cum-engineer is to observe markets' actual rules of operation and then 'to intervene in them, redesign them, fix them when they're broken, and start new ones where they will be useful'. The earlier assumption—still present in Leonid Hurwicz's writings in the 1970s—that specific conditions might call for the design of non-market forms, is long gone; unsurprisingly, given the kinds of commercial settings where most market design actually happens. As one prominent member of the neoliberal establishment put it in a review of Roth's book: 'Many of the world's future market designers will work in Silicon Valley startups rather than academia.'[24]

Market modalities: law and competition

Market design entails a choice of modalities to underwrite transactions. An example cited by Roth in *Who Gets What* hinges on the author's frustration with a rogue merchant who fails to deliver a piece of furniture, prompting him to take legal action. He quickly discovers he was not alone in his complaint against the merchant, whose bad reputation had somehow failed to spread through the local market. Where a more traditional economist might have been moved to reflect on the vagaries of the contract system, the economist-engineer Roth uses it to argue that digital platforms now allow customers to rank individual merchants, formalizing their reputation and making it visible to everyone, thus reducing the risks involved in market exchange. In fact, though Roth doesn't explore this, in the digital era there is now a clear choice of modalities: one can go down the legal route, and strengthen the rights of buyers—by proscribing transgressive behaviours on the part of sellers—or one can go down the avenue of information, reputation and feedback mechanisms, allowing earlier buyers to punish such transgressions retroactively.

Indeed, the problematic of *Reinventing Capitalism*, originally constructed along the price-information axis, also pivots around the axis of law-market. It is not that price is losing

ground to information; rather, solutions to social problems that are based on the logic of the law—and so on collective frameworks, subject to democratic revision—are losing ground to solutions based on the logic of the market, tailored to the atomized figure of the consumer. Uber, whose existence depends on the cross-pollination of numerous feedback mechanisms, is a case in point. One can argue that its model—with drivers and passengers rating each other, and the price of a journey reacting in real time to changes in demand—is precisely an example of prices giving way to information: Uber's ability to gather and deploy data about peripheral aspects of transactions, as well as about the broader market conditions in which they occur, undermines the centrality of the price mechanism. But this is to miss the reason why the pre-Uber model of regulated taxis did not incorporate even the feedback that could have been gathered within earlier technological possibilities. The rigidity of taxi fares was not a consequence of flawed assumptions about price and information, but a reflection of the legal conditions imposed on the cab owners: what they knew about passengers or changing market conditions was irrelevant, as they were legally compelled to offer the same service, at the same rates, to everyone. Solidarity for citizens, yes—but, from the perspective of startups, those were times of extreme information poverty.

Compared to a system powered by feedback and algorithms, this seemingly archaic, law-based system—which assumes, and guarantees, that passengers have rights—is clearly a drain on service providers' profits. The shift to 'governing by numbers', as Alain Supiot describes it, reverses that drain and might even increase market efficiency.[25] But this is achieved at the cost of eliminating certain rights—and, along with them, an entire mode of thinking about social coordination in terms of solidarity-based institutions like the law. Though this is rarely mentioned in mainstream discussions, different modes of social coordination have different political valences. A system that reduces complexity by making the law explicit, thereby shifting the burden of adapting to it onto suppliers—as with safety standards for medicines, for instance—leaves consumers anxiety-free. Compare this to a system that reduces complexity by using the implicit, unstated laws of capitalist competition to induce both producers and consumers to adjust their behaviour: whatever their differences in efficiency, the former system has the advantage of not secretly disciplining the consumers.

What has been done to passengers (and drivers) is now being extended to other domains. The field known as 'algorithmic regulation'—or 'Regulation 2.0'—studies how to apply Uber-style feedback mechanisms to a wide range of social activities.[26] Sidewalk Labs, a unit of Alphabet working on 'fixing' cities, has suggested using them for zoning: why should city councils impose restrictions on what can be built, rather than simply letting capitalist developers experiment as they will with the local real-estate market, and interfere only if the feedback—of neighbours complaining about noise, for instance—exceeds some negative threshold?

3. modes of social coordination

One indisputable contribution of *Reinventing Capitalism* is its identification of 'feedback data' as a site of future political battles. However, we need to widen the scope of the concept and consider 'feedback infrastructure' itself: the ownership and operation of the means of producing 'feedback data' are at least as important as the question of who owns the data itself. The crucial battles ahead will involve the role of this 'feedback infrastructure' in the reinvention of the political projects of both left and right.

Neoliberal feedback

For neoliberals, the new 'feedback infrastructure' serves two broad objectives. First, it may help to fix problems that clog existing markets, saddling them with inefficiency. Second, it may serve to stave off or block unwanted solutions to emerging social problems, in particular

solutions that are not, as they say, 'market-conforming'. For Cass Sunstein, this would be accomplished by designing digital 'nudges' and other systems of behavioural intervention that will get users to behave 'rationally' and 'do the right thing'. This is still a tough sell to some neoliberals, though, especially when the 'nudging' is conducted under the auspices of government departments.[27] More acceptably, a feedback programme would be accomplished, Alvin Roth-style, by designing markets where no viable markets were present before. The politics of the market-design approach are ambiguous. On the one hand, Roth's celebration of the engineer reeks of the very constructivist, rationalist, scientistic outlook—*l'esprit de géométrie*—that Hayek had fiercely opposed. On the other, a careful reading of Hayek in the context of Cold War ideological battles also reveals many instances in which he justifies constructivist interventions, especially in the name of 'planning for competition'.[28] Indeed, there may be no other option. The crises besetting neoliberalism in its moment of global triumph have revealed that, without the help of their more engineering-inspired neoclassical foes, the Hayekians simply don't know how to run the world they have conquered.

