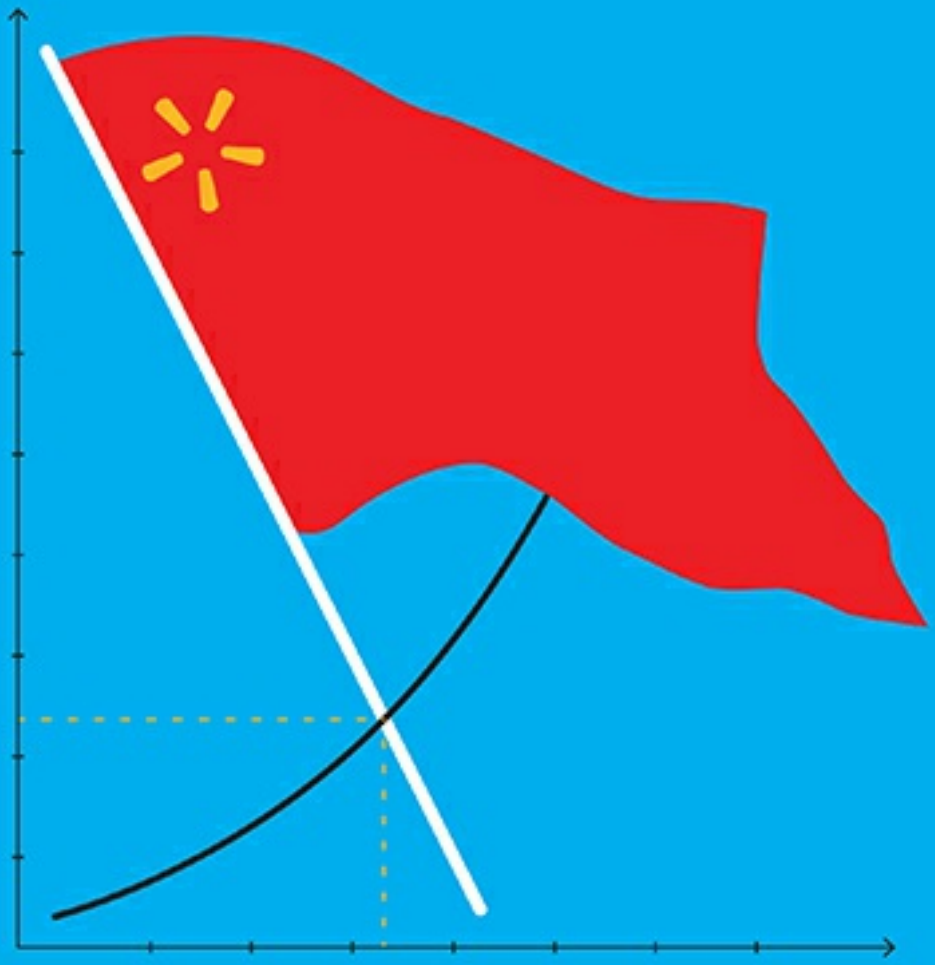
Leigh Phillips & Michal Rozworski



PEOPLE'S REPUBLIC OF WALMART

HOW *the* WORLD'S BIGGEST CORPORATIONS ARE LAYING *the* FOUNDATION *for* SOCIALISM

The People’s Republic of Walmart

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The People's Republic of Walmart

How the World's Biggest Corporations Are Laying the Foundation for Socialism

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MICHAL ROZWORSKI

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ACKNOWLEDGEMENTS

The idea for this book was born of a beer or three at a scruffy Gastown pub early on in our friendship. Sharing our frustrations about the absence of democratic planning from political debate, we quickly realized that we were both thinking of writing the very same book. But a million grand schemes are nightly forged in the workshop that is the tavern, only for them to have vanished by morning. This time however, surprisingly to both of us, such an intrigue has actually obtained results.

For that to have happened, we owe a large debt in particular to Bhaskar Sunkara, publisher of *Jacobin* magazine, who helped fashion our rough idea into the book you hold in your hands, championing the project all along the way. Warm thanks are also due Ben Mabie, Andy Hsiao and Duncan Ranslem, our thoughtful editors at Verso.

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We would also like to thank all our comrades and friends who offered encouragement, critique and other help at different stages; no book is an individual effort, however meticulously planned.

1

INTRODUCTION

"So you're writing a book celebrating Walmart, eh?"

"Er, no. Not exactly. Or, well, yes, in a way. You see, the logistical marvel that is Walmart, we do quite like. But it's so much more complicated than that."

"Bit of an odd topic for a pair of socialists. How on earth can you defend Walmart, with all their union busting, low wages and destruction of communities? Are they not one of the most evil companies in the world?"

"We're not defending Walmart, and certainly not union busting. We're just intrigued by how this epitome of capitalism is also, paradoxically, a vast planned economy. *Very* intrigued."

Variations on this conversational theme have repeated themselves since we started writing this book. Invariably among progressive friends of ours, concerned or suspicious eyebrows have been raised.

So let us be clear from the outset: Walmart is an execrable, sinister, low-down dirty villain of a company.

Lamentably, the word "flagitious"—meaning "horribly criminal or wicked," but also sharing a root with the word "flagellate" or whip, the Latin term *flagitium*, meaning "shameful thing"—is uncommon these days; yet at the same time that it is apropos for such a *flagrantly* socially delinquent business, it only begins to express the piercing, wolf-like hatred we two authors feel for Walmart.

Like any firm, Walmart is forced via competition in the market to reduce costs, notably labor costs —that most bendy and squishable portion of an enterprise's expenditure. While none of this is very nice, it would hardly be fair to describe Walmart as uniquely evil. Sure, it pays poverty wages, depends upon Asian sweatshops and both child and prison labor, and disembowels high streets with all the relish and élan of the third-century torturers of Saint Elmo. But who doesn't these days? Nevertheless, few other corporations seem to carry out their worker-immiserating, anti-union practices with quite such zeal, such crushing mastery; Walmart regards union busting not only as a necessary accompaniment to their enterprise, but places it at the very core of their business model. "I pay low wages," said founder Sam Walton. "I can take advantage of that. We're going to be successful, but the basis is a very low-wage, low-benefit model of employment."

So no one should conclude, before reading a word of what we say (or indeed after reading every word but misapprehending what we say), that this book intends to be in any way a hip, contrarian apology for Walmart or Amazon or the Pentagon or for any of the other enterprises whose planning and logistics operations we investigate. That is not our purpose. Walmart should offer no inspiration for progressives.

With that throat-clearing out of the way, and now that everyone is content that we have no love for Walmart, we want to talk about how we nevertheless have *admiration* for Walmart, much as how an epidemiologist concedes an irrefutable genius to the wicked evolutionary dexterity of drug-resistant tuberculosis; or in the way that Milton finds Satan, rather than Jesus, to be the more interesting

character; or the manner in which Sherlock Holmes can simultaneously revile and admire the intricate, canny stratagems of the malign savant Professor Moriarty.

If only Walmart's operational efficiency, its logistical genius, its architecture of agile economic planning could be captured and transformed by those who aim toward a more egalitarian, liberatory society!

But why should anyone care about so dry a subject as what is, in effect, a discussion about enterprise decision making, about the optimal allocation of goods and services? Why should we even favor democratic planning over the free market? Did the end of the Cold War and the collapse of the Soviet Union not put paid to the idea that socialism is viable? Isn't curtailing the free market's excesses the best that we can do?

Libraries' worth of books have been written on the injustices and contradictions of capitalism, not least its ineluctable expansion of inequality (even as poverty can be reduced—as the most extremities of it certainly have been over the last 300 years or so, albeit not least as a result of the pressure of trade unions and the left broadly conceived, dating back to its origins in the French Revolution, to share the wealth), enclosure of democracy, perennial manufacture of economic crisis, and thereby unemployment and even war, but we have no desire to recount these arguments here. So let us restrict ourselves to alighting upon perhaps its central misadventure.

There is certainly overlap between the set of all goods and services that are useful to humanity, on the one hand, and the set of all goods and services that are profitable, on the other. You likely find underwear to be a useful product (though for commandos, this is no certainty); The Gap, meanwhile, finds it profitable to produce such a product—a happy coincidence, of which there are many. But the set of all useful things and the set of all profitable things are not in perfect correspondence. If something is profitable, even if it is not useful or is even harmful, someone will continue producing it so long as the market is left to its own devices.

Fossil fuels are a contemporary example of this irremediable, critical flaw. Wonderful though they have been due to their energy density and portability—freeing us energetically from the caprices of Mother Nature, who may or may not blow windmills or turn waterwheels when we want her to—we now know that the greenhouse gases emitted by fossil fuel combustion will rapidly shift the planet away from an average temperature that has remained optimal for human flourishing since the last ice age. Yet, so long as governments do not intervene to curtail the use of fossil fuels and build out (or at least incentivize the build-out of) the clean electricity infrastructure needed to replace them, the market will continue to produce them. Likewise, it was not the market that ended production of the chlorofluorocarbons that were destroying the ozone layer; instead it was regulatory intervention—planning of a sort—that forced us to use other chemicals for our fridges and cans of hair spray, allowing that part of the stratosphere that is home to high concentrations of ultraviolet ray–deflecting tripartite oxygen molecules to largely mend itself. We could recount similar tales about how the problems of urban air pollution in most Western cities or of acid rain over the Great Lakes were solved, or how car-accident mortality rates or airline crashes have declined: through active state intervention in the market to curb or transform the production of harmful—but profitable—goods and services. The impressive health and safety standards of most modern mining operations in Western countries were achieved not as a result of any noblesse oblige on the part of the owners of the companies, but rather begrudgingly, as a concession following their defeat by militant trade unions.

Conversely, if something is useful but unprofitable, it will not be produced. In the United States, for instance, where there is no universal public healthcare system, healthcare for all would be

wonderfully useful. But because it is not profitable, it is not produced. High-speed internet in rural areas is not profitable, so private telecommunications companies are loathe to provide it there, preferring instead to cherry-pick profitable population-dense neighborhoods.

And amid a growing global crisis of antimicrobial resistance, in which microbial evolution is defeating antibiotic after antibiotic and patients are increasingly dying from routine infections, pharmaceutical companies have all but given up research into new families of the life-saving drugs, simply because they are not profitable enough. That amputation or surgery to scrape out infected areas might return as common medical responses is not a pleasant thought. But this course of action was the only one left to the doctors of nineteen-year-old David Ricci of Seattle when they surgically removed part of his leg, following repeated infections from drug-resistant bacteria—acquired in a train accident in India—that could not be treated, even with highly toxic lastresort antibiotics. Each time the infection returned, more and more of the leg had to be cut off. Although Ricci has since recovered, he has lived in perpetual fear of the reappearance of the bugs that can't be fought. As a 2008 "call to arms" paper from the Infectious Diseases Society of America (IDSA) put it, "[Antibiotics] are less desirable to drug companies and venture capitalists because they are more successful than other drugs." Antibiotics are successful if they kill off an infection, at which point—days or weeks, or at most months, later—the patient stops taking the drug. For chronic diseases, however, patients may have to take their medicine every day, sometimes for the rest of their lives. Thus, the paper concluded, it is long-term therapy—not cures—that drives interest in drug development. Policy proposals from the likes of the IDSA, the World Health Organization and the European Union amount to begging and bribing the pharmaceutical companies to lift a finger; but even here, however unambitious the approach, it is still external to the market. (Socialization of the pharmaceutical industry would be cheaper, and a much more rapid and effective approach, but most pundits deem it too radical, giving off too much of a whiff of socialism).

Beyond this one sector, we might note that basic research in any field—that blue-sky stuff, where scientists are led by simple curiosity and have no expectation of developing any marketable product, and which is the basis of technologies and medicines that later turn out to be very marketable indeed—simply cannot be done by the private sector. This type of research is extremely expensive but makes no guarantee of any return on such spending. Such research thus is almost entirely a phenomenon characteristic of public institutions or private charities rather than market actors. Similarly, it was not the market that got us to the moon, but a grand public-sector enterprise called NASA. Today, if we are to be honest, we must recognize that due to the vast costs associated with a viable Mars colony such as the one proposed by Elon Musk's SpaceX (even if the cost of escaping Earth's gravity is significantly reduced, for instance, through the use of reusable rockets), there still has to be a profitable commodity resulting from that colony that can be sold back on Earth. If there is one, bully for him. If not, his investors will quickly abandon him. So the colonization of Mars will be a public-sector endeavor or it will not happen.

But for many progressives, the story of logistics and planning seems musty and old. Are there not fresh arguments required to convince that barricades must be mounted, forgotten stories of wretched oppression yet to be recounted? It is true that there is little drama or romance to the story of planning—few riveting tales of selfless heroism, brave suffering or righteous fury (although there are not a few episodes of heartbreaking defeat, failure and ruin). But in essence, the story of injustice and its correction is a chronicle of efforts across all time to reduce inequality of all types: of haves and have-nots, of who works and who rests, of who has a say and who does not. And inequality is, in the end, a question of unfair allocation of things themselves or the result of such unfair allocation.

Put simply, a poor person has not been allocated the *stuff* (or the ability to buy it) that a rich person has. The needs of the rich and poor are met and unmet in wildly different ways: the potential to fully articulate their humanity is cut off at the root for some, while others are granted space to flourish. Inequality limits what a person, and indeed society, could otherwise do; it delimits our freedom. Past generations have fought to expand the realm of freedom—to ensure all adult humans have the same rights and to ensure that any new capabilities delivered through technological advance are to be made available to all. And if we are to continue this battle to correct the titanic, manifest unfairness of the way things are, we must therefore wage a struggle over which *method for the allocation of things* we want as a society.

So when we ask whether another world is possible, we are also asking: Is there an alternate method to allocate things? How would we distribute things differently? And who would decide how they are distributed? Could the plans that capitalists use every day to get goods and services into the hands of those who can pay for them be transformed to instead ensure that what we produce gets to those who need it most? And in transforming the way we distribute stuff, could we also start to transform everything else about the economy—from what stuff we make and how, to who works and for how long?

Once we have identified alternative ways to distribute things, the planning everywhere around us may telegraph aspects of another mode of production. More urgently, such extant planning may also suggest features of transitional stages on the way to a more all-encompassing transformation of our economy.

Under capitalism, our current mode of production (in essence, the way our society organizes the economy), the primary method used to allocate things is the free market. Ours is a world where prices for goods and services are, in principle, determined in response to supply and demand. Free market advocates claim this leads to a situation where the amount of stuff demanded by buyers matches the amount of stuff produced by suppliers: a condition they describe as "economic equilibrium."

For a mode of production to be called *capitalism*, it is not sufficient for a free market to exist; there are, after all, other essential features of capitalism, including exploitation in the workplace and the need to sell one's labor in order to survive. Nevertheless, the free(-ish) market is a *necessary condition* for capitalism—one that, as a method of allocation, leads to growing inequality via disparities in the distribution of income. Market interactions inevitably produce winners and losers, leading to concentrations of wealth. Over time, these disparities grow, a product of these same market interactions.

This "perfect" free market only exists in the minds of its most ardent defenders and within the pages of introductory economics textbooks. Real markets are a far cry from this idealized fairy tale: companies regularly collude to keep out competitors, large corporations constantly lobby for government subsidies, and it is the norm that a few big players dominate entire product categories and set prices. One market in particular—the labor market—needed centuries of coercion and dispossession to turn peasants and farmers into workers willing to sell their labor for a wage. Frequently, supply and demand do not reach equilibrium; as a result, the market system regularly leads to crises of overproduction, which in turn provoke recessions and depressions, with wrenching consequences for millions of people. The market's inherently competitive mechanisms catalyze, take advantage of, and exacerbate a range of inegalitarian prejudices based on identity (race, gender, sexuality and so on); lead to disruption of ecosystem services upon which humans depend; and drive militarist rivalry between nations that precipitates colonization, gives rise to imperialism, and

ultimately triggers wars. While the real world is often one of messy disequilibrium, of prices created by fiat rather than emerging from the competitive ether—and, as we'll see, one configured by capitalists who plan—it remains one where markets determine much of our economic, and thereby social, life.

In general, criticisms of the current way of doing things propose that the market be replaced, or at least reined in. But if allocation does not proceed via the market, then it will occur via economic planning, also known as "direct allocation"—made not by the "invisible hand" but by very visible humans. Indeed, this form of planned allocation already takes place widely in our current system, on the part of elected and unelected individuals alike, by both states and private enterprises, and in centralized and decentralized forms. Even arch-capitalist America is home not only to Walmart and Amazon, but also to the Pentagon: in spite of being incredibly destructive, the US Department of Defense is the single-largest employer in the world, and a centrally planned public sector operation. In fact, almost all countries are mixed economies that include various combinations of markets and planning.

Indeed, planning has accompanied human societies as long as they have existed. Thousands of years ago, the civilizations of ancient Mesopotamia created a nexus of economic institutions that connected the workshops and temples of the cities to peasant agricultural production in the countryside. The Third Dynasty of Ur (Ur III), which flourished around the Tigris and Euphrates Rivers near the end of the third millennium BCE, was among the first to make the breakthrough to widespread permanent record keeping. Clay tablets from Ur III include predictions of crop yields based on averages of soil quality, themselves derived from years of record keeping. Even though the economy was still at the mercy of uncontrollable weather, it could be managed at a rudimentary level. With the advent of detailed accounts, expectations and approximations—both crucial to planning—became features of economic life. Unlike the localized gift-exchange economy of prehistory, ancient Mesopotamia saw systems of centralized redistribution that mimic today's welfare states: taxes and levies in, transfers of goods and services out.

Alongside writing and mathematics, building blocks of civilization that developed in tandem with economic record keeping, the ancients also developed money—only not in the way some economists imagine. In an oft-repeated passage from *The Wealth of Nations*, Adam Smith wrote that "the propensity to truck, barter, and exchange one thing for another" led to the division of labor, the invention of money and greater economic complexity. This bit of make-believe has been passed down for centuries and can still be found in most introductory economics textbooks. The problem with this intriguing tale is that it is false. Specialization developed within large household compounds where there was no internal exchange; heads of households distributed total household production among members—they *planned*. Money, on the other hand, arose largely as a tool for traders, mercenaries and others to settle debts with the ancient temples. As economic complexity grew, money was more widely adopted as a means of keeping track of taxes and other major transactions. Some prices floated in extraordinary times: for example, the price of grain during a very bad harvest. Most of the time, however, prices were highly standardized.

Early planning and early money worked in synergy. In Babylon, for example, one *mina* of silver was divided into sixty shekels, corresponding to one *gur* of barley divided into sixty *kur*. Each kur was a half-day ration of food given to workers. So one gur was a monthly ration worth one mina (under a standardized calendar of thirty-day months, with a New Year festival lasting a few days to realign with the solar year). Such easy equivalencies simplified account keeping and planning.

Increasingly complex economic record-keeping, accounting and social institutions all point to early ancient civilizations producing something that cannot but be described as economic calculation and planning. This is not to say there was some Arcadia of central planning at this time, any more than it is accurate to describe hunter-gatherer society as some peaceful egalitarian Eden. The planning of the ancients was not only rudimentary and partial; it was also far from being a rational way of securing the shared benefit of all. Indeed, ancient planning was at the service of an economic system created for the benefit of a small coterie of elites who were motivated to maintain their wealth and power. Sound familiar?

Despite the persistent inequalities that stretch back to the Ancient World, there are nevertheless reasons for hope today, including the millions whose curiosity has been piqued by references to socialism by Vermont Senator Bernie Sanders during the 2016 presidential primary, and more recently by a series of contenders for political office across the United States. In the UK too, as of this writing, an unabashed socialist, Jeremy Corbyn, heads Her Majesty's Loyal Opposition. As the political debate becomes more polarized, young people on the whole, even in the Anglo-American center of the capitalist order, now view socialism more favorably than they do capitalism. Across Europe, far-left parties that proffer a rhetoric that endorses socialism, or at least some other way of doing things than business-as-usual capitalism—from Syriza in Greece to Die Linke in Germany and Podemos in Spain—are chasing the traditional social democratic parties and in some places eclipsing them, albeit with a widely varying mixture of success. And while Latin America's Left has recently experienced electoral losses, leftists across that continent have been experimenting with old and new socialist ideas, both within and outside of government.

There is not only a crying need for us to talk about what that alternative to the market would be, but also a great deal of confusion about what planning is and its history. To take one example: China appears to be the last man standing in the global economy; its growth rates, even if they have declined recently from eye popping to merely gobsmacking, have been achieved through an admixture of free market mechanisms and very heavy shepherding by authoritarian central planners. It seems even some members of the ascendant bourgeoisie in that country believe that Mao's economic planning was less mistaken than premature. A 2018 *Financial Times* feature describes Jack Ma, founder of the Chinese e-commerce colossus Alibaba Group, as part of a growing movement in the People's Republic who argue that "the fatal flaw of state planning was simply that planners did not have enough information to make good decisions." He and his co-thinkers believe that "big data" can solve this problem. But is this what we mean when we talk about an alternative?

Even though it has been more than a quarter century since the end of the Cold War, anyone who questions the outcomes of the free market is immediately pounced upon as an apologist for the Soviet Union and its satellites—failed authoritarian regimes that were indeed planned economies. Doesn't their collapse, following decades of economic decline, show that planning does not work?

These questions are far from academic. In such volatile times, it cannot be ruled out that a socialist candidate or party might soon form a government in the capitalist heartlands. If they do not take pains to sketch out ahead of time what an alternative to the market might look like, those involved will inevitably fall back on versions of what they already know. The capitalist-realist earworm, like the Ceti eel in *Star Trek II: The Wrath of Khan*, remains wrapped around our cerebral cortex, foreclosing the possibility of transformation even at the moment of its realization.

The time, then, is as ripe as browning avocados on toast to uncover a very old conversation: a long-standing but largely forgotten argument over the question of planning.