It's one thing to preach the virtues of 'spontaneous order' to those in favour of central planning; but the active dismantling of existing forms of planned or law-based social coordination requires the ability to furnish alternative forms that would at least avoid complete anarchy and chaos (the privatized train system in the uk comes close). One can wait as long as one wants for 'spontaneous order' to emerge, but the public's tolerance of neoliberalism may simply wear out in the meantime. Politically, it's too risky a strategy: the neoliberal programme, implemented to the letter, would quickly lose its durability and, with it, whatever efficiency-based legitimacy it might have had. A little constructivism, it seems, can go a long way.

Feedback infrastructure and the left

What programmes might the left propose for 'feedback infrastructure'? The initial temptation might be to dismiss it as a digitized version of Hayekian spontaneous order—the hidden mechanics of neoliberalism, of no use to an alternative progressive project. In the view of Supiot's *Governance by Numbers*, with its almost ontological distinction between law and numerals, and its condemnation of both communism and capitalism for their inherent urge to quantify, the urgent task for the left is to defend the law—and the spirit of solidarity that informs it—against the assault of feedback-driven governance. The problem with this stance is that, even if its suspicion of quantification is justified, it has no obvious way to prevent the encroachment of neoliberal solutions into those areas where law has only a minor presence. That law is a form of social coordination seems incontrovertible, but should it be the only form in the arsenal of the left? As digital technologies—the unwitting purveyors of neoliberalization—envelop our everyday life, how resilient will the law prove against their political effects? Won't it, if successful, eventually create other problems, so that, instead of the neoliberalization of everyday life, we'll have to tackle its bureaucratization? And how to organize and coordinate production, once quantification is off-limits?

A more promising project for the left might be to find ways to deploy 'feedback infrastructure' for new, non-market forms of social coordination, thus challenging neoliberalism with the very tools it has helped to produce. One possibility points in the direction of China's highly controversial social-credit system, with its allocation of punishments and rewards for transgressing or respecting social and political norms. The system's excessively hierarchical mode of control renders it an unappealing prospect, however: making people's eligibility to receive services dependent on their behaviour in the public sphere might solve problems of social coordination at too high a price.[29]

There are, however, at least three other possibilities. The first, which we might, following Hayek's description of competition, call 'solidarity as a discovery procedure', has to do with detecting new needs and ways to satisfy them through non-market mechanisms. The second, which we might call 'designing non-markets', concerns social coordination in matters unrelated to production and consumption. The third, which we might call 'automated planning', focuses exclusively on coordination in the economic sphere.

1. Solidarity as discovery procedure

Recall that Hayek, at least in his last decades, saw competition as not just the driving force of market activity, but also as a mode of discovery. Through competition, consumers unearth new tastes and producers develop new techniques of production. Hayek's conception of competition as a heuristic process is striking; it may even be accurate. But whatever its merits, competition is not the only discovery procedure available to humankind. Can other 'techniques of ordering social affairs' yield similar benefits? Central planning, on Hayek's terms, is out as a mode of discovery, as few 'unknown unknowns' come to light in the course of its operation; in fact, they seem to proliferate, as the once frictionless adjustment to the changing environment encounters knowledge problems and the centralized bureaucracy develops its own social interests. But why assume that there are just two 'discovery procedures'—competition and central planning? This Manichean binary had a common-sense political basis during the Cold War, replicating the antagonism between capitalism and communism. Trapped in that framework, Hayek had little to say about the discovery potential of other social arrangements, apart from competition.[30]

What forms might these alternative discovery procedures take? Consider a process centred on social life and problem-solving, rather than on capitalist consumption, as in Hayek's theory. Social existence presents us with a plethora of problems to solve, some of them highly specific and only relevant to small groups of people, others of much wider importance. Digital 'feedback infrastructure' could be used to flag social problems and even to facilitate deliberation around them, by presenting different conceptual approaches to the issues involved. What counts as a 'problem' would also be open for debate: citizens could enlist allies and convince others of the virtues of their own readings of particular problems and proposed solutions to them. This framing would suggest that deliberation-based democratic procedures could themselves be modes of problem-solving and means of social coordination.

One could imagine the use of digital feedback infrastructure to match 'problem-finders', who would express their needs and problems, and react to those identified by others—either explicitly, by voicing them or writing them up, or 'automatically', via machine learning, or—with 'problem-solvers', equipped with cheap but powerful technologies and the skills to operate them. Once the two groups have been 'matched' by the feedback infrastructure, the activity of the 'problem-solvers' can help to render the implicit needs of 'problem-finders' tangible and explicit, adding to the pool of solutions which can then be drawn upon by other 'problem-finders'. Assuming this takes place outside the commercial realm, there would be no barriers, such as patents, to impede the sharing of knowledge.

Collaborative problem-solving in the social domain already takes place to some extent. One example would be 'hackathons', which bring together ngos with particular problems and well-meaning hackers who might know how to solve them but would otherwise never encounter them. The original premise of hackathons—before they were co-opted by the development sector and Silicon Valley—was that altruism and solidarity should drive the cooperation between 'providers' and 'consumers' of solutions. In principle, these processes could be expanded on a much greater scale, given sufficiently fast and comprehensive feedback systems, with algorithms to match.

Would collaborative discovery modes of this type necessarily reveal less than those operating through Hayekian competition? Current economic conditions arguably favour competition-based discovery over solidarity-based processes, but this is not a natural or inevitable state of affairs—the result of evolution, as Hayek argued. Rather, it is the result of political interventions, informed by a Hayekian rejection of non-individualist, altruistic alternatives. It would be tautological to say that neoliberalism, which has striven to install competition as the only mode of discovery, also favours discovery through competition. To believe that capitalist competition will always yield more knowledge than other discovery procedures requires us to believe, for example, that we learn more about the world when we act as consumers than when we act as parents, students or citizens; and that our human needs are better expressed in the consumerist language of competition than in any other terms. In the realm of production, one would have to believe that the imperative to innovate 'induced' in competing producers by the capitalist laws of motion will yield greater improvements in social existence than would the imperatives driving non-market 'problem-solvers'—environmental considerations, perhaps—who might be capable of generating cost-reductions of their own. Besides, competition is not always conducive to discovery. Hayek himself understood that intellectual property rights, historically an important pillar of capitalist development, erect barriers to discovery—yet they seem to have become a permanent feature of his favoured system. This is not a problem in solidarity-based discovery procedures.

2. Designing 'non-markets'

Though neoliberalism always favours markets and prices, its technologies help create possibilities for transcending them. One such is indicated by Alvin Roth's work on devising ways to match organ donors with potential recipients, in the absence of prices: once the preferences of all the transacting parties have been clearly expressed, one can do away with the price system and find other ways of distributing scarce resources. This suggests the second use to which digital feedback infrastructure can be put by the left: designing 'non-markets'. There are, however, several problems with applying such solutions on a larger scale. First, the more transacting parties there are, and the more preferences they express, the greater the complexity of the matching process. Second, markets provide means of social coordination that extend far beyond simply distributing existing resources between a fixed number of parties with clearly stated preferences. What to do when the number of parties is unknown, the preferences are fuzzy, there are no ready-made resources to distribute and the external environment is ever more complex? This is where 'feedback infrastructure' can be of help, by replacing markets with equally carefully designed institutions that can leverage information flows to solve problems of complexity—the second function that Hayek assigned to competition.

The legacy of cybernetics is relevant here. It's indicative that *Reinventing Capitalism* dedicates a few paragraphs to trashing the work of Stafford Beer, the British cybernetician who helped the Salvador Allende government to build a very basic 'feedback infrastructure' for the Chilean economy in the early 1970s. The authors' grasp of Beer's project appears rudimentary, and they use it mostly to attack government 'nudgers' like Cass Sunstein—an odd choice, given that the Chilean project didn't try to shape individual behaviour, and that Beer explicitly warned against individual conditioning by digital means. Beer's solutions to the problems of complexity were very different from Hayek's, even though the two—who met briefly at a cybernetics congress in the early 1960s—started with similar premises. Beer, too, believed that complexity was growing, and that the old ways of minimizing it—religious edicts prescribing strict codes of individual behaviour, for example—no longer worked. But social life itself provided numerous examples of deliberately constructed efforts at reducing complexity, institutions being the most obvious ones. Firms—artificial entities, by any

standards—did this in the market domain; libraries, universities, traffic systems and measurement systems offered examples of deliberately created entities capable of handling complexity in non-market domains.

While Hayek never offered a convincing theory of how to adjudicate between the demands of competing 'spontaneous orders', Beer dedicated his life to deploying the tools of cybernetics to make both market and non-market institutions more responsive to the demands of growing social complexity. This meant building robust information flows inside the system, as well as between the system and its environment, so that its internal components could themselves undergo timely internal transformations to better adapt the system as a whole to changing external conditions.[31] Beer imagined 'spontaneous orders' as vested within each other, in a recursive manner—for example: a household inside a neighbourhood inside a town—and structured by an organizational division of labour, with some parts responsible for setting systemic goals, some for developing strategies for achieving them, some for maintaining the system. The total complexity of a given 'spontaneous order' was thus a function of the relationship between that order and its external environment, as well as the distribution and execution of functions inside it.

According to Beer, there are two ways to tame complexity. First, one can make the internal behaviour of the vested spontaneous orders more uniform, by way of rules, standards, ethical prohibitions and so on; Beer called this 'variety attenuation'. Second, one can try to detect emerging complexity early on, re-engineer the underlying organizational structure to deal with it—and, instead of standardizing the responses of individual components, give them as much autonomy and power in overcoming their own local manifestations of complexity as possible. Beer called this 'amplifying regulative variety'. The two modes aim at very different outcomes: the first seeks to make the system more coherent by reducing any unnecessary variations across its component parts, while the second seeks to make it more complex in order to match the complexity of the external environment. How to reduce complexity—how to determine the correct level of intervention, as well as the right mix of 'attenuating variety' and 'amplifying regulative variety'—was thus an open question. As Beer put it in *Designing Freedom*:

The precise form of variety attenuation is a matter for local decision. The critical mistake we are making is to take the variety-attenuating decisions at the wrong level of recursion. Then this is how freedom is lost, and this is what induces the instability that threatens to become catastrophic. For the whole-system model simply does not have the requisite variety to balance the local homeostats. They in their turn are robbed of the variety they need to find their own stable points.[32]

By contrast to this, Hayek's cybernetic model of society was simplistic. Capitalist competition—the system's overall regulator—was the means by which it communicated changes in rules and normative orientations, which were then complied by the smallest units of the systems, as a way of 'attenuating variety'. Beer's conception of society as composed of recursive orders, on the other hand, reveals that the imperatives and prescriptions imposed on local 'spontaneous orders' by capitalist competition—one of the outermost layers of the total social system—could also greatly constrain the adaptive and problem-solving capacity of the local 'homeostats'.[33] Since competition cannot resolve all the problems that emerge at these lower levels, and indeed limits the ability of these levels to respond in more effective ways themselves, overall complexity increases, inducing instability.

Beer argued that advances in information technology could drastically amplify 'regulative variety' while pushing 'variety attenuation' to the lowest possible levels of the system, where it would cause the least damage. Information technology should be able to offer a more

accurate, real-time picture of the external complexity, and to check if the system's contingency plans for dealing with it are adequate (Beer celebrated the 'self-aborting plan', which liquidates itself on discovering that the external circumstances have changed).[34] Second, technology allows for a close and continuous observation of the system's internal dynamics, and makes it easier to repurpose its organizational structure as the external environment demands. Once external and internal complexity have been studied and understood, it should be possible to find a 'hack' of some kind. Beer once gave the example of a timetable and room assignment in a busy school: a very complex problem of social coordination is solved with a simple two-dimensional chart.

For Beer, the exact allocation between the two solutions—that is, whether to constrain the behaviour of individual parts (citizens or customers, for example) or to amplify the regulative capacity and the institutional and informational plasticity of the system, and of the systems that contain it—was to be determined democratically. The second solution was generally preferable, as it granted citizens more autonomy. Thus Beer advocated making planning, computing and coordinating infrastructure free and available to all, so that individual institutions, tasked with reducing complexity in their own contexts, could find their own optimal solutions. This did not imply some neoliberal vision of the 'Big Society', where individuals are expected to take problem-solving into their own hands, as fund-starved public alternatives collapse. Instead, the ambition is for radical democracy to join forces with 'radical bureaucracy' in order to take advantage of advanced infrastructures for planning, simulation and coordination. This combination should, at a minimum, yield solutions as efficient as those of Hayek's 'spontaneous order', without, however, offloading all the adaptation costs onto citizens or erecting too many barriers to the problem-solving capacities of local systems.

Remarkably, not all neoliberals disagree. One of the most striking developments in neoliberal theory and practice of the last decade has been an explicit concession by some neo-Hayekians that information technology could provide efficient methods of social coordination in environments where price signals are missing.[35] Here, as in the case of market design, the neo-Hayekian embrace of non-price forms of social coordination is mainly driven by the political exigencies of keeping neoliberalism afloat by attacking the rump administrative state. If taming the Leviathan now means that neoliberals must preach the virtues of decentralized civil society, the 'social economy', the Ostromian commons, or 'polycentric orders'—still short of celebrating *autonomia operaia,* but getting there!—it seems they will oblige.

This leads to some genuinely bizarre ideological repositioning. Some Hayek-inspired scholars find it politically advantageous to concede that there are other forms of social coordination besides the price system, as long as they can also argue that decentralized social groups—ngos, charities, churches—can leverage information technology to do a better job at coordinating disaster relief than centralized government bureaucracies. However, once the neoliberals concede this, they become exposed on other fronts: why shouldn't *decentralized* government bureaucracies, redesigned along the lines proposed by Beer and fully plugged into the democratic 'feedback infrastructure', do at least as good a job as, say, churches, if not better? Once social coordination has been liberated from the heavy ideological baggage of the price system, there are no sound theoretical reasons to assume public institutions are always inferior to private ones in managing complexity.

3. Decentralized planning

What role can 'feedback infrastructure' play in coordinating economic activity in general? For some time now, left-leaning economists and activists have tried to reopen the Socialist Calculation Debate, arguing that the latest advance in data-gathering and computation would

make the job of Lange's Central Planning Board much easier.[36] Followers of Hayek and Mises have developed a standard response to such efforts, pointing out the efficiency losses involved in switching from the price mechanism to, say, a system using labour values as the basis of calculation. Neoliberals have it relatively easy in such debates, as the spectral presence of centralized planning in the proposed alternative economic system allows them to invoke the Hayekian knowledge problem. But is there a way to rethink the socialist position in a way that would neither involve central planning, nor morph straight back into the price system?

Processes of consumption and production have changed a great deal since the interwar period, and many of the initial assumptions of the Socialist Calculation Debate no longer apply—including the presumed virtues of central planning. On the consumption side, the predictive capacity of Big Data can anticipate our preferences better than we can; that Amazon got a patent on 'anticipatory shipping'—allowing it to ship products to us before we even know we want them—suggests that the 'feedback infrastructure' can foresee and facilitate the satisfaction of our needs in ways unimaginable to central planners. Such predictive capacity is a function, not of the mysterious workings of the price system, but of the data held by platforms. Likewise on the production side, 3D printers enable cheap and flexible manufacturing, without the need for massive fixed-capital investment.