Our aim is not to offer a comprehensive, definitive survey of this almost century-long discussion, which economists refer to as the "economic calculation debate" (or "socialist calculation debate")—whether it is mathematically and physically possible to plan an economy, and whether this is desirable—but to provide a plain-language, hopefully even enjoyable, introduction for the uninitiated. In the main, we aim here to bring together and make more easily comprehensible ideas and findings that have been forgotten or are otherwise jargon filled, mathematical, or computer-science-oriented, or which lie buried in the pages of little-read operations-research or business-management journals. Thus, we lean heavily on the work of economic historians, computer scientists and scholars of commerce. In writing a primer on planning, and on the challenge of logistics and economic calculation, we hope to take this vital debate down from moldering academy shelves and reintroduce it into the field of live political combat.

Above all, our goal with this brief text is simply to flag a rarely recognized, yet obvious, fact that in some sense makes the "calculation debate" anachronistic: it is already the case that great swaths of the global economy exist outside the market and are planned. Walmart is a prime example. Thus the question as to whether planning can exist at large scales without crippling economic inefficiencies could be moot. The caveat is that such vast, centrally planned enterprises—and they are so vast that we should really call them centrally planned *economies*—are not planned in any democratic fashion.

Although it may not sound sexy, our contention is this: When we say we want an equal society, what we're fighting for is democratic planning. There is no machine that can simply be taken over, run by new operators but otherwise left unchanged; but there is a foundation of planning that a more just society could surely take up and make its own.

This is not so much a book about a future society, but one about our own. We plan. And it works.

2

COULD WALMART BE A SECRET SOCIALIST PLOT?

Could Walmart be a secret socialist plot? This is, in effect, the question that Fredric Jameson, American literary critic, Marxist political theorist, and cheeky devil, all too briefly poses in a footnote to his 2005 volume *Archaeologies of the Future*, a discussion of the nature of utopia in the age of globalization. Since the demise of post-war technological optimism in the '70s, Jameson finds that the once robust tradition of utopian thinking has waned considerably; the bare handful of fresh utopias that he identifies as having emerged—be it cyberpunk aesthetics or the cheerleading for corporate-led globalization—appear wholly unimaginative in comparison to their promethean and modernist predecessors, who did not content themselves to merely transform realms of communication and information the way contemporary utopians might. These are mere sectoral concerns, he says, rather than grander, society-wide ambitions; they are not comprehensive utopias.

Today's soi-disant utopians take little advantage of the genuinely new, what Jameson calls "properly utopian," resources available now. Bits of a better world that we could exploit are already sprouting up yet no one seems to have noticed them. In a brief footnote, gleefully poking at the progressive consensus that regards Walmart as a globe-barnacling chain of retail hypermarkets, the Galactus of capitalism, the beau idéal—perhaps more so even than Goldman Sachs—of everything that is wrong with everything that is wrong, Jameson wonders whether we might in fact be missing a trick about this transcontinental marvel of planning and logistics:

> The literary utopists have scarcely kept pace with the businessmen in the process of imagination and construction … ignoring a global infrastructural deployment in which, from this quite different perspective, the Walmart celebrated by Friedman becomes the very anticipatory prototype of some new form of socialism for which the reproach of centralization now proves historically misplaced and irrelevant. It is in any case certainly a revolutionary reorganization of capitalist production, and some acknowledgment such as "Waltonism" or "Walmartification" would be a more appropriate name for this new stage.

But beyond these comments, the provocation is not fully developed. He lets the suggestion just hang there until the publication five years later of an essay on the subject: "Walmart as Utopia." Here, he insists more full-throatedly that Walmart is not merely a useful institution from which, "after the revolution," progressives could (per Lenin) "lop off what capitalistically mutilates this excellent apparatus." It is not residual of the old society, he says, but rather something truly emergent of the new one yet to be born. Walmart is "the shape of a Utopian future looming through the mist, which we must seize as an opportunity to exercise the Utopian imagination more fully, rather than an occasion for moralizing judgments or regressive nostalgia."

This is no contrarian "edgelord" rustling of jimmies, performed simply for the lulz; Jameson is

genuinely fascinated with the emergence of this novel entity that is resistant to easy categorization. He compares it to the discovery of a new species of organism, or of a new strain of virus. He delights at the apparent contradiction of how the largest company in the world, even in its full-spectrum dominance—indeed precisely because of this omnipotence—is described by admiring, horrified business writers as a boa constrictor slowly but inexorably strangling market capitalism.

But even here, Jameson is still mostly interested in using Walmart as a thought experiment—a demonstration of "the dialectical character of the new reality," and an example of the notion within dialectics of the unity of opposites: the firm as "the purest expression of that dynamic of capitalism which devours itself, which abolishes the market by means of the market itself."

Such philosophical arabesques are more than worthwhile, but we are curious about something perhaps a measure more concrete. We want to take Jameson's provocation beyond a footnote or a thought experiment and, in the light of what we know about Walmart's operations, revisit a nearly century-old argument between those who favored socialism and those who asserted that capitalism offered the best of all possible worlds. For beneath the threadbare cliché of the maxim that socialism is "fine in theory, but impossible in practice," there in fact lie claims about economic planning, and about how to calculate an egalitarian distribution of goods and services without need for markets. Furthermore, the appearance that these claims have been settled by the failure of the undemocratic Soviet Union and its satellites is merely superficial. And counterintuitive as it may seem at first, the no less undemocratic Walmart, and a handful of other examples we will consider, offer powerful encouragement to the socialist hypothesis that a planned economy—this time democratically coordinated by ordinary working people, rather than by bureaucrats or bosses—is not merely feasible, but more efficient than the market.

But before we begin to explain how Walmart is the answer, we first have to ask: What is the question?

The Socialist Calculation Debate

Since the neoliberal revolution of the 1970s and its acceleration following the end of the Cold War, economic planning at scale has been widely derided from right to center-left, and planned endeavors such as public healthcare have been under attack from marketization in most countries. In most jurisdictions, the electricity systems that were once in public hands have long since been privatized; therefore governments committed to efforts to decarbonize electricity companies have had little choice but to employ market mechanisms such as emissions trading or carbon taxation, rather than reducing greenhouse gas emissions via democratic fiat—that is, simply ordering the electricity provider to switch to non-emitting fuel sources. Almost everywhere, transportation, communication, education, prisons, policing and even emergency services are being spun off wholly or in part from the public sector and provided instead by market actors. Only the armed forces remain a state monopoly, and here only up to a point, given the rise of private security multinationals such as the notorious G4S and Blackwater (rebranded as Academi since 2011). The handful of social democratic and liberal parties that still defend public healthcare and public education do so while making vague assertions that "government has a role to play" or that "government can be a force for good." But they don't really say *why*; and in any case, this is making a case more for the state, rather than for planning per se, even though "the state" and "planning" are far from synonymous. Social democrats today will argue for a mixed economy, or for a mixture of state planning and the market—but again, they do so

without saying why. If planning is superior, then why not plan everything? But if some goods and services are better produced by the market than by planning, then what are the attributes of these particular goods and services that make them so? All this activity and argument empty of actual argument reflects a set of policies enacting surrender to an unchangeable status quo, the architects of which only retroactively attempt to transform such capitulation into a coherent ideology. For much of social democracy in the twenty-first century, beliefs follow from policies, rather than policies from beliefs. And while those centrists and conservatives who cheerlead the market stop short of advocating a world where *everything* is allocated via markets, they still do not offer arguments explaining why their preferred admixture of market and planning is superior. When challenged, they simply describe the current state of affairs: "No economy is completely planned or completely market-based." Well, plainly this is true. But again, this gives no explanation as to why their favored configuration is optimal.

Perhaps this is understandable. The endeavors that epitomized planning—those of the Soviet Union and its satellites—collapsed in the face of popular opposition, economic stagnation, a militarily superior geopolitical rival, and a leadership that had all but ceased to believe in its own system. The other major Stalinist power, the People's Republic of China, steered away from state ownership, liberalized its economy, and is now the world's second superpower, while what remains of other Communist-with-a-capital-C states such as Vietnam and Cuba are following in China's wake. It seems, at first glance, almost manifest that the market won the Cold War and that planning lost.

Yet if the market is conclusively, unassailably, incontestably the optimum mechanism for the allocation of goods and services, then why have the economies of Western nations continued to experience mismatches between what is produced and what is required—mismatches that have led to severe recessions and near-catastrophic economic crises since 1991? Why was the global economy barely (and likely temporarily) saved from a Depression-scale collapse in investment in 2008, not by market mechanisms, but as a result of (modest) Keynesian pump priming? What is the source of economic stagnation since the Great Recession? Why, after three decades of steady decreases in inequality in the West in the post-war period leading up to the 1970s, has inequality in the developed countries grown over the last forty years, triggering an explosion in popular anger, along with hard-right reaction, in country after country? Why has infrastructure crumbled and innovation stalled? Why can't the market resolve what is perhaps the greatest threat to modernity, microbial resistance to antibiotics—a situation that risks casting medicine back to the Victorian era—whereas a public sector effort likely could? And why can't the market, left to its own devices, meet the civilizationally existential challenge of climate change?

So the question of market versus planning should appear as unresolved as ever.

In the early decades of the last century, the question of whether the market or planning is the optimal mechanism for the allocation of goods and services was widely accepted as unanswered. In the 1920s and 1930s, left-wing economists influenced by Marxism, on the one hand, and right-wing economists of the neoclassical Austrian School, on the other, were engaged in a vigorous discussion —subsequently known as the "economic calculation problem," or the "socialist calculation debate"—over whether economic planning at scale was feasible. At the time, neoclassicals were not arguing from a position of ideological hegemony. The Soviet Union had recently been established, and the war efforts of both the Allies and the Central Powers were expansive exercises in central planning. By the 1930s, the Bolsheviks had rapidly launched a feudal Russia into electrified, industrial modernity, while few outside the country were aware of the extent of Stalin's crimes, meaning economists who would criticize planning would have to counter what appeared to be

substantial evidence in its favor. As a result, partisans on both sides took the idea of planning seriously, and the Austrians had to work hard to try to prove their point, to show how economic planning was an impossibility.

Viennese mathematician, positivist philosopher and political economist Otto Neurath instigated the "calculation debate" in a series of articles following his experiences as head of the Department of War Economy in the German Empire's War Ministry. A polymath who had studied mathematics, physics, philosophy and history, his doctorate was in the history of economics, alighting in particular on the non-monetary economy of ancient Egypt. An investigation of the 1912–13 Balkan Wars led him to conclude that war economies are "economies in kind," or what he termed "natural economies." Natural economies are those in which money and markets play no role in the allocation of goods; there is no common unit of calculation, no price, and accounting instead takes place in terms of a good or service's usefulness, described vis-àvis the magnitude of its physical properties. Neurath was also impressed by the ministry's extensive use of planning during the Great War.

During the socialist November Revolution of 1918, which would succeed at toppling the German Empire, Neurath helped draft a plan for the socialization of the economy of Saxony. Although never a prominent theoretician with the Austrian Social Democratic Party, he believed the upheaval would give him a chance to attempt a practical application of his ideas. He gave speeches on his concepts to mass meetings of miners in the south of the German province, speeches described by his friend and collaborator Wolfgang Schumann as "triumphal processions." While at this time many left-wing political groups vied for power across Europe, few of them, including the Bolsheviks in Russia, had developed any schemes for the construction of a socialist society beyond slogans calling for an overthrow of the bosses and the free association of the producers. Now that the bosses were gone, how would this free association work? Many called for socialism, but few could describe in detail what that might look like. Neurath, however, began to venture beyond slogans and yearnings to give concrete form to socialism. As a result of the impression Neurath had made, the Social Democratic president of Bavaria, Johannes Hoffmann, asked him to craft and implement a central planning office for this region as well. Upon arrival, he found little more than chaos: no staff, no office, not even a typewriter. Nevertheless, Neurath and his collaborators managed to produce the first working units for economic planning, along with more leaflets and lectures to popularize the concepts. Soon after, revolutionaries declared Bavaria a soviet (or "council") republic, but the experiment was short lived. In May 1919, the rightist mercenaries of the Freikorps—a precursor of the Nazis—entered Munich and crushed the council government, killing some 1,000 in ferocious street fighting and a further 700 via summary execution. Neurath was arrested and condemned to eighteen months imprisonment in Germany, but he was ultimately spared in an exchange with the Austrian government orchestrated by Austria's then–Social Democratic foreign secretary (and Marxist theoretician), Otto Bauer.

Neurath continued to be an active participant in Viennese socialist politics long after the defeat of the Bavarian soviet, participating in the development of adult education and the city's famously successful experiments in social housing. But ultimately he would become best known for cofounding the Vienna Circle, a group of like-minded scientists and philosophers who contributed to the philosophical movement of logical positivism—in essence an update of nineteenth-century positivism (the assertion that all authoritative knowledge is the product of sensory experience interpreted through reason) that argued for a "scientific conception of the world." He also became known for a concept he called the "unity of science": the idea that common scientific laws apply everywhere and at all levels of organization, including the social and even artistic ones.

But this call for a conciliation between different fields of knowledge was no defeatist departure

from the political realm, still less from his notions of socialist economic planning. Neurath's plans for full socialization had been built upon theories of natural (non-monetary) economies and sought to bring different types of knowledge together in order to understand and predict the complexities of the social realm—"empirical sociology," as he described it. In order to achieve economic efficiency while avoiding social inequity, the organizing structure of the new society would have to be rigorously scientific in its predictions of socioeconomic interactions. In other words, Neurath's argument for the "unity of science" flowed out of his recognition of the informational needs of nonmarket economies.

But while Neurath's economic ideas today rest little better than obscure, Ludwig von Mises, Austrian School economist and hero of latter-day neoliberals, took them as deadly serious, in so doing, launching the first counter-volley of the calculation debate. In the seminal 1920 essay "Economic Calculation in the Socialist Commonwealth," Mises went beyond what by this period was already a longstanding ethical argument against socialism: that under such a system, there would be no incentive to work and therefore no drive toward excellence. In this short text, Mises instead posed the following questions: In any economy larger than the primitive family level, how could socialist planning boards know which products to produce, how much of each should be produced at each stage, and which raw materials should be used and how much of them? Where should production be located, and which production process was most efficient? How would they gather and calculate this vast array of information, and how could it then be retransmitted back to all actors in the economy? The answer, he said, is that the mammoth scale of information needed—for producers, consumers and every actor in between, and for every stage and location of production of the multitude of products needed in society—is beyond the capacity of such planning boards. No human process could possibly gather all the necessary data, assess it in real time, and produce plans that accurately describe supply and demand across all sectors. Therefore, any economy the size of an entire country that tried to replace the myriad decisions from the multitude of sovereign consumers with the plans of bureaucrats working from incorrigibly flawed data would regularly produce vast, chasm-like mismatches between what is demanded and what is supplied. These inefficiencies would result in such social and economic barbarities—shortages, starvation, frustration and chaos—that even if one accepts the inevitability of inequalities and attendant myriad other horrors of capitalism, the market will still appear benign by comparison.

Meanwhile, Mises argued that the extraordinarily simple mechanism of prices in the market, reflecting the supply and demand of resources, already contains all this information. Every aspect of production—from the cost of all inputs at all times, to the locations of inputs and products, and the changing demands and taste of purchasers—is implicitly captured by price.

But if prices in the market are so much more uncomplicated, effortless and manageable, then why don't we just stick with them?

Mises's argument in his 1920 essay, later developed through a series of books, is described to this day by his acolytes as his masterpiece. And not without reason: it is perhaps the strongest argument ever mounted against the idea of socialism. How, indeed, could we replace prices with planning boards? And isn't socialism supposed to be direct rule by the workers, rather than a replacement of unelected bosses with remote bureaucrats? If centralized by bureaucrats, how could all that information be gathered? And if decentralized, how could all those millions (and globally, billions) of workers democratically coordinate production decisions?

Neurath, for his part, insisted that prices in the market, as descriptors for behavior in an economy,

are no less corrupted by this loss of fidelity because they fail to capture sufficient information on the material circumstances of citizens and fail to describe adequately all the costs or benefits of actions. In a system with market-based provision of healthcare, for instance, price does not describe information on inability to access healthcare, just as price does not reflect the impact of greenhouse gas emissions on the average temperature of the planet.

There is much more to the calculation debate, and we'll briefly outline some of the additional mathematical and computational aspects later on, but for now this theoretical standoff should suffice. It is enough to know that as a result of this impasse, depending on our political persuasions, we have opted either for the information imperfections of the market, or for the information imperfections of planning, without ever resolving the debate. The stalemate could even be tweeted in less than 140 characters: "What about data imperfections leading to shortages?" "Oh yeah? Well what about data imperfections leading to injustices?"

Thus we are stuck. Or so it has seemed for a long time.

Planning in Practice

Mises appeared to many to have turned on its head the aphorism that "Socialism works in theory, but not in practice." He convinced many that planning did not even work in theory. The calculation problem appeared to be socialism's theoretical Achilles' heel.

If something works in theory but not in practice, then there is usually something wrong with the theory. But it is equally true that if something in theory does not work, but in practice it does, then again, something must be wrong with the theory. And here is where the villainous Walmart enters our story. Walmart is perhaps the best evidence we have that while planning appears not to work in Mises's theory, it certainly does in practice. And then some.

Founder Sam Walton opened his first store, Wal-Mart Discount City, on July 2, 1962, in the non-city of Rogers, Arkansas, population 5,700. From that clichédly humble, East Bumphuck beginning, Walmart has gone on to become the largest company in the world, enjoying eye-watering, People's Republic of China–sized cumulative average growth rates of 8 percent during its five and a half decades. Today, it employs more workers than any other private firm; if we include state enterprises in our ranking, it is the world's third-largest employer after the US Department of Defense and the People's Liberation Army. If it were a country—let's call it the People's Republic of Walmart—its economy would be roughly the size of a Sweden or a Switzerland. Using the 2015 World Bank country-by-country comparison of purchasing-power parity GDP, we could place it as the 38th largest economy in the world.

Yet while the company operates within the market, internally, as in any other firm, everything is planned. There is no internal market. The different departments, stores, trucks and suppliers do not compete against each other in a market; everything is coordinated. Walmart is not merely a planned economy, but a planned economy on the scale of the USSR smack in the middle of the Cold War. (In 1970, Soviet GDP clocked in at about $800 billion in today's money, then the second-largest economy in the world; Walmart's 2017 revenue was $485 billion.)

As we will see, Walmart's suppliers cannot really be considered external entities, so the full extent of its planned economy is larger still. According to *Supply Chain Digest*, that business-management periodical more engrossing than a *Vice* exposé on the furry-fetish web-porn habits of the leadership of ISIS, Walmart stocks products from more than seventy nations, operating some 11,000

stores in twenty-seven countries. TradeGecko, an inventory-management software firm, describes the Walmart system as "one of history's greatest logistical and operational triumphs." They're not wrong. As a planned economy, it's beating the Soviet Union at its height before stagnation set in.

Yet if Mises and friends were right, then Walmart should not exist. The firm should long since have hit their wall of too many calculations to make. Moreover, Walmart is not unique; there are hundreds of multinational companies whose size is on the same order of magnitude as Sam Walton's behemoth, and they too are all, at least internally, planned economies.

Business writers in awe of the company say that the logistical success is ultimately a product of the obsession of Sam Walton (reputedly an inveterate cheapskate) with cost savings, even minor ones, and his use of this advantage to lower prices, increase volume, and thus enable still further cost savings via expanding economies of scale. While such cost savings are a necessity for all companies, perhaps Walton's single-minded-ness in this regard played some role beyond the usual. What we can say is that the company made a turn toward modern logistics long before many other large firms, and that it has been a trailblazer in logistics innovations that drive down costs.

In 1970, the company opened its first distribution center, and five years later, the company leased an IBM 370/135 computer system to coordinate stock control, making it one of the first retailers to electronically link up store and warehouse inventories. It may seem strange now, but prior to this time, stores were largely stocked directly by vendors and wholesalers, rather than using distributors. Large retailers sell thousands of products from thousands of vendors. But direct stockage—sending each product directly to each store—was profoundly inefficient, leading to regular over-or understocks. Even smaller retailers, who cannot afford their own distribution centers, today find it more efficient to outsource distribution center functions to a logistics firm that provides this service for multiple companies.

Think of when you go to your favorite indie vinyl-revival record shop, and the eyebrow-raising Jack Black–in–*High Fidelity* shop assistant says they cannot get a particular record because their distributor does not carry that album, and you think to yourself, "But I know this record is available; it came out last month on Hello Kitty Pencil Case Records!"—that's why logistical outsourcing happens. It would be far too expensive in terms of labor costs for one tiny store to be able to maintain a commercial relationship with thousands of record labels, and vice versa; but that store can have a relationship with, say, five distributors, each of whom have a relationship with, say, a hundred labels. The use of distributors also minimizes inventory costs while maximizing the variety that a store can offer, at the same time offering everyone along the supply chain a more accurate knowledge of demand. So while your local shop may not carry albums from Hello Kitty Pencil Case Records, via the banal magic of distributors, your tiny local shop will have a relationship with more record labels than they otherwise could.

In 1988, Procter & Gamble, the detergents and toiletries giant, introduced the stocking technique of continuous replenishment, partnering first with Schnuck Markets, a chain of St. Louis grocery stores. Their next step was to find a large firm to adopt the idea, and they initially shopped it to Kmart, which was not convinced. Walmart, however, embraced the concept, and thus it was that the company's path to global domination truly began.

"Continuous replenishment" is a bit of a misnomer, as the system actually provides merely very frequent restocking (from the supplier to the distributor and thence the retailer), in which the decision on the amount and the timing of replenishment lies with the supplier, not the retailer. Again, you might be asking, how is this an innovation, and why would it make such a difference? (You might also be

asking: Why does it now seem like I'm reading a god-awful, capitalism-fellating airport business book? Suck it up. Socialism is all about logistics, comrade.)

The technique, a type of vendor-managed inventory, works to minimize what businesses call the "bullwhip effect," the free market's kissing cousin to Stalinism's shortage problem. First identified in 1961, the bullwhip effect describes the phenomenon of increasingly wild swings in mismatched inventories against product demand the further one moves along the supply chain toward the producer, ultimately extending to the company's extraction of raw materials. Therein, any slight change in customer demand reveals a discord between what the store has and what the customers want, meaning there is either too much stock or too little.

To illustrate the bullwhip effect, let's consider the "too-little" case (although the phenomenon works identically in either scenario). The store readjusts its orders from the distributor to meet the increase in customer demand. But by this time, the distributor has already bought a certain amount of supply from the wholesaler, and so it has to readjust its own orders from the wholesaler—and so on, through to the manufacturer and the producer of the raw materials. Because customer demand is often fickle and its prediction involves some inaccuracy, businesses will carry an inventory buffer called "safety stock." Moving up the chain, each node will observe greater fluctuations, and thus greater requirements for safety stock. One analysis performed in the 1990s assessed the scale of the problem to be considerable: a fluctuation at the customer end of just 5 percent (up or down) will be interpreted by other supply chain participants as a shift in demand of up to 40 percent.

Just like the wave that travels along an actual bullwhip following a small flick of the wrist, a small change in behavior at one end results in massive swings at the other. Data in the system loses its fidelity to real-world demand, and the further you move away from the consumer, the more unpredictable demand appears to be. This unpredictability in either direction is a major contributing factor to economic crisis as companies struggle (or fail) to cope with situations of overproduction, having produced much more than they predicted would be demanded and being unable to sell what they have produced above its cost. Insufficient stock can be just as disruptive as overstock, leading to panic buying, reduced trustworthiness by customers, contractual penalties, increased costs resulting from training and layoffs (due to unnecessary hiring and firing), and ultimately loss of contracts, which can sink a company. While there is of course a great deal more to economic crisis than the bullwhip effect, the inefficiencies and failures produced by the bullwhip effect can be key causes, rippling throughout the system and producing instability in other sectors. Even with modest cases of the bullwhip effect, preventing such distortions can allow reduced inventory, reduced administration costs, and improved customer service and customer loyalty ("The product you want is right here, ma'am! No need to keep checking other stores! You can always trust us to have what you want. Make sure you come back to us first next time!"), ultimately delivering greater profits.

But there's a catch—a big one for those who defend the market as the optimal mechanism for allocation of resources: the bullwhip effect is, in principle, *eliminated* if all orders match demand perfectly for any period. And the greater the transparency of information throughout the supply chain, the closer this result comes to being achieved. Thus, planning, and above all trust, openness and cooperation along the supply chain—rather than competition—are fundamental to continuous replacement. This is not the "kumbaya" analysis of two socialist writers; even the most hard-hearted commerce researchers and company directors argue that a prerequisite of successful supply chain management is that all participants in the chain recognize that they all will gain more by cooperating as a trusting, information-sharing whole than they will as competitors.

The seller, for example, is in effect telling the buyer how much he will buy. The retailer has to trust the supplier with restocking decisions. Manufacturers are responsible for managing inventories in Walmart's warehouses. Walmart and its suppliers have to agree when promotions will happen and by how much, so that increased sales are recognized as an effect of a sale or marketing effort, and not necessarily as a big boost in demand. And all supply chain participants have to implement data-sharing technologies that allow for realtime flow of sales data, distribution center withdrawals and other logistical information so that everyone in the chain can rapidly make adjustments.

We hear a lot about how Walmart crushes suppliers into delivering at a particular price point, as the company is so vast that it is worth it from the supplier's persepective to have the product stocked by the store. And this is true: Walmart engages in what it calls "strategic sourcing" to identify who can supply the behemoth at the volume and price needed. But once a supplier is in the club, there are significant advantages. (Or perhaps "in the club" is the wrong phrasing; "once a supplier is assimilated by the Walmart-Borg" might be better.) One is that the company sets in place long-term, high-volume strategic partnerships with most suppliers. The resulting data transparency and cross–supply chain planning decrease expenditures on merchandising, inventory, logistics, and transportation for all participants in the supply chain, not just for Walmart. While there are indeed financial transactions within the supply chain, resource allocation among Walmart's vast network of global suppliers, warehouses and retail stores is regularly described by business analysts as more akin to *behaving like a single firm*.

Flipping all this around, Hau Lee, a Stanford engineering and management science professor, describes how the reverse can happen within a single firm, to deleterious effect. Volvo at one point was stuck with a glut of green cars. So the marketing department came up with an advertising and sales wheeze that was successful in provoking more purchases by consumers and reducing the inventory surplus. But they never told manufacturing, and so seeing the boost in sales, manufacturing thought there had been an increase in demand for green cars and cranked up production of the very thing that sales had been trying to offload.

The same phenomenon occurs in retail as much as it does manufacturing (and manufacturing is merely another link within the retail supply chain anyway), with Toyota being one of the first firms to implement intra- and inter-firm information visibility through its Walmart-like "Kanban" system, although the origin of this strategy dates as far back as the 1940s. While Walmart was pivotal in development of supply chain management, there are few large companies that have not copied its practices via some form of cross–supply chain visibility and planning, extending the planning that happens within a firm very widely throughout the capitalist "marketplace."

Nevertheless, Walmart may just be the most dedicated follower of this "firmification" of supply chains. In the 1980s, the company began dealing directly with manufacturers to reduce the number of links within, and to more efficiently oversee, the supply chain. In 1995, Walmart further ramped up its cooperative supply chain approach under the moniker Collaborative Planning, Forecasting and Replenishment (CPFR), in which all nodes in the chain collaboratively synchronize their forecasts and activities. As technology has advanced, the company has used CPFR to further enhance supply chain cooperation, from being the first to implement company-wide use of universal product bar codes to its more troubled relationship with radio-frequency ID tagging. Its gargantuan, satellite-connected Retail Link database connects demand forecasts with suppliers and distributes real-time sales data from cash registers all along the supply chain. Analysts describe how stockage and manufacture is "pulled," almost moment-to-moment, by the consumer, rather than "pushed" by the company onto shelves. All of this hints at how economic planning on a massive scale is being

realized in practice with the assistance of technological advance, even as the wrangling of its infinities of data—according to Mises and his co-thinkers in the calculation debate—are supposed to be impossible to overcome.

Sears's Randian Dystopia

It is no small irony that one of Walmart's main competitors, the venerable, 120-plus-year-old Sears, Roebuck & Company, destroyed itself by embracing the exact opposite of Walmart's galloping socialization of production and distribution: by instituting an internal market.

The Sears Holdings Corporation reported losses of some $2 billion in 2016, and some $10.4 billion in total since 2011, the last year that the business turned a profit. In the spring of 2017, it was in the midst of closing another 150 stores, in addition to the 2,125 already shuttered since 2010—more than half its operation—and had publicly acknowledged "substantial doubt" that it would be able to keep any of its doors open for much longer. The stores that remain open, often behind boarded-up windows, have the doleful air of late-Soviet retail desolation: leaking ceilings, inoperative escalators, acres of empty shelves, and aisles shambolically strewn with abandoned cardboard boxes half-filled with merchandise. A solitary brand-new size-9 black sneaker lies lonesome and boxless on the ground, its partner neither on a shelf nor in a storeroom. Such employees as remain have taken to hanging bedsheets as screens to hide derelict sections from customers.

The company has certainly suffered in the way that many other brick-and-mortar outlets have in the face of the challenge from discounters such as Walmart and from online retailers like Amazon. But the consensus among the business press and dozens of very bitter former executives is that the overriding cause of Sears's malaise is the disastrous decision by the company's chairman and CEO, Edward Lampert, to disaggregate the company's different divisions into competing units: to create an internal market.

From a capitalist perspective, the move appears to make sense. As business leaders never tire of telling us, the free market is the fount of all wealth in modern society. Competition between private companies is the primary driver of innovation, productivity and growth. Greed is good, per Gordon Gekko's oft-quoted imperative from *Wall Street*. So one can be excused for wondering why it is, if the market is indeed as powerfully efficient and productive as they say, that all companies did not long ago adopt the market as an internal model.

Lampert, libertarian and fan of the laissez-faire egotism of Russian American novelist Ayn Rand, had made his way from working in warehouses as a teenager, via a spell with Goldman Sachs, to managing a $15 billion hedge fund by the age of 41. The wunderkind was hailed as the Steve Jobs of the investment world. In 2003, the fund he managed, ESL Investments, took over the bankrupt discount retail chain Kmart (launched the same year as Walmart). A year later, he parlayed this into a $12 billion buyout of a stagnating (but by no means troubled) Sears.

At first, the familiar strategy of merciless, life-destroying post-acquisition cost cutting and layoffs did manage to turn around the fortunes of the merged Kmart-Sears, now operating as Sears Holdings. But Lampert's big wheeze went well beyond the usual corporate raider tales of asset stripping, consolidation and chopping-block use of operations as a vehicle to generate cash for investments elsewhere. Lampert intended to use Sears as a grand free market experiment to show that the invisible hand would outperform the central planning typical of any firm.

He radically restructured operations, splitting the company into thirty, and later forty, different

units that were to compete against each other. Instead of cooperating, as in a normal firm, divisions such as apparel, tools, appliances, human resources, IT and branding were now in essence to operate as autonomous businesses, each with their own president, board of directors, chief marketing officer and statement of profit or loss. An eye-popping 2013 series of interviews by *Bloomberg Businessweek* investigative journalist Mina Kimes with some forty former executives described Lampert's Randian calculus: "If the company's leaders were told to act selfishly, he argued, they would run their divisions in a rational manner, boosting overall performance."

He also believed that the new structure, called Sears Holdings Organization, Actions, and Responsibilities, or SOAR, would improve the quality of internal data, and in so doing that it would give the company an edge akin to statistician Paul Podesta's use of unconventional metrics at the Oakland Athletics baseball team (made famous by the book, and later film starring Brad Pitt, *Moneyball*). Lampert would go on to place Podesta on Sears's board of directors and hire Steven Levitt, coauthor of the pop neoliberal economics bestseller *Freakonomics*, as a consultant. Lampert was a laissez-faire true believer. He never seems to have got the memo that the story about the omnipotence of the free market was only ever supposed to be a tale told to frighten young children, and not to be taken seriously by any corporate executive.

And so if the apparel division wanted to use the services of IT or human resources, they had to sign contracts with them, or alternately to use outside contractors if it would improve the financial performance of the unit—regardless of whether it would improve the performance of the company as a whole. Kimes tells the story of how Sears's widely trusted appliance brand, Kenmore, was divided between the appliance division and the branding division. The former had to pay fees to the latter for any transaction. But selling non-Sears-branded appliances was more profitable to the appliances division, so they began to offer more prominent in-store placement to rivals of Kenmore products, undermining overall profitability. Its in-house tool brand, Craftsman—so ubiquitous an American trademark that it plays a pivotal role in a Neal Stephenson science fiction bestseller, *Seveneves*, 5,000 years in the future—refused to pay extra royalties to the in-house battery brand DieHard, so they went with an external provider, again indifferent to what this meant for the company's bottom line as a whole.

Executives would attach screen protectors to their laptops at meetings to prevent their colleagues from finding out what they were up to. Units would scrap over floor and shelf space for their products. Screaming matches between the chief marketing officers of the different divisions were common at meetings intended to agree on the content of the crucial weekly circular advertising specials. They would fight over key positioning, aiming to optimize their own unit's profits, even at another unit's expense, sometimes with grimly hilarious result. Kimes describes screwdrivers being advertised next to lingerie, and how the sporting goods division succeeded in getting the Doodle Bug mini-bike for young boys placed on the cover of the Mothers' Day edition of the circular. As for different divisions swallowing lower profits, or losses, on discounted goods in order to attract customers for other items, forget about it. One executive quoted in the Bloomberg investigation described the situation as "dysfunctionality at the highest level."

As profits collapsed, the divisions grew increasingly vicious toward each other, scrapping over what cash reserves remained. Squeezing profits still further was the duplication in labor, particularly with an increasingly top-heavy repetition of executive function by the now-competing units, which no longer had an interest in sharing costs for shared operations. With no company-wide interest in maintaining store infrastructure, something instead viewed as an externally imposed cost by each division, Sears's capital expenditure dwindled to less than 1 percent of revenue, a proportion much

lower than that of most other retailers.

Ultimately, the different units decided to simply take care of their own profits, the company as a whole be damned. One former executive, Shaunak Dave, described a culture of "warring tribes," and an elimination of cooperation and collaboration. One business press wag described Lampert's regime as "running Sears like the Coliseum." Kimes, for her part, wrote that if there were any book to which the model conformed, it was less *Atlas Shrugged* than it was *The Hunger Games*.

Thus, many who have abandoned ship describe the harebrained free market shenanigans of the man they call "Crazy Eddie" as a failed experiment for one reason above all else: the model kills cooperation.

"Organizations need a holistic strategy," according to the former head of the DieHard battery unit, Erik Rosenstrauch. Indeed they do. But is not society as a whole an organization? Is this lesson any less true for the global economy than it is for Sears? To take just one example: the continued combustion of coal, oil and gas may be a disaster for our species as a whole, but so long as it remains profitable for some of Eddie's "divisions," those responsible for extracting and processing fossil fuels, these will continue to act in a way that serves their particular interests, the rest of the company —or in this case the rest of society—be damned.

In the face of all this evidence, Lampert is, however, unrepentant, proclaiming, "Decentralised systems and structures work better than centralised ones because they produce better information over time." For him, the battles between divisions within Sears can only be a good thing. According to spokesman Steve Braithwaite, "Clashes for resources are a product of competition and advocacy, things that were sorely lacking before and are lacking in socialist economies."

He and those who are sticking with the plan seem to believe that the conventional model of the firm via planning amounts to communism. They are not entirely wrong.

Interestingly, the creation of SOAR was not the first time the company had played around with an internal market. Under an earlier leadership, the company had for a short time experimented along similar lines in the 1990s, but it quickly abandoned the disastrous approach after it produced only infighting and consumer confusion. There are a handful of other companies that also favor some version of internal market, but in general, according to former vice president of Sears, Gary Schettino, it "isn't a management strategy that's employed in a lot of places." Thus, the most ardent advocates of the free market—the captains of industry—prefer not to employ market-based allocation within their own organizations.

Just why this is so is a paradox that conservative economics has attempted to account for since the 1930s—an explanation that its adherents feel is watertight. But as we shall see in the next chapter, taken to its logical conclusion, their explanation of this phenomenon that lies at the very heart of capitalism once again provides an argument for planning the whole of the economy.

3

ISLANDS OF TYRANNY

Some years before the relatively obscure Marxist critic Frederic Jameson was fashioning utopian visions based on Walmart's internal planning, a much more mainstream figure, economist Herbert Simon, had a not dissimilar realization. A polymath, winner of both the Swedish National Bank's Prize in Economic Sciences in Memory of Alfred Nobel (widely but inaccurately described as the Nobel Prize in Economics) and the Turing Award (widely and comparatively more accurately described as the Nobel Prize for Computing), Simon in 1991 offered up the following thought experiment—one that might have seemed out of place to regular readers of the prestigious but orthodox *Journal of Economic Perspectives*:

> Suppose that [a mythical visitor from Mars] approaches the Earth from space, equipped with a telescope that reveals social structures. The firms reveal themselves, say, as solid green areas with faint interior contours marking out divisions and departments. Market transactions show as red lines connecting firms, forming a network in the spaces between them. Within firms (and perhaps even between them) the approaching visitor also sees pale blue lines, the lines of authority connecting bosses with various levels of workers. As our visitor looked more carefully at the scene beneath, it might see one of the green masses divide, as a firm divested itself of one of its divisions. Or it might see one green object gobble up another. At this distance, the departing golden parachutes would probably not be visible.
>
> No matter whether our visitor approached the United States or the Soviet Union, urban China or the European Community, the greater pan of the space below it would be within the green areas, for almost all of the inhabitants would be employees, hence inside the firm boundaries. Organizations would be the dominant feature of the landscape. A message sent back home, describing the scene, would speak of "large green areas interconnected by red lines." It would not likely speak of "a network of red lines connecting green spots."

Simon intended his tale of visiting Martians as a light chiding of his fellow economists for ignoring how pervasive authoritarian power relationships and planning actually are under capitalism. Planning was in fact almost everywhere you looked, even though the discipline of economics had largely spun tales even more fantastical than UFOs visiting Earth: the fairy story of a harmonious and self-regulating market economy. Yet there has always been a minority of economists, like Simon, who have dissented, recognizing the pervasiveness, a few even the promise, of planning.

Ronald Coase Asks Around

In the Depression year of 1931, a twenty-year-old British economics student arrived in Chicago to pursue an unusual research project. He was there to study something that at first glance appeared

utterly obvious; yet in reality it was anything but. Ronald Coase went to the United States to do something that, up to this point, few scholars in the still-young discipline of economics had cared to do: investigate how the firm, the black box at the heart of the economy, actually operated.

Coase's question was a simple one, but one to which the economics he had been taught didn't yet have an answer: "Why are there these 'islands of conscious power'? … If production is regulated by price movements [and] production could be carried on without any organization at all, well might we ask, why is there any organization?" In other words, if the market is the magic bullet to all human interaction, then even the simplest work tasks—from "stock this shelf" to "format this spreadsheet"—could theoretically be governed by prices on markets rather than by managers giving orders. Somewhat naively, Coase asked, why isn't everything bought and sold on its own little market? Why are there so many times more Walmarts than there are Sears? Why do companies—from mom-and-pop shops to corporate behemoths—even exist?

Noam Chomsky, the great linguist and lifelong critic of American foreign policy, had a pithy answer: Coase's "islands of conscious power" are also "islands of tyranny." Thus, economists are unwilling to pry open the black box of the firm because it holds capitalism's dirty secret. The market economy is not only rife with planning, but with *authoritarian* planning that concentrates economic decision making in the hands of wealth owners and keeps workers in line. Companies plan everything from how money is distributed between departments to the exact amount of time it should take to assemble a hamburger—and in every case, they plan which individual worker does which task, when, where and how. When you're on the clock, what the boss says goes.

Open nearly any introductory economics textbook, however, and the world appears as a nearly boundless realm of choice. Among the paeans to freedom and to the spontaneous efficiency of markets, few words even graze the everyday planning that goes on within the four walls of the firm. Fewer, still, name it as coercive. Planning under capitalism is about making people do things—without their input and not necessarily in their interest. At best, economists will bring up planning in order to ridicule it, failing, or refusing, to grasp its centrality even in a market system. Coase's seemingly naive questions start us on a path toward a corrective.

Coase, however, was no fellow traveler. While he had even flirted with socialist ideas in his youth, his economics education quickly turned him to the right (sadly, an all too common phenomenon). Coase argued that companies do all of this apparent in-house imitation of the Soviet Union simply because the cost is too high of leaving up to markets every last coordinating decision. This was quite a clever explanation for the dissonance between copious corporate planning within and throughout a free market system. Economists are fond of the saying that "there is no free lunch." Coase applied this to markets themselves. Markets introduce a whole web of what he called "transaction costs." Writing a contract, setting up a market or finding the best price all take up resources and time. So long as the cost of doing all this was cheaper in house than on the market (and it was), it was only rational to keep it in house. So the "free" market isn't really free either! Coase argued that it only makes sense that some decisions would be left to planning—a decision is made, and it is done. Planning is more efficient—though for Coase, only up to a certain point. Having completed his tour of American business and witnessed its inner workings, upon his return to Britain, he compiled his thoughts in a 1932 lecture to University of Dundee students little younger than himself, although it would be another five years before he published his results.

The resulting text, "The Nature of the Firm", features a quote from economist Dennis Robertson—a close collaborator of famed British macroeconomist John Maynard Keynes, and the originator of the

concept of the "liquidity trap"—in which Robertson talks of the curiosity of the very existence of companies, unflatteringly describing them as "islands of conscious power in this ocean of unconscious cooperation, like lumps of butter coagulating in a pail of buttermilk." But where Robertson had merely remarked upon the mystery, Coase explained it: "Those who object to economic planning on the grounds that the problem is solved by price movements can be answered by pointing out that there is planning within our economic system [that] is akin to what is normally called economic planning."

He was ignored for his insight. To this day, while hats are now tipped to Coase, and even though planning is plainly ubiquitous, taking place at heretofore unimagined scales, most economists talk very little about it. Economics textbooks offer in-depth explanations of consumer goods markets, the labor market, the money market or even the entire economy as one big market, but little to nothing about the planning inside firms. At best, economists will briefly mention planning, and then only to ridicule it. In much of mainstream economics, the firm is just a mathematical equation that consumes inputs and produces outputs. How it does this is rarely asked; its internal workings are insufficiently interesting. Or sufficiently embarrassing.

Willful disregard for the reality of planning is common enough. Adam Smith, the eighteenth-century Scot now considered the father of economics, is famous for introducing the "invisible hand" of the market. By this he meant no mystical force, but the idea that while individuals are making decisions whether to sell or to buy in the pursuit of self-interest, they are "led by an invisible hand to promote an end which was no part of [their] intention"—the welfare of society realized through a market system. Smith's hand often appears in economics textbooks as proof that markets produce, without any kind of plan, the best possible outcomes. However, Smith himself understood that real economies involve all manner of nonmarket interactions—even the phrase "invisible hand" makes but a single appearance in his *Wealth of Nations*. Smith, for example, assumed that factory owners would scheme together—that is, plan—to keep wages low. Later economists would concentrate only on the first half of his story: that the market system produces order out of chaos, all on its own.

Yet the vision of an orderly but completely unplanned market economy is nothing but fantasy. Planning exists in the market system and on a truly enormous scale. Today, the volume of transactions carried out within firms is as large as that carried out between them. Managers have always been very concerned with planning, but it is only by diving deeply into practical management texts that we can learn about its extent under capitalism. Economists have hidden it behind a tangled web of seeming disorder.