Some technologies do require vast capital outflows, Artificial Intelligence being a pertinent example. But the current mode of funding ai development—a dozen giant firms in the us and China wasting tens of billions of dollars on training their systems to develop identical capacities to classify faces and sounds—is not necessarily the most efficient way of securing its advancement. With a different funding model, one could democratize access to ai, while also getting more value for each dollar invested. Free, universal access to both additive manufacturing and artificial intelligence could facilitate the production of genuinely innovative products on a relatively low budget.

Given this new context, it does not seem very productive for the left to keep advocating for the use of more powerful computers to calculate input prices for the Central Planning Board—or to retain a centralized bureaucracy, with all the political problems it entails. Why insist on *central* planning, when a more decentralized, automated and apparatchik-free alternative might be achievable by putting the digital feedback infrastructure to work? The most ambitious effort to sketch what such an alternative might look like—think 'guild socialism' in the era of Big Data—was undertaken by the American radical economist Daniel Saros, in his rigorous, lucid—and unjustly neglected—*Information Technology and Socialist Construction.* [37] Saros's plan has some gaps and omissions, and the level of technological power available in 2019 is much greater than it was even five years ago. Still, the book's overall vision provides inspiration and encouragement to those searching for alternative ways of coordinating economic activity on a large scale. After an exhaustive summary of the positions taken in the Socialist Calculation Debate, Saros contends that the socialist economists couldn't envision a superior, more decentralized form of planning simply because the technology at their disposal was inadequate. The technology he has in mind, though, is not the kind used for solving equations or crunching numbers for the Central Planning Board, but one that powers the sort of 'feedback infrastructure' described earlier.

Saros's elegant solution disaggregates the many uses of the price system for social coordination, keeping some and replacing others with the 'feedback infrastructure' itself. At the centre of his system stands a General Catalogue, something of a mix between Amazon and Google, where producers, who are organized in guild-like 'worker councils'—worker-run startups if you will—list their products and services in a way that would be familiar to users of Apple's App Store or Google's Play Store. Consumers, equipped with a unique digital id

card, turn to the catalogue to register their needs during the so-called ‘needs registration period’ at the beginning of each production cycle; they rank the products they want, specifying their quantities for the next cycle. Consumers can still purchase products they didn’t request after the need-registration period ends, but they receive higher bonuses if their purchases do not deviate from their initial predictions. To encourage consumers to order no more than they need, bonuses are given for buying fewer items than the average consumer. Bonuses, which are awarded for other things, too—e.g. for staying in the same job for a long time—are added to the universal basic income that all citizens receive.

At the end of the need-registration stage, producers—whose products are ranked, Amazon-style, in the General Catalogue, with ratings affecting worker bonuses—calculate expected production figures and register their need for inputs in the Catalogue. Producers can fine-tune their production numbers using the consumption patterns analysed by Big Data, as well as the prior specifications of needs by consumers. This information also allows any shortages to be socialized, since it is possible to calculate the share of the total remaining supply of the good that a particular consumer is entitled to, in light of the needs expressed by all the other citizens. Worker councils decide on the price to charge for each product, but since they are not profit-seeking entities, their compensation is not tied to sales or profits, and so their main criterion in setting the price is getting rid of all their inventory before the next production cycle begins. Should demand for them be particularly low, certain products could be given away free.

These are just the basics of the sophisticated system outlined in Saros’s remarkable work. Some of its features would certainly offend the eco-socialist creed: consumers are allowed to express and fulfil all their desires, however excessive—though there are built-in incentives, like bonuses, fostering restraint. Some critics, like Supiot, might also consider the system’s dependence on feedback mechanisms and ratings a high price to pay, especially as it involves much-maligned quantification. On the other hand, Saros’s system might help minimize the power that would normally accrue to the technocratic class—though Saros concedes that system administrators and scientists evaluating resource scarcity will have something of the classic role assigned to bureaucrats.

How realistic is Saros’s system? An examination of how big technology firms organize their platforms reveals that some aspects of it are already in operation. Amazon, for example, rewards customers with lower prices for registering their expected future needs and ‘subscribing’ to periodic deliveries of regularly consumed products; it also carefully studies product searches and the offerings of other suppliers in its own ‘general catalogue’ to locate gaps in the market. Democratizing access to that information infrastructure, so that all producers can build on these emerging product insights, would surely result in a system that is far less centralized than today’s, where just one firm (Amazon) monopolizes all the planning based on that data. One may quibble about the details of Saros’s system, but it’s indisputable that this is not a model based on ‘central planning’ in any formal definition of the term. Yes, there’s plenty of market design, as well as plenty of social coordination based on information, not prices; but even neo-Hayekians, by now, have conceded that these are acceptable. Under Saros’s system, the price mechanism retains some of its functions, but, wedded to a non-capitalist ethos, it plays no role in setting the level of compensation.

Socialize the means of feedback production!

All three of these projects—‘solidarity as discovery’, ‘designing non-markets’ and ‘automated planning’—hint at a world in which increased complexity is not accepted as an unalterable fact and where competition is not the only way of dealing with it. Information technology, in turn, would be seen as a means of discovering and acting upon the plasticity of social and

economic arrangements, undoing the bundles—like price, the various functions of which had previously been lumped together—that have so far been taken for granted. Making progress on any one of these fronts could constitute a major advance for the left. But no such progress will materialize if the means for creating alternative modes of social coordination—the 'feedback infrastructure'—remain the exclusive property of tech giants.