Even so, the fortress built by mainstream economists over the twentieth century is not so monolithic that it excludes all doubt. The seeds of a critique of the planless world were sown even within its walls. Certainly, Coase was not arguing for planning on a large scale. He was simply a mainstream economist willing to look at the world honestly and notice the core role played by planning and control within capitalist business.

The Calculation Debate Continued

At the same time that Coase was traveling about, asking corporate managers why they didn't have markets for moving products from shelves at one end of a warehouse to ones at the other, economists elsewhere were still busy arguing whether it was necessary to have markets at all. As noted earlier, Ludwig von Mises argued in 1920 that socialist planning of an entire economy was impossible

because complex economies of the kind we now have need both markets and prices. In his view, markets decentralize the vast troves of information that a single planner couldn't compile and calculate. Prices, however, make it possible to compare vastly different things; without them, he reasoned, how would planners know the relative worth of things as disparate as a car factory and a ballpoint pen and ultimately decide how many of each there should be? The counterargument that best answered these questions, at least for a while, finally came in 1937 from Polish economist Oskar Lange.

Lange's life and work were full of contradictions. A lifelong socialist and Marxist economist, Lange was equally at home in the minutiae of mainstream neoclassical economics as in the footnotes to Marx's *Capital*. Although he ended up teaching at the Warsaw Higher School of Planning and Statistics during the era of postwar Stalinist dogmatism, Lange also spent time at Harvard in the 1930s and taught in the economics department at the University of Chicago from 1938 to 1945, just as the latter was becoming a bastion of free market orthodoxy. And despite being a proponent of market socialism, Lange nevertheless served the Polish state even in its Stalinist incarnation—first as ambassador to the United States, then as representative to the UN, and finally as member of the council of state. These contradictions, however unlikely, worked in Lange's favor when it came to the calculation debate (see chapter 2).

Lange had read his neoclassical economists. However, he believed their models of the capitalist economy could be commandeered and repurposed for socialist planning. Under capitalism, when H&M makes too many skinny, off-purple corduroy trousers, its stores eventually drive down the price to entice people to buy them. Demand meets supply when the price falls—at least that's what happens in theory. In reality, the extra pants can end up in landfills, and H&M's production for next season can end up moving somewhere with lower wages to make ever lower prices possible. Using the equations of Léon Walras, one of the founders of the neoclassical school, Lange wrote a pamphlet in 1937 that imagined a planned economy, which imitated the market without these downsides. Lange's fictional socialist planners would manipulate "shadow prices" on paper, rather than waiting for real prices to filter down from cash registers to production decisions. Like a UV light at a crime scene, socialist planning would make explicit all the math that only happened in the background in models of capitalism. Lange answered Mises's challenge—that prices and markets were necessary to any economic rationality—by incorporating them into a model of market socialism.

The key was devising how planners would figure out which shadow prices are the right ones—those that ensure the socialist economy is making enough, but not too much, of everything. For this, Lange repurposed another idea from Walras: *tatonnement*. In French, Walras's native tongue, the word means "groping toward." Walras imagined that markets groped toward the right prices until they found the holy grail of economics: general equilibrium, where all markets are in balance and the amount supplied of every single good or service is exactly equal to the amount demanded. Add some more math, and mainstream economists will tell you that they've proven that everyone is also as happy as can be, living in the best of all possible worlds.

Lange, however, figured planners could actually perform this tatonnement better than markets. Unlike in Otto Neurath's natural economy (discussed in chapter 2), people under Lange's market socialism would still go to (government-run) stores to buy consumer goods, signaling to planners what they wanted produced. Producers—all also publicly owned—would aim to produce what the planners translated from consumer demands as efficiently as possible, without needing to leave room for profit after covering costs. As the economy produced things and consumers bought them, central planners would run equations, figure out what there was too much of and what there was too little of,

and adjust the "shadow prices" until everything was in sync. Even without all the correct information available at once, Lange's expected his planners to grope toward equilibrium like markets did under capitalism, only better and faster. And it would only be a matter of time before computers came along that were powerful enough to make the process faster still. Lange spent his final years fascinated by computer science and cybernetics. In one of his last papers, he wrote: "The market process with its cumbersome tatonnements appears old-fashioned. Indeed, it may be considered as a computing device of the pre-electronic age."

Around the same time that Lange developed his theory of planning, the American economist Abba Lerner was working on his own version of market socialism. The two thinkers complemented each other so well that the idea that socialist planning could replicate capitalist efficiency came to be called the Lange-Lerner theorem. Mimicking parts of the theory of capitalism, Lange and Lerner wanted to show that planning could meet and even exceed capitalism's own measures for squeezing the most human satisfaction out of scarce resources.

By the time the Second World War began, many classical economists grudgingly admitted that Lange's arguments worked—at least in theory. If the socialist system of planning Lange and others described was theoretically possible, then the only question that remained was whether it was feasible. Although corporate and military planners, averse to socialism but intrigued by the power of even the simplest mathematical calculation for resource management and control, were beginning to use crude versions of formalized planning tools, it was difficult to imagine when—if ever—the computing power required for planners to solve Lange's equations in reasonable time on an economy-wide scale would be available. With seemingly dim prospects for viable application, there was no reason to trumpet the fact that the socialists might be right.

Hayek's Riposte

Such defeatism alarmed another Austrian economist, Friedrich von Hayek, who, following in the footsteps of Mises, was determined to prove Lange wrong. Hayek is better known today as the godfather of neoliberalism, the pro-market ideology that has come to dominate government policy around much of the world, the first incarnation of which is best exemplified by the administrations of Margaret Thatcher in the UK and Ronald Reagan in the United States during the 1980s. Hayek was explicit about wanting ideological regime change. The postwar welfare state truce between capital and labor had barely been installed when Hayek joined a small group of right-wing radicals to found the Mont Pelerin Society in 1944—a free market think tank before its time. It was integral to their task of reshaping ideology that they have at the ready a rebuke to Lange, Lerner and the other socialists who looked to have the upper hand.

For someone who believed so fervently in capitalism, Hayek offered a very honest picture of the system. Maybe it was precisely because he was so ideologically committed to capitalism that he could talk about its shortcomings—all the ways it deviated from the fantasies of the neoclassical economists with their perfect humans, perfect markets and perfect information. Hayek questioned these central assumptions. People are not hyperrational—we have incomplete, imperfect ideas about the world. Markets are never quite in sync: there is always too much or too little of something. Capitalism is dynamic, a process of constant change rather than a state of equilibrium. On this last point, Hayek harked back to Marx and Smith. But as we'll see, it would take a few decades for the mainstream of economics to embrace such notions.

We have to admit that Hayek was right in rejecting mainstream fantasies. In fact, it was Lange who had underestimated the problems he inherited from the economics of his time. Here, he differed from Marx. While Marx undertook a thoroughgoing critique of the classical school, which dominated when he was writing, Lange primarily tried to replace "capitalist" variables in the equations of dominant neoclassical economics with "socialist" ones. In doing so, he took on all the flawed assumptions of the mainstream model. These included everything from an impossibly rational *Homo economicus* to eventual general equilibrium to the "completeness" of markets—meaning a market for every possible thing, at every possible time present and future. (In practice, completeness would mean that you could agree to buy—today, for a firm price—a unit of Amazon stock, a haircut or even a block of aged cheddar to be delivered at any precise point in the future, whether two weeks and three hours from now—or even in fifty years!) These assumptions are not only patently false under even the most extreme variants of capitalism; they would soon be challenged—slowly and cautiously—even by neoclassical economists.

Without this baggage, Hayek took a different tack from the silent but grudging acceptance of the mainstream. He rejected Lange's case outright. Hayek argued that markets—incomplete, permanently off tilt, full of fallible humans—do not just aggregate and calculate information. Markets are producers of information and knowledge. Even if Lange's market socialism allowed planners to calculate better and faster than did free markets, planning would ultimately still be impossible because planners would not have the information created by market interactions to use in their calculations. Buying and selling may not generate technical and scientific knowledge, but it still creates all that knowledge of "time and place" that is instrumental to making efficient production and distribution decisions. Hayek argued that the problem for planners was not in the "how"—the equations to use—but in the "what"—the data that goes into the equations. The copious information planners need is unavailable before markets work their magic. Decentralization creates coordination: only the market can bring together the information that is normally isolated in the heads of different individuals.

Hayek, however, was writing before the advent of "big data," which is testing the limits of just how much granular information can be collected. It seems that he also wrote in blissful ignorance of Coase, who had shown just how flimsy the veneer of decentralized decision making really is, even under capitalist markets.

If Hayek sounds like a radical democrat, the affinity is purely superficial. What he is after is not so much freedom for people, but rather *freedom for information and money*—those two central lubricants of market activity. Human beings, after all, are not capable of democratically coordinating complex systems, so they must therefore submit themselves to the dictates of the market, onboarding its anonymous decisions no matter how profound the social costs it creates. The argument against planning clearly hinges on Hayek's ideological commitments

Oddly enough, despite challenging the market socialists head on, Hayek's ideas were initially ignored, perhaps because they were critical not only of left-wing, but also mainstream economic opinion. At a time when even Richard Nixon was pronouncing that "we are all Keynesians now," how could their maximalist rhetoric be anything but out of step? The debate on the calculation problem continued to unfold in the pages of obscure economic journals. The world, however, had moved on.

But shortly after Nixon's startling declaration of allegiance, the existing economic orthodoxies on both sides of the Berlin Wall were violently thrown into question. By the 1970s, "really existing

socialism" was mired in economic crisis, its cracks beginning to show. The "free world" was troubled, too, experiencing its most severe economic crisis of the postwar period. Political and economic elites saw in the crisis an opening to unwind their postwar compromise with labor, a compact borne not of love, but out of their fear of revolution. It was in this context that the new heterodoxy championed by Hayek became efficacious outside the walls of the academy at last.

We've All Been Misinformed

Something incredible happened to the discipline of economics in the 1970s: the professors suddenly discovered human beings were *not* the equivalent of walking calculators. Alongside this revelation, many others among the most cherished beliefs of economics had been cast into potential doubt. Much of the entire mainstream economics project since the late nineteenth century had been built on the foundation of perfectly rational humans. Models of markets working together in seamless harmony, as well as arguments about the market system producing the best outcomes, relied on the pretty fantastical assumption that each of us have any and all information permanently at our fingertips.

As some economists began to question the notion of hyperrational humans, they found Coase's notion of transaction costs to be a useful concept that could help save the rest of the discipline. The new field of transaction cost economics turned Coase's insights about planning within capitalism into a story about flawed humanity. If our world diverged from one populated by perfectly rational beings, then some nonmarket transactions could be grudgingly admitted into the market system—as long as our imperfections were more costly than the benefits we could get from markets. Even our imperfections could be co-opted into the same story about capitalism as the best of all possible worlds!

However, once the Pandora's box of flawed humanity is opened, it is hard to close. Joseph Stiglitz, another winner of the Swedish National Bank's Prize in Economic Sciences in Memory of Alfred Nobel whom the Left sometimes uses to lend credibility to anti-austerity politics, first made his name by furthering the critique of the assumption of human rationality while still making a case for markets. Distinct from the earlier mythology of a perfectly rational *Homo economicus*—nowhere to be found in reality, but for so long beloved by economists—the economics of information that Stiglitz helped launch started from the seemingly obvious idea that getting our hands on, and using, information is usually costly, and sometimes impossible.

An example economists love to use is the market for private health insurance. There is only so much an insurer can do to see if a person buying insurance is relatively healthy. Developing a better and better picture costs more and more. At some point, the costs prevent further information acquisition from making sense. In the same way, hiring a mechanic to take apart and inspect the engine of a used car to find out if it is a "lemon" can cost more than the car itself. Markets can fail: some people will end up overpaying for health insurance, while others will be uninsured. Your local sketchy used car dealership isn't likely to be the first place you'd think of as a well-functioning market.

Beyond individual markets, Stiglitz and others were asking a bigger question: What if the entire economy was something of a used car dealership? Once enough examples of failing markets accumulate, the entire system's efficiency and justice can be called into doubt. In short, the economics of information ultimately challenges the argument that capitalism, despite its flaws, is the best of all possible worlds. However, rather than seeing information problems as a reason to explore collective,

democratic decision-making alternatives that could bring people and information together, economists went to work making market theory work in spite of humanity's imperfections. Since the '70s, the economics of information has generated ever more ingenious ideas for incentivizing people or organizations to do things—all, of course, within the bounds of capitalist markets.

Mechanism design is one such idea. In this obscure corner of economics, economists drum up—elegant, but often mathematically complex—means to compel people or companies to reveal information that they would otherwise keep secret. A new auction format created by economists in the early 1990s to help the US government sell off cell phone frequencies to telecommunications firms is an exemplary case. The auction had rules designed to force companies to reveal how much the rights to frequencies were really worth to them—lying would see them lose the rights to competitors. The design netted the government hundreds of millions of dollars more than expected and is now commonplace around the world.

Mechanism design is a kind of planning, although a very indirect one. Economic decision making of any kind—whether outright planning or a "designed" market—needs to gather the bits and pieces of information spread between people. But information problems don't preclude other ways of doing things. Rather than creating a complex process that ultimately benefits a few big players, governments today could choose to run a public cell phone utility, which would constitute one more step on the way to greater socialization. As things stand, however, governments make some money on the auction, but give up control over a valuable resource. This also leaves behind a market dominated by a few big players who can charge famously high prices backed by shoddy customer service.

Other mechanisms "align incentives"—for example, trying to ensure that workers internalize and act in accord with the goals of managers or ensure that managers internalize and act in accord with the goals of stock owners. Mechanism design is just one more example showing that the free market also has to be planned. Real-world markets must be consciously made and remade.

Speaking of Making People Do Things …

What makes Coase's theory and the economics of information so important is that they show us why the capitalist planning that takes place all around us is such a blind spot, not just in economics, but in our everyday perception of the world.

Mainstream economics ignores the disciplinary nature of business. It has a lot to say about competition between firms, but it overlooks questions of power within them. The intricate explanations for bringing workers together in firms skirt around a fundamental issue: there is a gulf that separates workers' formal freedom to quit their job, if they don't like it, from the fact that we have to work to survive, and thus do not really have that freedom at all. Workers are brought together under the quite literally despotic rule of managers within businesses (a business is not a democracy) because, fundamentally, we have no other choice. Even in those workplaces where management has offered workers a modicum of control over decision making, outside of strong union representation, this gift of freedom and democracy is offered (and withdrawn) at the pleasure of management. This is the definition of authoritarian, that is, nondemocratic, rule—Chomsky's "islands of tyranny." Too often we confuse the violence of despots with what makes despotism wrong. But much of this violence is a grotesque tool to enforce submission. It is this unfreedom—unchallengeable control of a human by another—that is the worst crime.

Under capitalism, businesses buy the time and the energy of workers, and during that time, they

can dispose of workers as they wish (within the bounds of the laws of physics and legal or union constraints imposed as the result of class struggle). One of the few economists before Coase to look inside the black box of business was, as it happens, Karl Marx. Marx saw the firm as an instrument for extracting profit off the backs of workers. He alighted upon a simple fact: workers are paid a wage for their time, not for what they produce. Profit comes from the difference between what a business can pay its workers (plus the cost of materials, themselves made or extracted from the earth by other workers) and the value of what these same workers are able to produce.

Coase thought that firms planned simply to save costs. For Marx, what happens inside firms is much more important: it determines how everything we produce is divided up between us. How we produce goods and services is closely related to how much of what we produce goes to whom. Under capitalism, the class of owners (businesspeople or shareholders) receive much more relative to the class of producers (workers).

The manager's exercise of central planning over his small province of tyranny is therefore not simply a better means to an end, as Coase thought, but a reflection of how the economy actually works. The adversarial relationship between bosses and workers that capitalism creates is no accident of markets merely introducing transaction costs that are best avoided through planning. Yet for mainstream economists, the confrontation between workers and managers only comes up in the context of "shirking." The GPS device in the UPS driver's truck, the call center badge that monitors washroom breaks or the white-collar worker's app that tracks web browsing history are the sticks requiring one does as one is told; the bonuses are the carrots.

Shirking, however, is a very rational response for someone who has little or no say over their work, often has no deeper sense of collective responsibility and knows that the profit from what they do ends up in someone else's pocket. Shirking is not an innate tendency toward laziness, but rather the way people are under capitalism. Any complex society will have people with different, sometimes-conflicting interests who need to cooperate toward common goals. Humans have embarked upon and accomplished projects in common, from the mundane to the spectacularly ambitious, long before the advent of capitalism and its subtly coercive labor market—indeed, often involving much more explicit coercion. Across history, however, people have also found ways to plan and act together without bosses to tell them what to do.

In response to any mention of durable human cooperation that is not mediated by markets, in particular by the undisguised incentives provided by the labor market—at their most basic, work or starve—defenders of the market system often bring up the notion of the "tragedy of the commons." The phrase, coined by ecologist Garrett Hardin in a 1968 article in the journal *Science*, refers to a shared resource inevitably depleted through overuse by individuals acting in their self-interest. The prototypical commons employed to illustrate this tragedy is a plot of open, shared pastureland in a village. If farmers only look out for the cows that are theirs, rather than the entire pasture, each will allow their cows to overgraze, and the land shared in common will quickly turn to dust.

Over the course of her long career, Elinor Ostrom, the only woman to win the "not really a Nobel" prize in economics in its fifty-year existence, did much to debunk this crude story. She compiled evidence of groups stewarding common resources and found that in many cases, the commons not only survived but thrived. Rather than being overrun by unthinking self-interest, shared resources were in reality often governed by complex sets of social rules established over time. Ostrom studied actual shared pasture land in Swiss alpine villages and found it had been preserved for common use for over 500 years. Based on this and other case studies, Ostrom went on to identify

conditions that helped protect common resources—among them, participation in decision making by users of the resources, the capacity for monitoring usage, meaningful social sanctions and conflict-resolution mechanisms.

Findings that question the tragedy of the commons, just like the idea of planning itself, can be initially jarring. It is an implicit belief of our age that the only real incentives are pecuniary ones—that despotism is a necessary part of work, and that it is largely out of fear of losing their incomes that people work toward common goals. However, this is not human reality but capitalist reality. While there will always be work that needs doing, there are many ways to organize that work—to plan it and to ensure that it is done. In practice, the commons need not be tragic.

Even within capitalism, studies have shown that a flatter hierarchy makes for better teamwork and greater productivity. Similarly, even just handing all day-to-day operational decision making to the workers doing the work, while leaving only strategic decision making to managers, can boost productivity. Remarkable what giving people more direct decision making over the work processes does! A socialized and truly democratized economy—whether via worker representatives, community councils or more direct forms of democracy—would offer meaningful self-management with no need for illegitimate power of one human over others. In the meantime, simply expanding trade union membership pushes back against the islands of tyranny, giving workers at least some minimal levels of input into working conditions today and laying the foundation for a more thoroughgoing democracy in the future.

Get the Machine before It Gets You

Today, after decades of Hayek-inspired reforms in parliaments and numerous campaigns of outright intimidation in workplaces, union membership is stagnant or in decline, while democracy in the workplace remains a more distant dream than ever. We are told to celebrate more "flexible" work, to revel in the new freedom to change jobs frequently. Yet despite the transformations wrought by outsourcing and the breakdown of supply chains into smaller pieces, most people remain in stable but crappy jobs in which they have little say over how they work. Despite all the enthusiasm about markets and choice, planning remains the modus operandi of business.

What *has* changed is that the advent of the information technology age has permitted the capture of vast stores of information. What do Facebook and Google do? They prod us, gently and with our own collusion, to reveal information about ourselves. Their business model is the economics of information, come to life. For now, they use the accumulated data to sell ad space—who knew the epitome of high technology would be getting the right people to see ads for novelty "I have a Polish husband and I know how to use him" T-shirts?—but the possibilities are much broader.

Uber and other media darlings of the "sharing economy" combine sussing out information with finding new ways to lower transaction costs. Good capitalists that they are, they're doing it at the expense of workers and democracy (and other capitalists, namely the venture financiers who continue to pump money into a business like Uber even though it has so far failed to turn a profit). Uber's rapid expansion stems in large part from its army of well-paid lobbyists, who in turn cajole and threaten city governments behind closed doors into cutting regulations around taxi monopolies.

Uber's drivers, on the other hand, are poorly-paid "contractors." No longer classified as workers (except in the UK where courts reinstated their rights as workers), they can make below minimum wage and have few labor rights. As with more and more workers in a range of sectors, they are under

constant, nigh on panoptical, surveillance via data. Uber uses a five-star driver rating system in which drivers must maintain an average rating of 4.6 stars to keep driving for the company. Uber can "suggest" certain norms for its drivers to follow (how much to smile, what kind of extra services to offer, and so on), but in reality it is the risk of even one bad rating that quickly prods them to fall into line. Yet there is no top-down rule; when businesses can constantly collect and analyze information, strict management happens from the bottom up. Uber's business model is to use the economics of information to do more than just sell ad space. The company's ability to make people do things without telling them explicitly is not unique and is but a refinement of capitalism's ability to make people complicit in their own unfreedom—a refinement made possible by a greater amount of and greater control over information.

On the other hand, rather than the herald of dystopian workplaces everywhere, Uber is also a natural candidate for a worker co-op. All that Uber provides, after all, is an app; the company is nothing but a middleman. A cooperatively owned network of drivers using a similar app could set pay rates and work rules democratically, in the here and now. A drivers' co-op would be far superior to the venture capital–fueled behemoth we have today, even if this is a form of enterprise that, while introducing more workplace democracy than is normally possible under capitalism in the short run, is still subject to the same profit-seeking imperatives as any firm within capitalism—imperatives that will prompt self-exploitation in order to compete with other enterprises, thus ultimately undermining these very same democratic impulses.