If the Socialist Calculation Debate teaches us anything, it's that the left should not waste time debating the merits of the price mechanism in isolation from its embeddedness in the broader system of capitalist competition, which generates non-price knowledge—reputation and so on—and produces the general social norms and patterns of legibility which allow the price system to do so much with so little. While it's true that, evaluated on its own terms, the price system appears a marvel of social coordination, it's also true that, without capitalist markets, it doesn't exist. It thus makes sense to strive for a more comprehensive assessment, looking at how the existence of capitalist competition—and of capitalism in general—affect social coordination *tout court*. Social coordination can be mediated by a whole ecology of mechanisms, including law, democratic deliberation, decentralized 'radical bureaucracy' and feedback control, as well as the price system. Consider, for example, the non-price knowledge that circulates in capitalist economies, which not only informs the price system but also shapes our assessment of the urgency of threats, helping to inform our responses. The more accurate that information, the more likely we are to ensure social coordination in solving tasks which—like climate change—are crucial to the survival of the species.

Yet capitalist competition often ends up contaminating that knowledge, making an accurate assessment of the situation nearly impossible. After the neoliberal turn, competition is increasingly becoming a non-discovery procedure. Consider the energy companies or pharmaceutical firms who deliberately manufacture ignorance by selectively funding academics and think tanks. Or the media-military-industrial complex, shaping how the public thinks about the latest war. Or the increasingly privatized education system, unable to 'discover' the sort of knowledge that has no easily quantifiable impact. Or the credit rating agencies, whose business models often obscure the real state of the firms they are supposed to be evaluating. An entire academic industry—under the quirky name of 'agnotology'—has sprung up to study the production of such manufactured ignorance and its use by capitalist firms.[38] The best possible outcome of this research would be a recalibration of how we assess the comparative advantages of various systems of social coordination—and a shift of focus, from measuring solely their respective contributions to economic efficiency, to weighing up their ability to perceive existential social problems, in all their complexity, and to propose possible solutions.

The ideological residue of the Cold War, with its binary choice between central planning and the price system, has obscured the existence of this broader ecology of modes of social coordination. The emancipatory promise of information technology is to rediscover and enrich this repertoire, while revealing the high invisible costs of relying on the current dominant mode of social coordination—capitalist competition. Given this possibility, the agenda of the neoliberal establishment is clear. On the one hand, they will rally behind a slogan of 'There Is No Alternative (to Google)', depicting any departure from the cartelized Silicon Valley model—or at least, any moves that dare go beyond the consumerist utopia of a 'New Deal on Data'—as yet another step on the road to serfdom. On the other hand, they will continue filling in the empty social and political spaces which previously had their own logics and ways of doing things, with the 'smart' capitalist logic of digital platforms.

The left, then, should focus on preserving and expanding the ecology of different modes of social coordination, while also documenting the heavy costs—including on discovery itself—of discovering exclusively via competition. This mission, meanwhile, will be all but

impossible without regaining control over the ‘feedback infrastructure’. The contradiction between collaborative forms of knowledge discovery and the private ownership of the means of digital production is already becoming apparent in the processes of ‘peer production’—long celebrated by liberal legal academics—used in the production of free software or services like Wikipedia. Under the current Silicon Valley private-ownership model, the feedback infrastructure is unlikely to be amenable to radical-democratic transformation.[39] Freedom, as neoliberals have long understood, must be planned; but so must their ‘spontaneous order’. In the absence of such planning, spontaneity quickly morphs into adaptation to an external reality that is not to be tinkered with. This may be an acceptable—even desirable—development for conservatives, but it should be anathema to the left.

1Alex Pentland, ‘Reality Mining of Mobile Communications: Toward a New Deal on Data’, *Global Information Technology Report, 2008–09*, Geneva 2009, pp. 75–80.

2Viktor Mayer-Schönberger and Kenneth Cukier, *Big Data: A Revolution That Will Transform How We Live, Work and Think*, New York 2013. There was no suggestion here of politically significant change on the horizon; the main upshot of *Big Data* appeared to be the capsize of causal reasoning in the face of abundant but poorly understood correlations. If data showed that people were buying more strawberry tarts during hurricanes—the arch-example of most books on the subject—then the task was to sell more strawberry tarts, not to fret about the reasons why. Born in an Alpine village above Salzburg, Mayer-Schönberger founded his first software-development company in 1986, at the age of twenty, while still an undergraduate student of law. After stints at Harvard Law School and the lse, he has taught at Harvard’s Kennedy School, Singapore and Oxford. His first major book in English, *Delete: The Virtue of Forgetting in the Digital Age*, appeared from Princeton in 2009.

3Viktor Mayer-Schönberger and Thomas Ramge, *Reinventing Capitalism in the Age of Big Data*, New York 2018, p. 216. Henceforth, rc.

4G. A. Cohen, *Why Not Socialism?*, Princeton 2009, p. 57.

5For the latest articulation of this thesis, see Leigh Phillips and Michal Rozworski, *The People’s Republic of Walmart: How the World’s Biggest Corporations are Laying the Foundation for Socialism*, London and New York 2019.