Similarly, social networks could be run as public utilities rather than as private monopolies—remember that we created public electricity or water works after the failures of nineteenth-century robber baron capitalism. One of the big questions of the twenty-first century will be, who owns and controls the data that is quickly becoming a key economic resource? Will it be the fuel for democratic planning, or instead for a new more authoritarian capitalism? These questions require that we recognize the immense challenges posed by data-driven twenty-first-century capitalism: How could we nationalize multinational corporations that span and disregard national borders, and often play jurisdictions off of one another? How would we ensure privacy with so much data under collective, state control?

Privately held data is making possible more efficient production, but at the same time it is enabling closer supervision, and modern corporate planning is only starting to take advantage of all this newly available information. One outcome is illusory freedom for workers. If we constantly produce information both at and outside of work, we don't need to be supervised so directly—but the boss is still watching, and doing so more closely than has ever before been possible. Data and metrics speak for themselves: managers can see how many parts a worker assembled per minute or how many packages a driver delivered per hour.

Increasing self-management at work—ostensibly without managers, but still closely surveilled—is a symptom of bigger changes. As wages, both in the United States and across much of the global North, have grown at glacial pace or outright stagnated since the 1970s, workers have taken on more personal debt just to keep up. At the same time, governments have cut public benefits, leaving workers more vulnerable when they are laid off or injured. Even Alan Greenspan, the former head of the US Federal Reserve, called today's workers "traumatized." Translated, this means that pressures to fall into line now exist outside the explicit top-down hierarchies.

Capitalism is stuck with planning even though it regularly transmogrifies its techniques of planning. Today, capitalist planning exists both in the old, hierarchical sense that Coase studied as

well as in new, more roundabout ways that take cues from the economics of information.

Opening the Gates to the Future

There's an old quip among historians of economics that a PhD-level microeconomics textbook from the 1960s could be mistaken for a textbook at the department of planning at a university in Havana. In the microeconomics textbook, the free market generates the prices that dictate how much of everything is produced and how things are distributed; in the planning textbook, a planner solves the same equations by coming up with the equivalent proportions of production and distribution. Oskar Lange's version of socialism and the economic orthodoxy of the twentieth century shared the same flawed assumptions. Over time, as outlined in this chapter, many poked holes in these assumptions: Markets are costly, said Coase. Human beings are not infinitely powered, all-knowing calculators, argued Stiglitz. Even Hayek was right: capitalism is dynamic, not static, and rarely in the sort of equilibrium imagined by Lange and conventional economics.

But the economics of information also challenges Hayek's counterargument to Lange, that the market is the only means we have to produce all the information that planning would require in the first place. For markets sometimes fail to discover the right information, and that which they do reveal can be false. Also, the enormous amount of economic activity that continues to take place outside the market—within the black boxes we call Walmart or Amazon or General Motors—is evidence against Hayek. At the same time, the rise of information technology shows just how much information it is possible to have at our fingertips. Hayek describes prices as "a system of telecommunications"; today, we have telecommunications far more precise and powerful that can communicate information directly without it being mediated by prices. Hayek's arguments may have worked to disarm some of Lange's vision for planning, but they shouldn't stop contemporary socialists from arguing for democratic planning that is also a process of discovery.

Economics, if it is to be of use to those who desire an egalitarian society, needs to leave behind fantasy worlds. Paul Samuelson, one of the most influential mainstream economists of the postwar era and author of the economics textbook used in most graduate programs from the 1950s well into the 1970s, observed that in the idealized vision that animated both sides of the calculation debate, it doesn't matter whether capital hires labor, or labor hires capital. The dense web of abstractions completely obscures what it means to be a boss or a worker, an owner of resources or an owner of a body and mind that can be put to work for a wage.

The economist Duncan Foley describes this lacuna in the calculation debate: "The real import of the historical social choice between socialism and capitalism is precisely what is left out of the socialist calculation debate: the social relations through which people organize themselves to produce." When we say that we are interested in how things are distributed, we mean that we are interested in how society is organized. Who makes the orders, and who follows them? What counts as "work," and what is part of the household? Who rears the children, and who does the dishes?

These are only some of the big questions with which any economics of equality will have to grapple. Planning is not only possible, but is already all around us, albeit in hierarchical and undemocratic forms. What a very different, democratic planning will look like is a question a new generation of progressive economists needs to begin today to discuss, debate and test through modeling.

But to the question of whether information should be discovered and created via a system that

inevitably creates huge social disparities while depriving a majority of people of a say in how they work, or rather via one of democratic deliberation that fosters equality, the answer should be obvious.

4

MAPPING THE AMAZON

Amazon is on its way to developing psychic powers. Or at least, such was the fantasy that one could be forgiven for believing, based on the hosanna-filled, adrenalized newspaper column inches that appeared in the summer of 2014 when the online bookseller-turned-"everything store" filed a patent application for a new process it called "anticipatory shipping." Amazon would soon know what you wanted to buy before you knew it yourself. When you placed an order for the latest John Green young adult novel for non–young adults, another jar of artisanally brined lupini beans, or that Instant Pot wonder–pressure cooker that produces pulled pork faster than the speed of light, the package would already be on its way.

As those journalists less prone to the confection of hyperbolic clickbait pointed out at the time, what this patent describes is in truth a very small step from what Amazon already does. It is a minor extension of the kind of data the company already collects and of the colossal, tentacular logistics operation it already runs. Amazon, building its retail market position on the back of the internet revolution, is the largest technology company using the fruits of modern IT to distribute consumer goods. In short, Amazon is a master planner. It is these sorts of logistical and algorithmic innovations that give the lie to the hoary free market argument that even if planning can deliver the big stuff like steel foundries and railways and healthcare, it would stumble at the first hurdle of planning for consumer items. A fortiori, Amazon offers techniques of production and distribution that are just waiting to be seized and repurposed.

What Amazon Plans

Since its late-'90s dot-com beginnings selling only books, Amazon has expanded to potentially fulfill a large part of a household's everyday consumption. Echoing Walmart's horizontal integration, the company has even started to incorporate producers of the things it sells into its distribution network by placing its own workers at the factories and warehouses of some of its key suppliers. Under what the company calls its "Vendor Flex" program, the number of Band-Aids that Johnson & Johnson produces, for example, can depend in part on Amazon's need. It gives the retail behemoth a role in managing production that extends beyond its own corporate borders.

Beyond simply distributing products, Amazon is, like Walmart, "pulling" demand. In fact, in its early days, Amazon headhunted so many top-level managers from Walmart for their logistics savvy that the Waltons sued. The untold billions of gigabytes of customer data that Amazon collects and the algorithm marvels it uses to parse this data give it an incredibly detailed picture of what people want to buy, and when. Meanwhile, integrating operations with producers ensures that products can be ready in sufficient quantities. Here too, given the sheer scale of this economy, we see the fits and starts of a more integrated model of production and distribution planning, however hierarchical and servile toward its bosses it may be. We might describe Jeff Bezos as the bald, moustache-less Stalin

of online retail.

Yet at heart, Amazon remains (for now) a giant distribution network for consumer goods. The internet age has enabled the rise of a new type of retail model for moving goods from producers to consumers, and Amazon took advantage of this opening better than any of its rivals did. Amazon now controls nearly half of total online retail in the United States. So when Amazon plans, it plans big. Some of Amazon's planning problems are the same as those faced by other major distribution networks; other problems are entirely novel. In essence though, Amazon's story is another tale of getting the logistics right—in other words, getting things from point A to point B as cheaply as possible. While this task sounds simple enough, it demands plans for everything from warehouse siting and product organization to minimizing the costs of delivering customers' packages and shortening delivery routes. *Wired* magazine describes the company as "a vast, networked, intelligent engine for sating consumer desire."

Add to this the fact that Amazon, as with every internet company, collects improbable amounts of data on its consumers. A conventional brick-and-mortar store doesn't know which products you look at, how long you spend looking at them, which ones you put in your cart and then put back on the shelf before arriving at the checkout, or even which ones you "wish" you had. But Amazon does. This data tsunami not only involves consumer information, but stretches throughout the supply chain, and the company uses this data to its advantage wherever it can. Its planning problems are no longer the pedestrian optimization challenges faced by any large company before the internet age, but rather the optimization of "big data"—sets of data that are produced at such gargantuan volumes, varieties and velocities that traditional data processing techniques and software are insufficient.

Amazon's scale—its ambition to be the "everything store"—introduces significant problems for its IT systems. It is one thing to deliver even a thousand products to a hundred or a thousand retail stores, as would a traditional seller. It is another to deliver millions of products to millions of customers. The problems that Amazon has to solve to be the most efficient it can be are very hard, even if they may not appear so at first glance.

The warehouse and transport problems mentioned above are a particular class of mathematical challenge known as "optimization problems." In an optimization problem, we aim to do something in the best way possible, subject to a number of limits on our action, or "constraints." Given three different possible routes through a city to deliver a package, say, which is fastest given the number of traffic lights and one-way streets? Or more realistically for Amazon, in delivering some daily number of packages, the company is limited by the schedule of delivery flights, the speed of airplanes, the availability of delivery trucks and a host of other constraints, in addition to city traffic. There are also random events, such as bad weather, that can shut down airports—and while these are sporadic, they are also more likely in some places and at certain times than others.

Every day when you commute to work, you are solving a relatively simple optimization problem. But the math behind optimization is very complex for problems with more than even just a handful of constraints. Given enough variables (conditions that can change) to be optimized and enough constraints, even the most powerful supercomputer we can currently construct, armed with the best possible algorithm we can design, would be incapable of solving some of these problems within our lifetime, and some even within the lifetime of the universe. Many of Amazon's problems fall squarely into such categories.

So while patents for drone delivery get all the media attention, the true wonders at the heart of its operations are actually the esoteric mathematical techniques that help it manage and simplify its

optimization problems. To give one example, these key patents help Amazon plan how to best move items between warehouse shelves and customer doorsteps. Part of solving this problem involves "load balancing": the same way that your computer shifts tasks so as to not crash any single system, Amazon decides where to build its massive warehouses and how to distribute products between them to make sure no part of its system gets overloaded.

To be clear, Amazon's planning methods are not complete solutions to optimization problems that might take the lifetime of the universe to solve, but instead simply best approximations to get around exploding mathematical complexity. Yet Amazon still chooses to plan rather than leave optimization up to price signals from the market. Amazon's engineers break down problems into smaller pieces, simplifying them or finding other ways of giving a computer a chance at solving them in seconds, rather than eons. What Amazon looks for is traction; the aim is to make problems tractable rather than to solve them with absolute precision.

Again, take the problem of shipping orders at the lowest cost. Even precisely answering the seemingly simple question of finding the lowest cost shipping method for a day's worth of orders can quickly grow out of hand. There is no single best way to ship one order out of thousands or millions shipped on a given day, because each order's cost depends on all the others. Will the plane from the UPS "Worldport" hub in Louisville, Kentucky, to Phoenix be full? Did your neighbor down the street order her electric toothbrush with express shipping, or can it be delivered with your book order tomorrow? The complexity ratchets up still further when Amazon considers not only all the possible alternative routes—which it controls—but also adjusts for the possibility of random events such as severe weather and tries to predict the next day's orders. This "order assignment" optimization problem has hundreds of millions of variables, and no easy solution. The problem is so complex that there are not even approximations that can take every aspect of the problem into account.

But despite such problems, the planning process within Amazon does not fall apart. While Amazon may depend on horrible working conditions, low taxes and poor wages, it nevertheless functions. The planning problems faced by individual corporations under capitalism do have approximate, "good enough" solutions. As this book argues again and again, planning exists on a wide scale within the black box of the corporation—even if it is "good enough" rather than perfect.

That's the trick: to find the best possible, even if partial, approximations. Amazon's modelers work to bring intractably complex problems down to size, to build plans that neither stretch into infinite time, nor respond to all the possible random events that could happen at every step, but that simply work. This means coming as close as possible to the true answer of a planning question within a realistic time frame and with the use of available computing power. When it is impossible to use an "algorithm of algorithms" to mechanically find the algorithm that best approximates the original problem, creativity then comes into play.

As computing power increases and mathematical science advances, our solutions to optimization problems become better and better. The planning problem is not one of 100 percent precision, but of efficiently using the available computing power to get to 80 percent or 95 percent of the way there. And remember that the market isn't 100 percent precise either; prices are constantly in flux, and the economy is constantly adjusting. Far from the Econ 101 fantasy of economic equilibrium, the market is never anywhere close to a perfect synchronization of what we want and what is produced.

Structure amid Chaos

Describing Amazon as a big planning machine doesn't quite match its image as an icon of "new economy" disruption. Even before Silicon Valley became a hub of global capitalism, planning was typically well hidden behind the facade of competition. Today, the facade has only become more ornate: all you see is a website and then a package at your doorstep. Behind the scenes, however, Amazon appears as a chaotic jumble of the most varied items zipping between warehouses, suppliers and end destinations. In truth, Amazon specializes in highly managed chaos. Two of the best examples of this are the "chaotic storage" system Amazon uses in its warehouses and the recommendations system buzzing in the background of its website, telling you which books or garden implements you might be interested in.

Amazon's recommendations system is the backbone of the company's rapid success. This system drives those usually helpful (although sometimes comical—"Frequently bought together: baseball bat + black balaclava") items that pop up in the "Customers who bought this also bought …" section of the website. Recommendations systems solve some of the information problems that have historically been associated with planning. This is a crucial innovation for dreamers of planned economies that also manage to satisfy consumer wants, historically the bane of Stalinist systems. The chaos of individual tastes and opinions is condensed into something useable. A universe of the most disparate ratings and reviews—always partial and often contradictory—can, if parsed right, provide very useful and lucrative information.

Amazon also uses a system it calls "item-to-item collaborative filtering." The company made a breakthrough when it devised its recommendations algorithm by managing to avoid common pitfalls plaguing other early recommendation engines. Amazon's system doesn't look for similarities between people; not only do such systems slow down significantly once millions are profiled, but they report significant overlaps among people whose tastes are actually very different (e.g., hipsters and boomers who buy the same bestsellers). Nor does Amazon group people into "segments"—something that often ends up oversimplifying recommendations by ignoring the complexity of individual tastes. Finally, Amazon's recommendations are not based on simple similarities, such as, in the case of books, keywords, authors or genres.

Instead, Amazon's recommendation algorithm finds links between items based on the activity of people. For example, a bicycle repair manual may consistently be bought alongside a particular bike-friendly set of Allen keys, even though the set isn't marketed as such. The two things may not be very obviously related, but it is enough that some people buy or browse them together. Combining millions of such interactions between people and things, Amazon's algorithm creates a virtual map of its catalog that adapts very well to new information, even saving precious computing power when compared to the alternatives—clunkier recommendations systems that try to match similar users or find abstract similarities.

Here is how the researchers at IBM's labs describe Amazon's recommendations: "When it takes other users' behavior into account, collaborative filtering uses group knowledge to form a recommendation based on like users." Filtering is an example of an IT-based rejoinder to one of the criticisms Hayek leveled against his socialist adversaries in the 1930s calculation debate: that only markets can aggregate and put to use the information dispersed throughout society. The era of big data is proving Hayek wrong. Today's deliberately planned IT systems are starting to create "group knowledge" (collective intelligence, or shared information that only emerges out of the interactions within or between groups of people) out of our individual needs and desires. And Amazon doesn't just track market transactions. Beyond what you buy, the company collects data on what you browse, the paths you take between items, how long you stay on the page of each item you browse, what you

place in your cart only to remove it later, and more.

Hayek could not have envisioned the vast amounts of data that can today be stored and manipulated outside of market interactions (and, to be fair, even many Marxists have assumed that the myriad capricious variables associated with faddish consumer items in particular forecloses the capacity for their socialization), although he certainly would have admired the capitalists such as Bezos who own the data and use it to pad their obscene fortunes. It is a delicious irony that big data, the producer and discoverer of so much new knowledge, could one day facilitate what Hayek thought only markets are capable of.

Really, it is not such a big step from a good recommendations system to Amazon's patent for "anticipatory shipping." It has a viability beyond any Silicon Valley, TED Talk–style huckster bombast or tech-press cheerleading. The reason this genuinely incredible, seemingly psychic distribution phenomenon could actually work is not a result of any psychological trickery, subliminal advertising craftiness, or mentalist power of suggestion, but is found in something much more mundane: demand estimation. With its huge data sets that measure the relationships between products and people, Amazon is already very successful in figuring out demand for particular products, down to a previously unimagined level of detail.

The bigger question for egalitarians is whose demand counts, and for how much. Under capitalism, it is one dollar, one vote: those with fatter wallets have a much bigger influence over what society produces, simply through their much greater buying power. We get a few super-yachts instead of superabundant housing for all; and we might well say the same when it comes to which consumer items we prioritize for production and distribution.

In our irrational system, the ultimate purpose of product recommendations is to drive sales and profits for Amazon. Data scientists have found that rather than high numbers of customer-submitted reviews, which have little impact, it is recommendations that boost Amazon's sales. Recommendations help sell not only less popular niche items—when it's hard to dig up information, even just a recommendation can be enough to sway us—and bestsellers that constantly pop up when we're browsing.

Zooming out beyond Amazon's corporate interests, the recommendations system is a way of managing and integrating great swaths of social labor. Many of us freely, without expectation of any reward, spend time and energy writing reviews and giving out stars to products or even just mindlessly browsing on Amazon and other technology platforms. This is work that we and others benefit from. Even over the course of one day, we may repeatedly engage in unpaid labor to rate everything from the relatively innocuous, such as call quality on Skype, to the more serious, such as posts, comments and links on Facebook and Twitter, to the potentially very impactful on individual lives, such as the "quality" of Uber drivers. Under capitalism, the social labor of many is transformed into profit for the few: the filtering may be "collaborative," but the interests it serves are competitive and very private.

Workers Lost in the Amazon

While many of us end up using free time to perform the social labor that allows Amazon to perfect its recommendations system, Amazon's warehouses run on paid labor that is nonunionized and frequently occurs under appalling, similarly big data–disciplined conditions. Before taking a closer view of the work itself, let's quickly look at the workplace. The focal points of Amazon's distribution network

are its warehouses, which the company calls "fulfillment centers." These usually take up football fields' worth of floor space jammed with shelving units. Amazon uses a peculiar form of organization called "chaotic storage," in which goods are not actually organized: there is no section for books or subsection for mystery fiction. Everything is jumbled together. You can find a children's book sharing a bin or shelf with a sex toy, caviar next to dog kibble.

Once again, powerful planning is what allows Amazon to save on what turns out to be needless warehouse organization. Every item that enters a fulfillment center gets a unique barcode. Once inside the warehouse, items go in bins, each of which also has a unique code. Amazon's software tracks both the items and the bins as they move through the warehouse. The software always knows which bin an item is in and where that bin is. Because items can always be found easily, deliveries from suppliers can be unloaded where it is convenient, rather than methodically organized and reorganized.

Amazon's chaotic storage could be a metaphor for the free market system: at first glance, it seems that the chaos organizes itself. Orders and packages zoom through the system and customers get what they want. But as with the free market, upon closer inspection we see thickets of deliberative planning at every step. Highly refined IT systems make sense of the chaotic storage, track items from the moment they arrive at a warehouse to the moment they leave, and make sure everything falls seemingly supernaturally into place. Everything ordered, coordinated, planned and not a market in sight to perform any of these billions of allocation decisions.

Planning is also present in the most minute details of a warehouse worker's day. Handheld scanning devices tell workers where to go to pick items for orders. Workers are appendages of machines that lay out precisely which routes to follow between shelves and how long they should take. Here's how a BBC undercover worker-reporter described the work: "We are machines, we are robots, we plug our scanner in, we're holding it, but we might as well be plugging it into ourselves." A leading UK researcher on workplace stress contacted by the same BBC investigation claimed that conditions at Amazon warehouses pose serious physical and mental health risks.

Around the start of this decade, Amazon's top operations managers determined that its warehouses were still too inefficient, and so they themselves went shopping for something better. In 2012 Amazon bought Kiva Systems, a robotics firm, and it now uses robots to put its entire shelving system into motion. Amazon's updated, even more automated fulfillment centers now feature shelves that move and humans who stand in place—the opposite of what a warehouse normally looks like. Flat, Roomba-like robots rove the warehouse floor along designated pathways. They can lift entire shelving units just off the ground and maneuver them along the same pathways to "picking stations." These are small designated areas where human order pickers stand, taking items from storage bins and putting them into order bins as shelving units come and go.

The social, physical and mental cost of a machine for delivering the right things to the right people ultimately falls on the workers who make the machine hum—regardless of whether workers are piloted around a maze of shelves by a handheld scanner or pick orders in place while robots whiz to and fro toward them. The boosters at *Wired* magazine are in awe of the subjugation of the Chaplins in this twenty-first-century *Modern Times*: "The packing stations are a whirl of activity where algorithms test human endurance."

Other more critical reporting has been less kind to Amazon in fleshing out just what these endurance tests entail. In 2011 the Lehigh Valley, Pennsylvania, local paper, the *Morning Call*, investigated its nearby Amazon fulfillment center. Workers said they routinely faced impossible-to-meet targets, debilitating heat and constant threats of being fired. On the hottest days of the year,

Amazon had paramedics on hand outside the warehouse to treat heat-exhausted workers—a cheap Band-Aid solution for Amazon that makes clear its low estimation of health and safety; apparently humane working conditions are not one of its algorithms' optimization constraints. It was only after this story blew up in the national media and the revelation hurt its largely liberal-tech-and-innovation brand image that Amazon began to refurbish some warehouses with air conditioning. In fact, only one out of the twenty workers featured in the *Morning Call* story said Amazon was a good place to work.

Amazon workers interviewed by the media consistently report feeling the constant stress of surveillance. Being too slow to pick or pack an item, or even taking a bathroom break that is too long, results in demerit points. Amassing enough of these points can lead to being fired. Soon, this feeling of constant surveillance could become far more visceral: in February of 2018, Amazon patented a wristband that monitors a warehouse worker's every hand movement in real time. And Amazon pits workers not only against the clock, but also against one another. Warehouses are staffed by a mix of temporary workers hired by subcontractors and permanent workers hired by Amazon. Permanent positions are few, but they come with some security, slightly higher pay and limited benefits; they are dangled as carrots before temporary workers, encouraging competition and overwork, further fostering a climate of uncertainty and fear.

With the help of robots, the average time to fill an order in a warehouse automated by Kiva technology has plummeted from ninety minutes down to fifteen. Working conditions, however, haven't budged: the work remains as dull and draining as ever, warehouses remain hot, and the pace of work can be absurdly fast, regardless of the level of automation. While workers in automated warehouses stand all day and try to keep up with the robots zooming by, workers in the nonautomated warehouses can expect to walk nearly double the distance on a daily shift of a typical mail carrier. Even small things like distances to break rooms can be an obstacle—sometimes so long that going both ways can take up most of a break.

Long hours for low pay are the norm in an Amazon warehouse, but the relatively highly paid white-collar workers at Amazon also face a crushing work environment. A 2015 *New York Times* exposé revealed an environment of overwork and "purposeful Darwinism" that pushes many past their physical and emotional limits. Even if sophisticated planning is Amazon's workhorse, it is implemented within the bounds of a ruling ideology of ruthless competition that breaks white-and blue-collar workers in different ways. Put differently, Amazon is doing exactly what Marx described in a lesser-known passage from *The Communist Manifesto*: "The bourgeoisie cannot exist without constantly revolutionizing the instruments of production, and thereby the relations of production, and with them the whole relations of society." Our task must be to disentangle the good brought by technology from the tentacles of a system that degrades workers and subverts more rational planning.

Amazonian Technologies beyond Amazon

Despite being a model of the new, disruptive, internet-dependent capitalism, Amazon remains a planning device as much as other companies ever have. In simplest terms, Amazon is a giant planned machine for distributing goods. It is a mechanism for forecasting, managing and meeting demand for an incredibly wide array of things we need and want. It is a collection of thousands of interlocking optimization systems that work together to carry out the deceptively simple task of moving objects from producers to consumers. Rather than the anarchy of the market, once we enter the Amazon, we are entering a sophisticated planning device—one that offers not only clues for how we could manage

demand and supply of consumer goods in a society not built on profit, but also warnings to would-be planners for the public good.

British economic journalist Paul Mason suggests as much in his 2015 book, *PostCapitalism*, imagining a future where the data accumulated by Amazon and other large consumer-facing firms is used to regulate production. His vision is one where comprehensive planning takes the place of separate and haphazard supply and demand. For Mason, capitalist technology will eventually be the means that allows us to go beyond the system that created them. Socialist construction, however, is not so simple. Instead of optimizing the satisfaction of our needs and desires, as well as workers' working conditions and livelihoods, Amazon's plans are geared toward maximizing profit for its shareholders—or future profit, since Amazon keeps plowing money from sales into research, IT and physical infrastructure to squeeze out competitors. Planning for profit is in fact an example of capitalism's web of allocation inefficiencies. The planning technologies dreamed up by Amazon's engineers are a way of meeting a skewed set of social needs—one that ends up enriching a few, misusing substantial free social labor, and degrading workers. A democratized economy for the benefit of all will also need institutions that learn about people's interests and desires, optimize via IT systems, and plan complex distribution networks; but they will look different, perhaps alien to the systems we have today, and they will strive toward dissimilar goals.

Three challenges should give us pause before even beginning to call the riddle of democratic planning solved.

First, there is large-scale technical feasibility. The difficulty of planning and optimizing even the isolated task of delivering Amazon's packages demonstrates that designing systems for economy-wide planning will be anything but trivial. The algorithms that power everything from Amazon's recommendation system to Google's search engine are still in their infancy—they are relatively simplistic, making best-estimate guesses, and are prone to failure. Algorithms run into systemic problems, for example with working class and poor people who more frequently use shared devices to shop or non-English speakers, where their capacity for "reading" nuance is limited. We'll have to storm both the barricades and the optimization problems.

Second, the planning done by Amazon and others still relies heavily on prices in interactions that take place beyond the borders of the firm itself. Amazon purchases its inputs—from the multitude of items it stocks, to the warehouse shelves they sit on, to the servers that run its database—on a market; consumers, meanwhile, also take into account the relative costs of items when deciding whether to add them to their virtual carts. Beyond the confines of the firm, a market system continues to operate. This means that it's not simply a matter of repurposing existing technologies, lopping off the bosses and otherwise keeping everything the same.

Even though there is market-less planning within corporations, it is a form of hierarchical, undemocratic planning that is very much necessary to survive and thrive in a market. Many elements of this planning apparatus, their very form and purpose, are conditioned by that undemocratic hierarchy. A democratic planning system built from the ground up would look very different. To catch a possible glimpse, even foreshadowing, of what a market-less world might look like, compare Amazon's book section to an online public library catalog. A library catalog also contains a vast, searchable, interconnected array of books—but not a single price. And it should be possible to harness far more information than is currently contained in a library catalog: for instance, how long people spend looking at a book, (with digital books) how many of its pages they actually read, whether they click to see if it is available in their neighborhood, whether they are willing to place a

hold (and, for instance, to do so even if there are ten others in the queue in front of them) and what path they follow through the online catalog. The example of an expanded library catalog shows that we could build not only recommendation tools, but also models of interests, demands and needs that are independent of prices.

Finally, while the big data collected and processed by Amazon is precisely the kind of tool that would aid in overcoming these challenges of large-scale economic calculation—and indeed it is already being used in this way by the Amazons and Walmarts (never mind the Facebooks and Googles) of the world—we have to recognize that alongside the staggering freedom-enhancing potential of the massive data sets held by both corporations and states, there also lies a staggering capacity for freedom *restriction*.

The story of Walmart's major rival Target sending deals on diapers and baby food to several expectant mothers who did not yet themselves know they were pregnant, based on data mined on individual spending patterns, seems almost quaint today. Now, we are only a single Google search for "poor sleep" away from months of bombardment by mattress ads on every social media network to which one belongs. There are more insidious examples: in 2012, the short-lived "Girls Around Me" app used a mash-up of geolocation and social media data to allow individuals to find out all kinds of personal details about women in their vicinity who had used Facebook or Foursquare's "check-in" feature. The UK's *Daily Mail* called it the "Let's Stalk Women" app, while science fiction author Charles Stross imagined a near future of other, far-nastier data mash-ups—could anti-Semites create a "Jews Near Me" app? Beyond the private sector, states across the world are also increasingly using and misusing big data. Police departments across the United States have begun to experiment with something called "predictive policing" to devise methods for predicting offenders, victims, identities, and locations of crimes. It is the arrival of "pre-crime" from the pages of Philip K. Dick's *Minority Report* into the real world. Similarly, China's "Integrated Joint Operations Platform" combines data from multiple sources, including online tracking and facial recognition–enabled CCTV cameras, as well as health, legal and banking records, in order to flag suspected political dissidents. In Xinjiang, a disputed territory that is home to a long-standing conflict between the Han Chinese majority and the Muslim Uyghur minority, suspects are investigated, visited by the police, arbitrarily detained without charge or trial, and even sent to "political education centers." Human rights campaigners worry that people in Xinjiang are unable to resist or challenge this level of technological policing. And all this is planning, too.

Is it enough for progressives to solemnly declare that we have taken the advice of Peter Parker's Uncle Ben to heart: that with great power comes great responsibility, and that this time, when we have come to power, we will do better than the American or Chinese states?

There are those who blithely claim that in order to use big data sets for planning, all we must do is anonymize, or "de-identify," them—that is, irreversibly strip them of whatever identifiers they contain. Google and Facebook say that they already do exactly this when serving up those behaviorally targeted adverts; human research subjects in medical or other scientific trials are de-identified to protect their privacy; and patient identifiers such as name, date of birth, phone number, address and so on are removed from electronic health records before they can be used by health authorities or researchers. It all seems so simple. However, there is a key difficulty: a growing consensus among computer scientists considers permanent de-identification to be impossible, not just technologically, but in principle.

This is because, however rigorously you might have managed to anonymize a data set, there is

always the possibility that at some point in the future, it can be compared to some other data set that is released (or leaked) in a way that re-identifies it. In personal correspondence with us, Cory Doctorow, a science fiction writer and digital rights campaigner, explained how this could work:

> Imagine that the NHS releases prescription data with prescribing doctor, time and place—but not patient names. Then imagine that Uber or Transport for London has a leak that releases a large set of journeys. By correlating those journeys with prescriptions, you can probably re-identify a large number of people in the "anonymized" NHS data … The databases held by the likes of Amazon hold the seeds of personal destruction for millions of people—everything from buttplugs to fungal remedies to books about socialism or atheism to trusses. A public release of that database has the power to cause terrible, widespread harms, and we should not be blithe and hand-wavey about it.

But such scenarios are no work of speculative fiction. In 2017, Strava, the popular mobile-based fitness route tracker, released some 13 trillion GPS points of its users—its "Global Heatmap"—a public but de-identified record of 700 million bike rides, runs, jogs and swims, 1.4 trillion latitude and longitude points, and a total distance of 16 billion kilometers covering a recorded activity duration of 100,000 years. The company was very proud of what it described as "the largest, richest, and most beautiful dataset of its kind. It is a visualization of two years of trailing data from Strava's global network of athletes." A couple of months later, Nathan Ruser, an analyst with the Australian Strategic Policy Institute, a defense-sector think tank, showed on Twitter that because soldiers, sailors and aviators also number among the span-dex-enveloped athletes that often use Strava, the released data had also accidentally revealed "clearly identifiable and mappable" locations of US, Russian, Australian and Turkish military bases, some of which had up to that point been kept secret. The locations of forward operating bases in Helmand Province, Afghanistan, were there for anyone to observe. Ruser even spotted GPS points in the Antarctic that appeared not to correlate to any known research installation. "Is there a hidden base?" he half-joked.

Can we leap over the dichotomy of surveillance capitalism versus surveillance communism? Could a major goods distributor such as Amazon or a social network like Facebook be built as an international nonprofit cooperative, democratically controlled by a society independent of both the market and the state?

We admit that these are difficult questions to which we don't have answers. But we all need to start thinking about what the answers might be.

The time has come for concrete, rather than abstract, proposals for the democratization of global governance, economics and planning, including around issues of geolocation, social networking, search, data mining, machine learning and ubiquitous computing. Because here's the thing: the big data cat is out of the bag. Both the ubiquitous surveillance of corporations and the ubiquitous surveillance of the state are already here. We need a third option—one that goes beyond the state-versus-market dichotomy.

5

INDEX FUNDS AS SLEEPER AGENTS OF PLANNING

Even if the most perceptive of free market cheerleaders might be ready to concede that large-scale planning does indeed happen within capitalist enterprise, they remain insistent that innovation and rational economy-wide investment allocation are insurmountable stumbling blocks for any more thoroughgoing notion of planning. They double down on their original argument: that the market is simply a more efficient allocator, the only way to guarantee the "correct" incentives to invest or innovate. However, as with the mammoth scale of planning of production and distribution that takes place behind the curtain at corporate giants such as Walmart and Amazon, it is also the case that investment and innovation occur outside of market mechanisms far more than market defenders are willing to admit, or perhaps have even noticed.

Let's start with investment. To invest is, at base, the act of putting some portion of economic activity today toward the capacity to produce more tomorrow. Here too, beyond current production and distribution, firms must make plans to allocate those goods and services that will produce yet more goods and services in the future. They must, in short, *plan* investment: build the factories that will make tomorrow's gadgets, the hospitals that will house tomorrow's patients, the rail tracks that will carry tomorrow's trade, and the windmills, dams or reactors that will power all of them.

Investment is often presented as a sacrifice, and as a result imbued with moralism. In this story, investors are heroic scrimpers and savers, putting the future good ahead of the gratification of the moment. In reality, as we are far from the first to point out, they are owners of a disproportionate share of society's common resources, produced not by themselves but by their workers; by dint of this daily theft of the value produced by workers, they hold disproportionate power over how social life is organized. Under capitalism, workers receive less in wages than the value of the labor power they furnish for producing the goods and services society will consume—this difference is profit, part of which goes to investment and fuels capitalist growth. This is why investment is no sacrifice, or at most the sacrifice of value produced by other people.

Going further still, it's a common misperception that the stock market is the major source of investment funds. But in fact, the majority of US capital investment comes from retained profits, not from the stock market.

When times are good and profits are rolling in, the belief that things can only get better is too easily sparked among the rich and powerful. Investment surges. Bad money chases after good, overcapacity and overproduction develop—and eventually, there's a crash as investors realize that not everyone will be able to cash in. There are two mutually exclusive rules of capitalist crises: "don't panic," and "panic first." Busts thus inevitably follow booms, and the system goes through repeated cycles—at significant human cost.

Downturns, which spike unemployment and poverty, discipline workers; the sack, as the Polish economist Michal Kalecki wrote, is the key disciplining device under capitalism, and perhaps even

more important a possession to business owners than is profit. This is because the potential for putting workers out of work, not profit and wealth alone, is what gives an owner the power over other human beings, delivering unto the boss (at least for the hours of work) no less a whip hand than that of the slavemaster. In so doing, it gives the owner the ability to use humans as tools in the craft of their choice—as paintbrush, hammer or scythe. It is a reminder of how the system functions at the most basic level. Recessions also discipline capital, enforcing a changing of the guard and creating the conditions for new bouts of accumulation. The system as a whole regenerates and refines itself, fresh faces masking the same core social relationships.

These cycles of boom and bust are not, however, pure anarchy. Capitalism, too, has something akin to an economy-wide central planner: the financial system—the first car in the rollercoaster, managing spirits and rationing investment. Economist J. W. Mason, who has developed the idea of finance as planner in a series of articles in *Jacobin* magazine, writes: "Surplus is allocated by banks and other financial institutions, whose activities are coordinated by planners, not markets … Banks are, in Schumpeter's phrase, the private equivalents of Gosplan. Their lending decisions determine what new projects will get a share of society's resources." Banks decide whether a firm will get a loan to build a new plant, a household a mortgage, or a student a loan for tuition and living expenses —and the terms on which each is repaid. Each loan is an abstract thing that masks something very concrete: work for workers, a roof over someone's head or an education.

In rationing investment, the financial system is central to managing expectations about the future—connecting today with tomorrow. Interest rates, financial sector regulations and loan decisions are capitalism's way of choosing between different possible economic plans. Investment today is meant to lead to profits tomorrow. Regulation defines the very terms of how resources are accounted for: what constitutes profit or how a bank's loan portfolio functions. The financial system's best guesses of ultimately unknowable future profitability, then, govern how concrete resources are set aside. So much, so straightforward. Yet even here, we begin to see how the capitalist economy is not as anarchic as free market proponents would have us believe.

Central Bankers, Central Planners

At the fulcrum of any contemporary financial system sits the central bank, banker to the bankers. Typically, central banks are most visible during crises, when they intervene to prop up the financial system, lending when panic overtakes others. Yet even during "normal" times, central banks, through regulation and monetary policy, help set the overall pace of credit creation and, ultimately, of economic activity overall. Often presented as neutral policy makers, central banks are in fact political beings with political aims, tightly integrated with the rest of the private financial system.

Take the US Federal Reserve. Its leadership has been very concerned with how quickly wages are growing, what unions are doing and how the balance of power is shifting within workplaces—what socialists would call "the state of class struggle." Often in very explicit terms, the Federal Reserve has taken great interest in the relationship between workers and bosses, labor and capital, as much as any union organizer. The archives of meeting minutes dating back to the 1950s reveal central bankers talking frankly and knowledge-ably about which unions are currently in bargaining and their relative strength. The auto and steel sectors received particular attention; the governors of the Fed might have been even more interested in the strategy of the United Steelworkers (USW) or United Auto Workers (UAW) than would the average shop steward.

This was true during the postwar Golden Age of capitalist growth as well. Here are Governor C. Candy Balderson's views as described in the minutes from the March 3, 1956, meeting of the Reserve's Federal Open Market Committee:

> The [Federal Reserve] System's actions should be decisive enough to cause businessmen to realize the danger of a wage-price spiral and not abdicate when they face wage negotiations this spring and summer the way they would if they felt they could simply increase their prices and continue to sell goods. He hoped that labor unions would appreciate the dangers of a wage-price spiral.

That summer, the Fed ended up taking decisive action, raising interest rates, as a successful steel strike pushed previously reluctant central bankers to Balderson's side. The years 1957–58 saw a short recession precipitated in part by these higher rates. But Fed governors were explicit that they had deliberately applied the brakes to the economy and altered the costs of investment in order to change the climate in which capital bargained with workers. They planned, overriding what the (labor) market, left to its own devices, would otherwise have delivered.

Similarly, during the first eight months of the 1973–75 oil-shock recession, interest rates continued to rise—nicely coinciding with UAW bargaining with the Big Three automakers. When the Fed finally lowered rates to stimulate investment and counteract the slump, Fed governors argued that, unlike expansionary fiscal policy carried out by Congress and the president, presumably at the behest of the democratic will, their independent actions would be much easier to undo when the economy "overheated" again and workers started to ask for more. And undone they were—very quickly: as is widely acknowledged, in 1980, under the Carter administration's Federal Reserve leadership of Paul Volcker, the body used sky-high interest rates to launch an assault, not only (or even primarily) on inflation, but on the remaining power of organized labor. And in the decade following the 2008 financial crisis, Fed-led monetary policy played an oversized role; indeed, distrust for state spending has, since the advent of so-called "neoliberalism" in the 1970s, consolidated itself as common sense. To manage ongoing stagnation, central banks across the global North have made massive purchases of bonds, mortgages and other kinds of equity, adding to their rate-setting and regulatory power. The irony here is that an unaccountable, undemocratic department within the state, in the form of central banks, has intervened in the economy in spite of elite consensus *against* state intervention in the economy.

Of course, the path is never straight between the actions of banks (central and private alike) and what happens in the wider economy. Some interventions fail. And aims and tactics will change to reflect the balance of power in the economy: in principle, planning carried out by the financial system could just as easily support, on the one hand, a high-productivity economy that more evenly distributes growth (as during the 1950s), as it could one of corporate short-termism and upward transfers of wealth (as starting in the 1980s), on the other.

The financial managers of the global economy—the vast majority working at private rather than central or other public banks—occupy a class, not a control room. They share much in terms of wealth, positions of power, education, and lunches in Davos. But as individuals they have their own histories, ideological leanings and visions for how best to achieve stability for capital. Large-scale planning is mundane, technocratic and systemic, not conspiratorial. Networks of power and ideology replicate themselves without the need for open scheming. Economy-wide planning under capitalism is so diffuse that much can get in the way of even the best-laid plans—never mind the unavoidable yet

unpredictable crisis dynamics of the system itself. And so, as capitalism heaves from boom to bust, its managers switch from plans for prosperity to plans for surviving a crisis, all of them contested and imperfectly implemented.

Communism by Index Fund?

Contemporary capitalism is ever more tightly integrated through the financial system. What do we mean by integration? Well, for instance, the chance that any two firms in the broad S&P 1500 index of the US stock market have a common owner that holds at least 5 percent of shares in both is today a stunning 90 percent. Just twenty years ago, the chance of finding this kind of common ownership was around 20 percent. And index funds (which invest money passively), pension funds, sovereign wealth funds, and other gargantuan pools of capital all bind economic actors still closer together via their enormous pools of money. Passive management of such funds is a relatively novel investment strategy, involving retention of a broad swath of assets that replicates an existing index, which itself aims to replicate an entire market; in this model, limiting buying and selling still offers robust diversification, but with limited transaction costs and low management fees. Passive management is increasingly dominant, not just within equity markets, but among other investment types, and it is displacing the historic but more expensive norm of active management strategies, which use fund managers and brokers to buy and sell stocks and other investment vehicles, deploying their research and knowledge to attempt to outperform the market.

This shift in recent years from active to passive investing is not news. But the implications are systemic and profound for the very notion of a competitive market.

An investor who has holdings in one airline or telecom wants it to outperform the others: to increase its profits, even if only temporarily, at others' expense. But an investor who owns a piece of every airline or telecom, as occurs in a passively managed index fund, has drastically different goals. Competition no longer matters; the overriding interest now is squeezing the most out of customers and workers across an entire industry—no matter which firm does it. In principle, capitalist competition should unremittingly steer the total profits across a sector down, ultimately to zero. This is because even though every firm individually aims for the highest possible profit, doing so means finding ways to undercut competitors and thus reduce profit opportunities sector-wide. Big institutional investors and passive investment funds, on the other hand, move entire sectors toward concentration that looks much more like monopoly—with handy profits, as firms have less reason to undercut one another. The result is a very capitalist sort of planning.

This unseemly situation led *Bloomberg* business columnist Matt Levine to ask, in the title of a remarkable 2016 article, "Are Index Funds Communist?" Levine imagines a slow transition from today's index funds, which use simple investing strategies, through a future where investing algorithms become better and better, until "in the long run, financial markets will tend toward perfect knowledge, a sort of central planning—by the Best Capital Allocating Robot." For him, capitalism may end up creating its own gravediggers—except they will be algorithms, not workers.