6The most prominent proponent of this thesis has been Izabella Kaminska of the *Financial Times.*

7 rc, p. 5.

8 rc, p. 12.

9The German spd has voiced similar ideas, calling on American tech giants to start sharing their data with German companies: Andrea Nahles, ‘Die Tech-Riesen des Silicon Valleys gefährden den fairen Wettbewerb’, *Handelsblatt*, 13 August 2018. Mayer-Schönberger declined to get involved with the Austrian initiative, citing ideological disagreements with the övp–fpö government. Soon after Nahles’s piece appeared, however, he joined the cdu–spd coalition government’s newly created Council of Digital Advisors in Berlin. Meanwhile the idea of a data-sharing mandate has been taken up more widely; see for example the recent Peterson Institute paper by Claudia Biancotti and Paolo Ciocca, ‘Opening Internet Monopolies to Competition with Data Sharing Mandates’, piie *Policy Brief*, April 2019.

10 rc, p. 143.

11 Shoshana Zuboff, *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power*, New York 2019; Albert Wenger, *World After Capital*, available in open-source form at GitBook.

12 Dan DeFrancesco, 'Here's a Breakdown of How Much us Banks Are Spending on Technology', *Business Insider*, 28 March 2019; Kim Nash, 'Amazon, Alphabet and Walmart Were Top it Spenders in 2018', wsj, 17 January 2019.

13 Kristin Broughton, 'bb&t-SunTrust Tie-Up Brings Tech Budgets into Focus', wsj, 7 February 2019; Laura Noonan and Patrick Jenkins, 'Citigroup ceo Says Machines Could Cut Thousands of Call Centre Jobs', *Financial Times*, 18 February 2019.

14 Dan DeFrancesco, 'A New Study Found jp Morgan and bofa Are Winning Wall Street's Technological Arms Race', *Business Insider*, 28 March 2019.

15 Lauren Mostowyk, 'Global Fintech Investment Rockets to a Record $111.8B in 2018, Driven by Mega Deals', kpmg, 13 February 2019. This included Blackstone's $17 billion investment in Refinitiv, a Thompson Reuters spin-off.

16 See also the numerous contributions in Jamee Moudud, Cyrus Bina and Patrick Mason, eds, *Alternative Theories of Competition: Challenges to the Orthodoxy*, Abingdon and New York 2012.

17 This ground is well-covered in Johanna Bockman, *Markets in the Name of Socialism: The Left-Wing Origins of Neoliberalism*, Stanford 2011.

18 The best and most concise interpretation of the Austrian position on prices and knowledge, and its subsequent misreading by various schools of information economics, remains Esteban Thomsen, *Prices and Knowledge: A Market-Process Perspective*, London 1992.

19 F. A. Hayek, 'The Meaning of Competition' [1948], in Bruce Caldwell, ed., *The Collected Works of F. A. Hayek: The Market and Other Orders*, vol. 15, Chicago 2014, p. 109.

20 This history is discussed, at some length, in Philip Mirowski and Edward Nik-Khah, *The Knowledge We Have Lost in Information: The History of Information in Modern Economics*, Oxford 2017.

21 See, for example, Leonid Hurwicz's explication of 'the Hayek type of argument' in 'Centralization and Decentralization in Economic Processes', in Alexander Eckstein, ed., *Comparison of Economic Systems: Theoretical and Methodological Approaches*, Berkeley 1971, p. 93.

22 See F. A. Hayek, 'The Nature and History of the Problem', in F. A. Hayek, ed., *Collectivist Economic Planning*, London 1935.

23 Alvin Roth, *Who Gets What—and Why: The New Economics of Matchmaking and Market Design*, New York 2015.

24 E. L. Glaeser, 'A Review Essay on Alvin Roth's *Who Gets What—And Why*', *Journal of Economic Literature*, vol. 55, no. 4, December 2017, pp. 1602–14.

25 Alain Supiot, *Governance by Numbers: The Making of a Legal Model of Allegiance*, Oxford 2017. See also his earlier work on the law as an instrument of solidarity: *Homo Juridicus: On the Anthropological Function of the Law*, London and New York 2007.

26 See Abbey Stemler, 'Regulation 2.0: The Marriage of New Governance and Lex Informatica', *Vanderbilt Journal of Entertainment & Technology Law*, vol. 19, no. 1, 2016, pp. 87–132; and Karen Yeung, 'Algorithmic Regulation: A Critical Interrogation', *Regulation & Governance*, vol. 12, no. 4, December 2018, pp. 505–23.

27 The Austrians, predictably, never really accepted the idea of nudging, despite its impeccable neoliberal pedigree. For a typical Austrian take on nudging, see Abigail Devereaux, 'The Nudge Wars: A Modern Socialist Calculation Debate', *Review of Austrian Economics*, vol. 32, no. 2, June 2019, pp. 139–58.

28 *The Road to Serfdom*, despite the recent acclaim it has received in libertarian circles, is one book where Hayek makes quite a number of such concessions to social democracy. This did not go unnoticed by the most ardent of libertarians who often dismiss Hayek as a 'social democrat' at heart. A typical statement of such charges can be found in Walter Block, 'Hayek's Road to Serfdom', *Journal of Libertarian Studies*, vol. 12, no. 2, 1996, pp. 339–65.