This idea—that finance itself will socialize production—may read like clickbait provocateurism, but it isn't actually that new. The point has been made frequently by writers on the left for over a century, most prominently by the Marxist economist Rudolf Hilferding, whose *Das Finanzkapital*, published in 1910, already postulated a shift from the competitive capitalism Marx had analyzed to something far more centralized, tending toward monopoly driven by finance and a state under its

control. The same debate has resurfaced many times since then: from the school of "monopoly capital" led by Marxist economists Paul Baran and Paul Sweezy in the 1950s, influential among some sections of the Left for some time, to the more obscure bank control debates in the 1970s and '80s. The notion reemerged with left-wing economist Doug Henwood's *Wall Street*, which dissects the US financial system and its role in organizing economic activity. Published in 1997, at the height of the Clinton-era boom in the United States, the book is remarkably prescient, foreshadowing today's toxic mix of rising inequality, stagnant incomes for the working class and crises driven by speculation, much of it based in financial engineering—not a rosy picture of finance eating itself, but rather one of it slowly digesting the rest of us.

While in terms of mechanics, it may be easier to transfer into common ownership a real estate income trust that owns the title to hundreds of homes than it is to seize hundreds of homes outright—or to take over a single index fund that owns millions of shares than it is to take over hundreds of factories—politically, the task is no less difficult. Moving ones and zeros around on an electronic exchange requires class power just as much as storming barricades does. The agents of progressive change—those who might push for and carry out a sweeping socialization of investment—are far removed from the centers of financial capitalism. On its own, an investment algorithm can no more dig capitalism's grave today than a power loom could in the nineteenth century. Both are inanimate tools created by capitalism that open up new possibilities for socialists who hope to transform the world in the interests of the many, but these tools are nothing without organized political forces ready to put them to more useful ends.

What kinds of transitional demands could such forces make to hasten future socialization? There are relatively small, but meaningful, steps such as creating a public payments system—to ensure that every time you tap your credit or debit card, it is not a private company getting a cut and setting the terms—or a public credit rating agency—to displace the likes of Moody's or Standard & Poor's, which play a key role in determining how investment is distributed among competing projects, most recently helping divert a sizeable chunk of it into junk mortgages that nearly crashed the world economy. Then there are bigger public sector projects, like a massive increase in public housing construction—which places land into common ownership, takes housing off the market and ends its role as an investment asset—and its corollary, expanded public pensions. As for those who hold financial power themselves, what better way to disempower them than directly, through proposals to tax away large concentrations of wealth or diminish the role of shareholders and the stock market over the corporate sector—ultimately empowering the workers that produce the goods and services, and the communities that use them. All of these reforms serve to make planning explicit and public, rather than hidden and private as it is today. To quote J. W. Mason once more,

> A society that truly subjected itself to the logic of market exchange would tear itself to pieces, but the conscious planning that confines market outcomes within tolerable bounds has to be hidden from view because if the role of planning was acknowledged, it would undermine the idea of markets as natural and spontaneous and demonstrate the possibility of conscious planning toward other ends.

The question is not whether the economy will be planned as a whole, or not at all. Instead, it is whether the present money managers will continue as the capitalist planners of the twenty-first century, or whether we ordinary people will start to remake our economic institutions, introduce democracy into their hearts, and bring the planning that already exists out into the open.

Incentivize This!

At this point, defenders of the market are likely to retreat to another line of defense: incentives. Even if capitalists already plan here and there (or even nearly everywhere, as we have shown), only markets can guarantee the efficiencies that come from having the right incentives. Socialist managers will simply waste investment funds as a result of "soft budget constraints"—the notion that managers can ultimately always get more resources—creating vicious cycles of excessive risk taking and false reporting.

Incentives are, however, simply another way of answering the question, "How do we make people do things without telling them directly?" The biggest incentive under capitalism is that without a job, a worker will lose their home, their belongings and ultimately starve. This is the cat-o'-nine-tails that disciplines "free labor," the terror that forces a worker to doff her cap before every foreman or manager. This despotism lies at the very heart of the system, yet it goes unmentioned in any call to "get the incentives right" from business journalists or neoliberal reformers.

The list of socially harmful incentives is much longer. There are incentives to pay poverty wages, to maintain unsafe working conditions, to push poor people out of their neighborhoods, to produce bombs and to use them. Even stock prices, those supposedly *most price-like* prices, in large part reflect gambles rather than economic fundamentals. The flip side is all manner of nonmarket sanctions that exist and have existed throughout human history. Markets are not the only, or even remotely, the best way to pursue common projects that require people and resources committed across time and space. What defenders of capitalism are afraid of is not planning, but its democratization.

Friedrich von Hayek—perhaps the most honest defender of the market, an honesty that led him to see through the equilibrium and efficiency fairy tales of mainstream theoreticians and to openly support right-wing dictators like Pinochet—framed the incentive function of markets and prices in two ways. First, he posited that prices collect dispersed information, connecting it to decisions over concrete resources, especially their future use. Even ignoring that the price system is inevitably bound up in producing inequalities and exploitation, Hayek's thesis that only prices can facilitate social "action at a distance" is less and less plausible today. Networks of cables, towers and radio waves crisscross the Earth with the sole purpose of delivering ever more abundant streams of information. There are trillions upon trillions of pieces of data—on everything from how we use things, to what we think of them, to what resources went into making them—that could form the information foundation of nonmarket decisions about future uses of resources.

Hayek's second argument, that prices are also indispensable to the discovery of new information, has recently been unpacked by Greek socialist economists John Milios, Dimitrios Sotiropoulos and Spyros Lapatsioras. The trio writes:

> With the establishment of central planning, there will not be a "discovery process" on the part of managers, hence no proper capitalist behavior and therefore no efficiency in capitalist terms. In the end, every serious restriction of capital markets threatens the reproduction of the capitalist spirit … The unleashing of finance not only channels savings to investment in a particular way, but it also sets up a particular form of organization in capitalist society.

In short, Hayek may be right that prices aid in discovery under capitalism; however, that insight cannot be generalized to every socioeconomic system, including that which might supersede capitalism.

Capitalist institutions affect our behavior in multiple ways, from what we do today to what we want—or have—to do tomorrow. Capitalism is not just a means for dividing up goods and services—though it is that too; it is a way of structuring society. The planning that happens is still embedded in and hidden under a facade of markets. In a way, then, it is crucially important to "get the incentives right" in order to maintain these social and economic institutions. The threat of disinvestment is a disciplining force for capital and its managers, just as much as unemployment is a disciplining force for workers. Projects will be taken up if and only if they are thought to be profitable—a criterion that has produced a litany of technological wonders alongside an equally long litany of human misery.

If democratic planning has the capacity to transform the economy, it is likely to transform us as well. We're very malleable creatures—biological systems constrained and shaped by our environment and by each other. We create society, but society also creates us; one of the successes of capitalism, and especially its most recent, neoliberal variant, has been to instill competition into more and more aspects of life. The reverse has also happened here and there: for instance, a few short decades of Nordic social democracy managed to produce more cooperatively predisposed citizens. Social scientists have long understood that building different institutions will also make us into different people. Will we still need incentives? In the broadest sense of being motivated to do things, of course we will. But it is a poor theory of social life that says creation or innovation can only take place with the prospect of personal monetary gain.

As we argued in chapter 2, the set of all goods and services that are profitable may overlap with, but is not coincident with, the set of all goods and services that are useful to society. If something is not profitable, such as we have seen with new classes of antibiotic, no matter how beneficial, it will not be produced. Meanwhile, so long as something is profitable, no matter how detrimental, such as fossil fuels, it will continue to be produced. The problem is generalizing behavior under capitalism to all human behavior. Investments—decision making over how we divide our resources between our present and future needs—could be planned such that they are responsive to human needs rather than investors' need for profit.

The Innovative State

But even if investment—diverting resources for future-oriented use—can be planned, what about innovation, the very discovery of those new uses? At first glance, innovation does not seem like something you can plan. But like investment, which is already subject to copious conscious planning, much, if not most, innovation today happens outside the market. The common story gives far too much credit to individuals, to the inventor's flash of insight. But most innovation is social. It proceeds in small steps, and most of it is done not because of a price signal but in spite of it: innumerable improvements are made every day by workers on assembly lines or at computer desks who get no credit, just as great discoveries are produced in research laboratories that are not only financed but often directed by the state. Steve Jobs didn't invent the iPhone; as Italian American economist Mariana Mazzucato brilliantly points out, almost every major component is the product of state-directed innovation.

In her book *The Entrepreneurial State*, Mazzucato laments that while the myriad examples of private sector entrepreneurial activity cannot be denied, this is not the only story of innovation and dynamism. She asks: "How many people know that the algorithm that led to Google's success was funded by a public sector National Science Foundation grant? Or that molecular antibodies, which

provided the foundation for biotechnology before venture capital moved into the sector, were discovered in public Medical Research Council labs in the UK?" Far from the slander of the state as slow-moving and bureaucratic, and the myth of the nimble private sector, she argues that businesses are in fact ineluctably risk averse, due to the need for a relatively short-term return on investment. Instead, the reality is that the state, from the internet and personal computers to mobile telephones and nanotechnology, has instead proactively shepherded new sectors out of their most uncertain, unforeseeable periods—and in many cases even through to commercialization. And this is not a case of the state filling the gaps of the private sector, correcting market failures. The state was central: "None of these technological revolutions would have occurred without the leading role of the state. It is about admitting that in many cases, it has in fact been the state, not the private sector, that has had the vision for strategic change, daring to think—against all odds—about the 'impossible.'"

In the United States, ostensibly the most capitalist of states, this process has largely been hidden because so much of it has occurred under the direction of the Pentagon, that part of government where even the most ardent Republican free marketeer allows him or herself to discover the joys of central planning. In fact, war and economic planning have a long history together, and the conflict-ridden twentieth century necessitated public-driven planning and innovation on vast scales.

World War II—a new, fiercer form of total war—gave rise to a comprehensive wartime planning regime, even in the capitalist heartland. In the United States, the War Production Board (WPB) was created in 1942. Its mandate was widely ranging, encompassing everything from fixing production quotas to resource distribution and price setting. The WPB, America's grand national experiment in economic planning, was responsible for converting peacetime industries to war production, allocating and prioritizing material distribution, rationing essential items such as gas, rubber and paper, and suppressing nonessential production. It had its successes—the war was ultimately won by the Allied camp—but its short existence was compromised by infighting between civilian and military personnel, and undermined by business that was always looking out for its own interests, jockeying to exit the war stronger.

But wartime planning sprouted up beyond just the WPB. A smaller agency called the Defense Plant Corporation was responsible for over a quarter of total wartime investment in new plant and equipment; with it, the government ended up building and controlling some of the most modern manufacturing facilities in the United States at the time. Beyond the immediate war effort, government funded and planned basic research that led to major breakthroughs. The Manhattan Project, which ultimately developed the atomic bomb, is well known, but there were other advances from such efforts that were indisputably socially good, including the mass production of the first antibiotic, penicillin.

Prior to the advent of antibiotics, unless you had surgery, mortality from pneumonia was 30 percent, and from appendicitis or a ruptured bowel, 100 percent. Before Alexander Fleming's serendipitous discovery of penicillin, patients with blood poisoning contracted from a mere cut or scratch filled hospitals, although doctors could do next to nothing for them. The first recipient of penicillin, forty-three-year-old Oxford police constable Albert Alexander, had scratched the side of his mouth while pruning roses. The scratches developed into a life-threatening infection, with large abscesses covering his head and affecting his lungs. One of his eyes had to be removed. The discovery of penicillin may have been made by a Scotsman, but in 1941, with much of the British chemical industry tilted toward the war effort and London's defeat at the hands of Hitler a real possibility, it was clear that large-scale production of penicillin would have to be moved to the United States.

A high-priority program aiming to increase penicillin yields was placed under the direction of the Fermentation Division of the Department of Agriculture's Northern Regional Research Laboratory (NRRL) in Peoria, Illinois, a move that proved vital to the innovations that made large-scale production of penicillin possible. Howard Florey, the Australian pharmacologist—who, along with German-born British biochemist Ernst Chain and Alexander Fleming, would go on to win the 1945 Nobel Prize for Medicine for the development of penicillin—visited a number of pharmaceutical companies to try to interest them in the drug, but he was disappointed in the results. The Committee on Medical Research (CMR) of the Office of Scientific Research and Development (OSRD)—created in June 1941 to ensure that as war approached, the appropriate amount of attention was directed toward scientific and medical research relating to national defense—convened a meeting with the heads of four drug firms to impress upon them the urgency of their involvement and assure them of government assistance. The response, however, was pessimistic. It was only during the second such conference, ten days after the attack on Pearl Harbor, that the argument was won. Crucially, the government obtained agreement for the sharing of research between the different actors through the CMR—a cooperative development that proved decisive in the scaling-up of production as each company solved different aspects of the overall problem, each in itself a problem from hell. As Pfizer's John L. Smith characterized it, "The mold is as temperamental as an opera singer, the yields are low, the isolation is difficult, the extraction is murder, the purification invites disaster, and the assay is unsatisfactory." Despite the successes of initial production under OSRD auspices, the manifest utility of this wonder drug to the war effort, ahead of the invasion of occupied Europe, prompted the War Production Board in 1943 to take over direct responsibility for cranking up production. The board directed twenty-one companies to participate in its aggressive expansion of penicillin production, each of which received priority on construction materials and supplies. In time of war, government leaders did not trust the private sector to be up to the task: the supply of all penicillin that was produced was controlled by the WPB, which distributed it to the armed forces and the US Public Health Service. Production soared from 21 billion units in 1943 to 1.7 trillion units in 1944 (in time for the D-Day landings at Normandy), to some 6.8 trillion units at war's end.

With the war's conclusion in 1945, planning was rapidly abandoned, departments were shuttered and government plants were sold off to private industry. Paradoxically, however, US corporations ended the war stronger than they began it. Elephantine contracts from government, price supports and relaxed anti-trust laws all worked to boost profits and grow corporations. The wartime planning regime needed to get business onboard, so throughout the war, while government bureaucrats made some of the top-level decisions, business still controlled production. The war ultimately enabled a capital-friendly version of planning: production was still mainly carried out by large firms belonging to even larger cartels, albeit with a significant dose of government rationing. At the same time, the scope of economic planning carried out inside corporations increased.

The combination of bigger government and bigger corporations that emerged from World War II led even those on the right to question whether capitalism would give way to some form of economy-wide planning. Hayek's fellow traveler Joseph Schumpeter famously thought that the replacement of capitalism by some form of collectivist planning was unavoidable. A fervent anti-socialist, Schumpeter nevertheless saw how the capitalism of his time was aggregating production and creating ever-larger institutions—not just firms but also government agencies—that planned internally on ever-larger scales. He thought it was only a matter of time before bureaucratic planning overtook, through its sheer weight, the dynamism of the market. The rise of Keynesian economic management and the experience of wartime planning convinced Schumpeter that a transition to the socialism he

despised was inevitable, if not imminent.

Instead, the onset of the Cold War after 1945 produced a fervent official anti-Communism, alongside a narrow, technocratic vision of economic management. The government saw good in increasing productivity, and even in coordination between business; but any move to extend democracy to the economy was bad. Elite concern about a growing militancy, both among rank-and-file soldiers still in Europe and workers in the United States, meant that even as official rhetoric extolled loudly the virtues of free market capitalism, in practice, the American welfare state expanded. As with Western Europe's emerging welfare state, elites grudgingly accepted social reform as the lesser evil to the immediate threat of social revolution. Business compromised: government would play a larger role in the economy, supporting basic innovation and ensuring that the final products and services produced by business found markets, while at the same time professing unwavering support for the free market.

The central hotbed of publicly planned innovation was the postwar Pentagon, coordinating government agencies that would prove responsible for the initial development of computers, jet aircraft, nuclear energy, lasers, and, contemporarily, much of biotechnology. Its approach built upon the method of partnership between government and science for basic and applied research that was pioneered by the Manhattan Project of the United States, the UK and Canada during the Second World War. With the Soviet launch of Sputnik in 1957, as Mariana Mazzucato argues, senior figures in Washington were petrified that they were falling behind technologically. Their immediate response was the creation, the following year, of the Defense Advanced Research Projects Agency (DARPA), an agency that—along with allied agencies that the Pentagon viewed as vital to national security (including the Atomic Energy Commission and NASA)—would support blue-sky research, some of which might not produce results for decades. DARPA oversaw the creation of computer science departments throughout the 1960s, and in the following decade, it covered the high costs of computer chip prototype manufacture at a lab at the University of Southern California.

Mazzucato lists twelve crucial technologies that make smartphones "smart": (1) microprocessors; (2) memory chips; (3) solid state hard drives; (4) liquid crystal displays; (5) lithium-based batteries; (6) fast Fourier transform algorithms; (7) the internet; (8) HTTP and HTML protocols; (9) cellular networks; (10) Global Positioning Systems (GPS); (11) touchscreens; and (12) voice recognition. Every last one was supported by the public sector at key stages of development.

We see a similar phenomenon within the pharmaceutical sector, but this time with respect to the crucial role played by government labs and public universities in the development of radical new drugs, known as "new molecular entities" (NMEs)—particularly those given a "priority" (P) rating—as opposed to the cheap-to-develop and therefore more profitable "me too" drugs (existing treatments with the formulas tweaked slightly, which are favored by Big Pharma). Mazzucato quotes Marcia Angell, former editor of the *New England Journal of Medicine*, who argued in 2004 that while the large pharmaceutical companies blame high drug prices on exorbitant research and development costs, the reality is that it was government-funded labs that were responsible for some two-thirds of the NMEs discovered in the previous decade. One must go beyond the concession that private pharmaceutical companies have been unproductive and declare that in the war against disease, they have been absent without leave for decades.

It all reminds of Karl Marx's simultaneous admiration and condemnation of capitalism of the nineteenth century. How furious he was that such an incredible system, more productive than feudalism or slavery or any other previous economic structure, could also be so inexorably restricted,

so bounded, so lazy with respect to what it could produce. All these possible things (whether knowns, known unknowns, or Rumsfeldian unknown unknowns) that could so benefit humanity would never be manufactured so long as they were unprofitable, or even just insufficiently profitable! This was what Marx meant when he raged against the "fettering of production." Human progress, the expansion of our freedom, has thus far been held back by this irrational system.

6

NATIONALIZATION IS NOT ENOUGH

On July 5, 1948, the National Health Service Act, establishing the world's first universal, public and free healthcare system, came into effect in the UK. Despite the Labour government's passage of the act two years previously, the formal creation of the NHS remained deeply uncertain and a source of fractious debate until the moment of its arrival. In a speech to Parliament on February 9, 1948, Aneurin Bevan, the Labour minister for health, exhorted his colleagues:

> I think it is a sad reflection that this great act, to which every party has made its contribution, in which every section of the community is vitally interested, should have so stormy a birth … We ought to take pride in the fact that, despite our financial and economic anxieties, we are still able to do the most civilized thing in the world—put the welfare of the sick in front of every other consideration.

The story of the British NHS is, however, much more than a story about caring for the sick. It is a century-long saga of the struggle for some form of democratically controlled planning under capitalism—a major reason for the tempestu-ousness of its birth and the conflicts it continues to engender. Radical enough, but not revolutionary, the NHS signaled the potential for a slow erosion of the market in a major sphere of life. It raised the possibility of a democratic planning that initially coexists with capitalism—an embryo of the new world developing within the confines of our old, tired one. But just as we've already seen how the simple act of planning—even on the vast scales undertaken by the likes of Walmart or Amazon—is not enough, it turns out that simply placing planning in the hands of the state is likewise insufficient for this embyro to really flourish.

"Nye" Bevan, as supporters affectionately called the charismatic leader of Labour's left wing who was tasked with establishing the NHS following Labour's landslide election victory in July 1945, famously said that "the NHS is socialism." Before its creation and throughout its history, many of the NHS's opponents have seen it that way as well and have acted accordingly. While the NHS is today the fourth-largest employer in the world, directly employing 1.4 million staff and outpolling every other institution—including the monarchy—in popularity among Britons, it is also, sadly, living proof of how a dream of a universal, publicly run service has been compromised, reduced to a hobbled mess of public and private institutions crisscrossed by markets. It is an example of far-reaching potential stymied.

Yet even at its best—and for all the compassion it embodies, and lives it has improved and saved—the NHS has fallen short of the horizon of democratic possibility. A short history of how this imperfect institutional expression of human decency, this real yet incomplete democracy came to be, and how it planned, offers much more than an abstract badminton match of ideas between libertarian and statist versions of socialism.

The story of the NHS begins not in the halls of the British Parliament at Westminster, but in the

mining villages and industrial towns born of the human sweat that powered the Industrial Revolution. Before the NHS, healthcare was largely a luxury. The wealthy hired personal doctors; the rest simply did without or depended on the modicum of relief provided by churches or the state. Local governments set up rudimentary hospitals for the poor, but they were at best insufficient, at worst more akin to prisons. They often kept the sick and the infirm separated from the rest of society, rather than cure them—sweeping the unemployed and unemployable under a squalid, fetid rug and calling it charity.

As a counter to this injustice, working-class organizations of all kinds began to experiment with mutual aid. Workers formed "friendly societies," pooling together small monthly dues from individual workers to pay doctors and run occasional free clinics. As they grew, some societies could hire full-time doctors and even build their own clinics, offering care to entire families, rather than just (mostly male) workers. This people's healthcare was most advanced in the coal-mining valleys of South Wales, where working-class culture thrived. By the early twentieth century, even little cottage hospitals were springing up alongside the black pits.

It was this spirit of mutual aid that allowed communities to survive economic downturns. Unemployed miners were put to work doing administrative tasks such as collecting fees—themselves reduced during such times—and doctors were also forced to take a pay cut in proportion to a society's lower income. This simple solidarity kept services intact, even when money was short. Worker-run clinics in Wales and across the UK were among the first large-scale insurance schemes for healthcare, predating both national public insurance (as in Canada or France) and private insurance (as in the United States). The working class organized itself to deal collectively with a problem that affected every individual, but with which no individual could deal on their own. It was socialized medicine in embryo.