29 Neoliberals of Austrian persuasion have already grasped that the battles over identity and reputation systems—like the one presented in China—would constitute the new chapter of the Socialist Calculation Debate. For a nascent critique of 'social credit' from within the Hayekian paradigm, see Abigail Devereaux and Linan Peng, 'Give Us a Little Social Credit: To Design or to Discover Personal Ratings in the Era of Big Data', gmu Working Paper in Economics, no. 18–35, 6 December 2018. In a way, the 'social credit' system presents a challenge that is different from central planning in that it does furnish infrastructure for reshaping the underlying normative foundations as well as grids of intelligibility—and doing it at scale—without which any turn away from the price system would simply not function as effectively (the Soviet experience with central planning testifies to that). To what extent such reorientation away from the price system fits into the broader political plans of the Chinese government is another matter.

30 Hayek's emphasis on competition follows from his assumption that it's the only social drive compatible with evolutionary developments. Feelings of altruism and solidarity had their evolutionary uses in primitive societies, when we lived in small social units, but they proved inadequate for living in an 'extended market order'. Hayek's idiosyncratic theory of cultural evolution, informed by his account of 'group selection', thus culminates in the politically expedient conclusion that selfish, individualist behaviour in market settings is the only non-reactionary and evolution-friendly response. One consequence is that any discovery procedures rooted in solidarity, altruism, or any other non-individualist social practices are dismissed at the outset: they are a throwback to the past and, in any case, logistically impossible in the modern extended order. Being only an amateur evolutionary scientist, Hayek's move was a risky bet and many of his peers sought to distance themselves from his evolutionary turn, especially his last work, *The Fatal Conceit*. Hayek's use of 'group selection', however, goes back to the 1960s and cannot just be blamed on his senility; it also informs his trilogy on *Law, Legislation and Liberty*, in particular the extensive epilogue to its last volume. Naomi Beck's *Hayek and the Evolution of Capitalism* (Chicago 2018), a comprehensive examination of his evolutionist thinking, damningly concludes that it suffers from 'incoherencies, lack of supporting evidence and disregard for the theories that inspired it'.

31 On this point Beer and Hayek were in full agreement. See the reflections on what a 'change of environment' may require in F. A. Hayek, 'Notes on the Evolution of Systems of Rules of Conduct' [1967], in *The Market and Other Orders*, p. 282.

32 Based on Beer's 1973 Massey Lectures, *Designing Freedom* (Toronto 1974) offers a concise introduction to his ideas for the general reader.

33 Beer's elaboration of how outer layers of a system—he discusses the media and the military-industrial complex—get to constrain the set of options and future paths perceived by the actor in the current order is laid out in Beer, 'The Will of the People', *Journal of the Operational Research Society*, vol. 34, no. 8, August 1983, pp. 797–810. Beer's depiction of a

hierarchy of social orders and the constraints that they impose upon one another is what differentiates his work from that of, say, Niklas Luhmann, who began with the same cybernetic premises, but drew very different conclusions.

34 Stafford Beer, 'The Aborting Corporate Plan: A Cybernetic Account of the Interface Between Planning and Action', in Erich Jantsch, ed., *Perspectives of Planning*, Paris 1969, pp. 397–422.

35 See Daniel Sutter and Daniel Smith. 'Coordination in Disaster: Nonprice Learning and the Allocation of Resources after Natural Disasters', *Review of Austrian Economics*, vol. 30, no. 4, December 2017, pp. 469–92; Emily Chamlee-Wright and Justus Myers, 'Discovery and Social Learning in Non-Priced Environments: An Austrian View of Social Network Theory', *Review of Austrian Economics*, vol. 21, no. 2–3, January 2008; Emily Chamlee-Wright and Virgil Henry Storr, 'Social Economy as an Extension of the Austrian Research Programme', in Peter J. Boettke and Christopher Coyne, eds, *The Oxford Handbook of Austrian Economics*, Oxford 2015, pp. 247–71.

36 For some representative writings on this issue, see Allin Cottrell and W. Paul Cockshott, 'Calculation, Complexity and Planning: The Socialist Calculation Debate Once Again', *Review of Political Economy*, vol. 5, no. 1, 1993, pp. 73–112; Cottrell and Cockshott, 'Computers and Economic Democracy', *New Historical Project*, 8 April 2003; Nick Dyer-Witheford, 'Red Plenty Platforms', *Culture Machine*, vol. 14, 2013; Ionela Bălţătescu and Petre Prisecaru, 'Computability and Economic Planning', *Kybernetes*, vol. 38, no. 7–8, 2009, pp. 1399–1408; Erick Limas, 'Cybersocialism: A Reassessment of the Socialist Calculation Debate', 4 February 2018, available at ssrn.

37 Daniel Saros, *Information Technology and Socialist Construction: The End of Capital and the Transition to Socialism*, Abingdon and New York 2014.

38 For a general introduction, see Robert Proctor and Londa Schiebinger, eds, *Agnotology: The Making and Unmaking of Ignorance*, Stanford 2008. Colin Crouch, without explicitly using the term, has recently discussed the ignorance-inducing nature of modern capitalism in *The Knowledge Corrupters: Hidden Consequences of the Financial Takeover of Public Life*, Cambridge 2016.

39 A search for 'the means of peer production' on Google returns just four search results—an accurate indicator of the political concerns of peer production's liberal boosters.