As workers became more organized, these mutual aid–financed clinics grew still further in scale and number. Membership was opened up to entire communities, beyond just miners and their families. In turn, and through unions, workers made demands, not only on bosses for better working conditions, but also on government for radical redistribution of resources, including the establishment of healthcare as a right. In essence, this would be a public healthcare system: the same phenomenon of mutual aid extended to all of society and, crucially, requiring those with greater means to pay a greater share of the finance. Pushed to act to contain such broader demands and the spread of socialist ideas, the UK government created, in 1911, a limited national insurance scheme. This first attempt at publicly funded healthcare, however, was far from comprehensive: even after two decades, National Insurance covered just 43 percent of the population, the majority of them working-age men.

Today, doctors can be some of the strongest defenders of public healthcare, helping us recognize, for example, that vaccinations will not deliver the crucial defense of herd immunity unless an entire community is vaccinated. But at the time, it was not only the wealthy, as one might presume, but also most doctors that opposed the establishment of public healthcare. The former did not want to shoulder new taxes to pay for universal services that would disproportionately benefit the poor and working majority; the latter feared that a national scheme would not only reduce their incomes but also challenge their managerial control over what medical care looked like.

Both fears were warranted. As they expanded, worker-run schemes did indeed start to challenge the absolute power of doctors over medical care. Worker societies did not so much target individual clinical decisions—rather, they increasingly wanted a say in planning, in how resources were allocated. Would new money go into building clinics or hiring nurses—or into savings accounts held

by doctors? The most forward-thinking societies advocated for doctors to become salaried workers rather than contractors—people thus invested in the expansion of medical practice, rather than that of personal fortunes. As with any other sector, medicine has its own logistic specificities. Decisions have to be made about where clinics are located, how to divide tasks between nurses and doctors, which afflictions should be prioritized, and so on. To have a say over these things goes beyond simple redistribution of resources; rather, British workers were demanding that an entire sector of the economy be democratized.

Doctor Knows Best

The barriers to change were formidable. Medical care was (and often remains) largely paternalistic: doctor knows best, and patients are to do as they are told. Doctors are also typically small-business people, and not just in the UK. They decide much more than which prescription to write; they have influence over where clinics are established, which medical technology to use, and what counts as a legitimate health need and what doesn't. Of course, within the confines of the operating or examination room, doctors are legitimate experts. They have specialized skills and knowledge furnished by years of medical training. Contrary to the claims of modern-day charlatans, the advent of medical science unquestioningly represented a qualitative leap beyond the magical thinking and credulity that preceded it. The medieval notion that four humors in imbalance causes illness cannot compete with the germ theory of disease. As the lyrics of "The Internationale," the socialist hymn, famounsly command: "For reason in revolt now thunders, / And at last ends the age of cant! / Away with all your superstitions, / Servile masses arise, arise!"

Even so, doctors are not the only medical experts. Although nurses were key to the provision of care in the early-twentieth century United Kingdom, nursing was seen as less valuable because it was associated with femininity and low skill. Subjugated in society as women, nurses long played a subordinate role in hospitals and had little input into the shape of a system that would quickly stall without them. At a bare minimum, democratization would have to encompass all the workers involved in producing healthcare.

But health and disease stretch far beyond the four walls of a clinic or hospital, and beyond the medical knowledge of health practitioners; they are not a single, isolated compartment of our lives. For example, whether someone contracts lung disease may depend on pollution as much as it does on the responses of the health system, as epidemiologists will be the first to remind. Chronic disease during old age depends on a whole life history, reaching back through quality of social integration as an adult to childhood nutrition and primary education. Work-related injuries are highly dependent on the kind of work we do and the kinds of safety protections we have—from rules against asbestos to unions' willingness to fight for them. Health researchers today call these the "social determinants of health." While medicine can be a narrow field of expertise, healthcare encompasses everything we do. It is not just an individual responsibility but is deeply impacted by what society looks like and the level of its collective decision making. What, for example, counts as a legitimate health concern, and what can be dismissed? Are you depressed because of who you are, or because you're working two mind-numbing jobs at minimum wage? Is it you, or is it capitalism?

These questions go to the heart of what democratic planning looks like in practice anywhere, not just with respect to healthcare. For if we want a more egalitarian system to apply the best of human technical knowledge more effectively, without having to sit through interminable meetings or cast an

unending string of votes, then we'll have to give up some decision-making power—whether to experts, (elected) managers or representatives. At the same time, while healthcare should be delivered by experts, it should not be run exclusively by them. The question of whether people should be passive consumers of medicine or instead its active cocreators is a common theme throughout the history of public healthcare, wherever it has emerged. Veteran British physician Julian Tudor-Hart describes the seeds of transformation later developed by the NHS: "This embryonic new economy at the heart of the NHS depends on the growth of an element it always contained, which has only recently, and slowly, been recognized: the power and necessity of patients as co-producers … Once released from deference, public expectations become an irresistible force, providing initial elements of democratic accountability can be retained and rapidly extended." This is a call for a new system—one based on mutual accountability, democratic control over resources and input in decision making from all affected—a struggle already taken up by British workers in the early twentieth century.

The Second World War transformed everything, not least the prospects for true public healthcare. As war engulfed Europe, the British government introduced planning across major sectors of the economy. There were limits on markets, including the market for healthcare. Profit, while ever present, was at least within certain bounds, temporarily made secondary to the goal of winning the war. In this darkest of times—this "midnight in the century," as libertarian socialist Victor Serge described the period—the whisper of new, more democratically planned institutions was a signal of what was possible. The government-run Emergency Medical Service (EMS) demonstrated to ordinary people that medical provision could be allocated according to human need—even the skewed and limited set of needs dictated by war conditions—instead of for private gain.

The British working class emerged from the war emboldened. Planning had worked. Capitalists were forced to sacrifice profit to win the war, and the system didn't collapse. The country needed rebuilding, and the war had also shown that with enough intervention into the economy, everyone who needed a job could get one. This sense of potential propelled the Labour Party to a landslide in elections held at war's end. Labour's program was reformist but sweeping: the institutions of a new, extensive welfare state would hem in the market. Although it would take until 1948 to be officially established, the new National Health Service was the postwar government's greatest achievement. Healthcare was made free at point of service, paid out of taxation and universally available. Distinct from some other public healthcare systems, hospitals were not merely publicly funded but nationalized.

Doctors, led by the British Medical Association (BMA), protested ferociously at the coming public system, afraid of losing their privileges. They called Bevan a "medical Führer," and the NHS "creeping Nazism." They threatened to paralyze the new system. But with medicine still a lucrative profession and public opinion firmly against them, the doctors' threats were mostly hollow. Nye Bevan, who had experienced firsthand the system of medical mutual aid in Tredegar, the Welsh mining village where he was born, declared: "We're going to Tredegarize you."

The BMA did, however, win on one point. Labour had resurrected the old demand of the friendly societies—that doctors become salaried public servants, rather than independent small-business people that contracted with the state—but the BMA insisted doctors remain an independent power, formally beyond the remit of immediate democratic direction. In the face of the BMA's dogged opposition, Bevan ultimately conceded that family doctors, unlike those in nationalized hospitals, would remain independent contractors—" stuffing their mouths with gold" in his words. Within a few months of the NHS being established, the vast majority of doctors, however reluctantly, signed up. Public planning won out over private interests.

How the NHS Planned

The first task of the early NHS was turning an inadequate patchwork of clinics, hospitals and other services into a functioning, properly joined-up and universal public healthcare system. Early planning was rudimentary. In 1948, while the UK, like much of Europe, was still recovering from the bombardments, demolitions and ruination of the war, detailed statistics were effectively nonexistent. The world's first truly universal (as opposed to specialist) computing device, the Small-Scale Experimental Machine (SSEM) at Manchester University, ran its first program on June 21 of that year. By the end of the 1949, the world was home to a total of still just four similar devices, and even these were in stubbornly tentative operation. Widespread computer use was still decades away. The Ministry of Health set budgets and priorities but planned little else. Annual budgets for hospitals were very simple: take the previous year's numbers and increase them by however much the entire NHS budget was increasing. The NHS did grow, but this method of annual, proportional increases locked in and perpetuated inequalities that existed on the eve of its creation.

Much like today, where less populated regions suffer a lack of high-speed internet because telecommunication companies cherry-pick the most profitable areas to service (and let the rest of a country rot, for all they care), great chunks of the country came into the era of the NHS hospital-less, or at best with hospitals in poor shape, a situation that would not be corrected for years. The first major planning initiative at any serious scale would not come till the 1960s. Its aim was precisely to tackle these inequalities by building more and better hospitals, especially in poorer areas. The 1962 Hospital Plan of the then–Conservative government was a grand promise, but it almost immediately ran into chronic underfunding—presaging much of the history of the NHS to come.

A decade later, however, under another Labour government, meaningful planning appeared to be on the horizon. In policy documents, the aspirational goal of the NHS was now "to balance needs and priorities rationally and to plan and provide the right combination of services for the benefit of the public." In practice, three changes pointed to the potential for more thoroughgoing, democratic planning.

First, the NHS expanded the horizons of health. A reorganization in 1974 created "Area Health Authorities," whose boundaries neatly coincided with those of local governments. AHAs were intended to better integrate healthcare into local planning of other kinds, whether this meant sewers, roads, community centers or schools. The potential was, in principle, enormous: healthcare could be more than just a reaction to illness and begin to have bearing on those broader social determinants of health.

The same 1974 reform changed how healthcare was managed. New local management teams integrated the three parts of the NHS that had been run independently since 1948: hospitals, family medical clinics, and community health centers for the elderly and those with severe mental health difficulties. For better or for worse, these teams made decisions by consensus (extending something that had been part of the NHS since its founding in the three-person consensus boards, consisting of a doctor, a manager and a nurse, that ran individual hospitals). Working alongside these consensus management teams were "Community Health Councils." Local organizations representing seniors or the disabled were given the right to elect one-third of each CHC's members. When created, CHCs had no direct decision-making authority, but they held genuine promise to democratically transform the NHS. With community representation, CHCs showed that it was possible to open the opaque NHS hierarchy to bottom-up voices of patients and citizens.

Finally, in 1976, the NHS committed to distributing resources in line with health needs, a

potentially radical transformation. Taking into account regional differences in age and morbidity, the Resource Allocation Working Party (RAWP) greatly expanded upon past faltering attempts to correct baked-in inequalities from the pre-NHS era. Regions with bigger needs (which were often poorer as well) would now receive bigger budgets. The Priorities for Social Health and Service document, from the same year, incorporated rationing and priorities into the budgets set by the central NHS. By identifying key areas of spending, the politicians and managers who ran the service could finally wean doctors from some of their inherited power in a way that Nye Bevan had only dreamt of.

The reforms of the 1970s maintained a naive faith in top-down technocrats, reinforcing the paternalistic notion that expertise can overrule democracy that had also in part animated the creation of the NHS—one shared by both Labour and Conservative politicians. Many of these reforms simply created new layers of citizen-phobic, under-democratic bureaucracy. But these reforms also carried in them the seeds of a more radical remaking of the NHS. Rather than planning only how much healthcare there was, and where—the important questions that the 1960s planners had to tackle first—these reforms could also have laid the groundwork for planning that tackled how healthcare was produced and, most importantly, who participated in decision making.

However, instead of ratcheting up democracy within the system, most of the 1970s reforms failed in the face of brewing economic crisis. The oil shock of the early 1970s saw both prices and unemployment spike at the same time—something that economists of all mainstream stripes had said was no longer supposed to happen. The regime of boom and bust was supposed to have been solved by Keynesianism, delivered by the postwar compromise between capital and labor. In response to the new crisis, throughout the 1970s and early 1980s, elites in the UK (as in the United States and much of the West) launched an assault on the postwar economic settlement that had guaranteed higher wages and expansive public services for workers in exchange for high growth rates and high profits for business. With profits threatened, higher wages and expanding public services came under attack from the right in the UK and across the global North. UK unions launched one last major strike wave, which reached its height in 1979. It wasn't enough. Worker expectations for more and for better were firmly in the crosshairs when the most right-wing Conservative government since the war, led by Margaret Thatcher, came to power that same year. The tide had turned against the welfare state; capital had decided it was time to break the postwar compact with labor.

The reforms of the 1970s fell, one by one, to the Right's vision for healthcare. Norman Fowler, Thatcher's secretary of state for health, scrapped the area health authorities in 1982, before they even had a chance to integrate with local governments. A year later, Fowler eliminated management by consensus and reinstated individual responsibility for managers, calling the policy "general management." Community health councils outlasted AHAs by two decades—scrapped in England only in 2003—but even as they were allowed to limp on, they remained, more than anything, a vague protest body. The RAWP formulas stayed, but the principles behind them were soon transformed, by New Labour this time rather than by Conservatives. Under Labour Prime Minister Tony Blair, metrics that had been aids in planning slowly transmogrified into performance targets for managers.

Over the course of the 1980s, a business ethos crept into the NHS. It didn't come out of nowhere: the right's once-marginal ideologues had long blamed all NHS shortcomings on misspent budgets and a lack of "choice" by patients. While the problems of poor services and long wait times were real, fears about "out-of-control" budgets were largely manufactured. The NHS had been massively underfunded. Spending on health as a percentage of GDP had started out at a measly 3 percent of GDP in 1948, growing only to around 6 percent by the 1980s. At the time, France was spending about 9 percent of GDP on healthcare, and Germany 8 percent; thus, the NHS was and remains a relative

bargain.

Even in 2014, the UK spent just over 9 percent of GDP on healthcare, still below the average for countries in the global North. By comparison, the market-based system in the United States consumes nearly double that figure, 17 percent of GDP, while still denying care to millions—a paragon of economic inefficiency. The right's counterargument—that any budget, no matter how big, would never be enough—falls flat. Health budgets have remained relatively stable, except in the one country in the Organisation for Economic Co-operation and Development (OECD) that maintains a mostly private system.

But even 6 percent of GDP is still a big slice of the economy that holds relatively little opportunity for profit. Right-wing hand-wringing about cost control provided cover to the healthcare corporations that would gain, even if only part of the NHS were sold off. The barrier to overt privatization was that the NHS regularly topped polls of the most trusted institutions among the British electorate. Famously, even neoliberal revolutionary Margaret Thatcher had to promise that "the NHS is safe in our hands" in a speech to her own Conservative Party convention in 1983. But by 1988, when Thatcher announced a major review of the NHS, nearly a decade of hard-right rule and a much longer ideological battle against the welfare state left these words increasingly hollow.

Three years later, Thatcher's successor as prime minister, John Major, introduced the biggest reform in the history of the NHS: the "internal market." Although the Conservatives couldn't put the NHS onto the market, they found a way to put the market into the NHS, with an end result that was neither fish nor fowl.

The big change was termed the "purchaser-provider split." Before this reform, a doctor would refer a patient to a local hospital or clinic for any further service, such as a blood test, hip replacement or liver transplant. The NHS paid the doctor and funded the hospital, so no money explicitly changed hands between the two. Under the internal market, akin to the Sears debacle described earlier in the book, hospitals and community care clinics "sell" services. They are the providers. Doctors, local health authorities or other NHS agencies are purchasers who in turn "buy" these services in the name of their patients.

Over the course of the 1990s, a Labour-Conservative consensus around the allocative efficiency of markets and competition replaced the postwar consensus around planning and public service. Margaret Thatcher reportedly called Tony Blair—elected in 1997 as the first Labour prime minister since the 1970s—her greatest achievement. Nominally center-left, his business-friendly, pro-market New Labour government worked to expand the Conservatives' market reform (although at this point only within the NHS in England, as Scotland, Wales and Northern Ireland were given more autonomy and largely turned away from market reform). In the English NHS, purchasers, now called "commissioners," became fully independent of the NHS hierarchy, thus attenuating voter accountability. Alongside more markets, New Labour also created new institutions, such as the Monitor and the Care Quality Commission, to act as market regulators. In almost every case, such independent "expert" bodies were formally public bureaucracies, rather than market actors—not unlike independent central banks or the European Commission—nevertheless, they represented ever more impaired responsibility to voters, despite their location within the state. Once again, the Venn diagram of the set of state agents and the set of democratic agents shows overlap, but not coincidence, between the two. Public ownership does not by itself mean democratic ownership; and, as shown by the NHS's market reforms, public ownership may not even mean decommodification. The state now oversaw a fragmented system rather than planned one that was more unified.

With the door to wholesale market transformation cracked, David Cameron's post-2010 coalition of Conservatives and Liberal Democrats pushed it wide open. Their 2012 Health and Social Care Act now extended access to explicitly forprofit providers and introduced competition over commissioning contracts themselves—a contract for who gets to sign other contracts. By this time, even the British Medical Association—the same doctors' organization that had initially fought Bevan to maintain space for private business and professional privileges—was now standing up to reforms that would be a gateway for healthcare corporations first to cherry-pick, then to take over, large sectors of the NHS. In the years immediately following this overhaul, over 10 percent of total NHS spending already went to for-profit providers.

Against the Market

The story of the NHS since the 1990s is not just one of a conflict between planning and markets; it is also a reminder that markets need to be made and sustained, a point well understood by the neoliberals who set out to do just this. Markets are human creations; indeed, Adam Smith's prehistory of plucky Neolithic humans getting by through "truck and barter" is as inaccurate as the creationist Eden where humans rode dinosaurs. Rather than being natural and inevitable, markets are a planned institution. The NHS is a perfect example of such conscious effort going into the creation of something that is ultimately antidemocratic—where the strength of your voice is the size of your wallet—not to mention anarchic and often irrational. Three decades on, the central NHS is increasingly a rudderless vehicle for handing out money, as system-wide planning has eroded away. Competition was supposed to make the NHS more efficient, increase the quality of services and give patients a voice. On all counts, however, it has done little; and instead it has undermined the basic values of the NHS—that healthcare be universal, accessible and free.

Market reforms introduced plenty of new costs. Ostensibly about slimming down government bureaucracy, the dense jungle of contracts between providers and purchasers in fact required armies of new bureaucrats. Even by 1994, three years into the internal market, the NHS had hired 10,000 new managers. While administration costs made up just 5 percent of the total NHS budget in the 1980s, by 2005 they had nearly tripled, to 14 percent of the total. On these simple measures, planning was several times as efficient as the market. A 2014 report from the UK's Center for Health and the Public Interest put the cost of just running the internal market itself at an estimated £4.5 billion per year—enough to pay for dozens of new hospitals.

A public, universal health service can amalgamate costs. In this system, hospitals do not have to charge for individual procedures (or their components, like anesthesia); instead, costs are absorbed into a common budget from which surgeons are hired and supplies purchased. Resource control can still occur without the mediation of internal pricing: for example, through simple service prioritization. The complexity of modern medicine (and the increase in preventative care) means that isolating costs is not only difficult, but largely arbitrary. But despite it being hard to draw a straight line between small packets of health spending and health outcomes, the internal market requires that services be divided into such "products" to be priced. Administering the resulting network of contracts is not only inefficient; it cuts against the socializing tendencies of public healthcare.

Markets in healthcare are not only costly, but also far from the simple models described in economics textbooks. What economists call "costs of entry" are very high: building new hospitals is an option available only to the state or to the few large healthcare corporations. And without the state,

these corporations end up dominating the market, leading to scant competition but widespread waste and duplication. Consultants and marketers, for example, have flourished under the NHS internal market. Socialists have long pointed out that marketing is a major waste of resources and human energy under capitalism, but it's especially jarring in healthcare: resources that could go toward saving lives or curing diseases end up wasted on enticing doctors to pick one clinic over another for a referral.

Have all of these additional costs created new benefits? At best, it's hard to tell. Every patient comes into treatment with their own personal history, including all the social determinants of health, making comparison very difficult. On an aggregate level, recall that as England moved further along the market path, Scotland decided in the late 1990s to return to a more public NHS, where patients are not just consumers of healthcare but owners of the healthcare service itself. Since then, the Scottish NHS has improved more rapidly on important indicators, such as wait time for a hospital bed or an ambulance. On other measures like life expectancy, the gap between relatively poorer Scotland and its southern cousin remains steady, as well.

Difficulties in gauging quality haven't stopped market boosters from pretending it's simple. As part of its reforms, New Labour even created a three-star rating system—like Uber driver reviews but for hospitals. This went about as badly as you'd expect. For example, under the star system, cardiac surgeons in London hospitals were less willing to perform high-risk but life-saving operations because they could damage their hospital's rating. The free market fanatics, who complained that perverse incentives let quality languish under planning, thus created perversions all their own.

So, if competition cannot claim to be more efficient or to deliver higher quality, can it at least give patients that elusive "voice"? In fact, it turns out that having a choice in one's medical provider is a fairly low priority. In a recent UK survey, 63 percent of people ranked fairness as their most important value in healthcare. Choice in services, however, was last. What's more, where conditions become more life threatening and treatments more technologically advanced, people demonstrate even less desire to give input into medical decisions. And surveys have also found that people would rather have a greater say over the kind of treatment they receive than over who delivers it. People clearly desire a voice in healthcare decision making, but realizing this requires different and deeper democratization than that provided by the shallow market version. Involving patients by treating them as if they were consumers choosing shampoo at the drugstore is very different to giving patients more informed autonomy over their own health.

The Planned, Democratic Alternative

Today, after nearly three decades of market reform, each year the NHS manages healthcare less, while managing competition more. It plans by proxy. Less room for strategic planning means decisions are made by smaller, independent units that are enmeshed in growing webs of contracts. Of course, before the 1990s, the NHS still planned too little, and planning was not democratic enough. And it was also chronically underfunded. The slow extension of the internal market—Margaret Thatcher's dictum that "there is no alternative"—to healthcare was one way out of the impasse at the end of the 1970s—an antidemocratic one, and inefficient for the system, but lucrative for private providers.

But there were, and are, alternatives. In the place of today's commissioners or the earlier ministry-appointed technocrats, we can imagine community health councils that combine

representatives elected from the general public, members of local health advocacy groups, and experts in medical science and provision of medicine, as well as representatives elected by medical workers themselves. People elected from the community could go through basic training in health policy and health science. We could imagine a council of councils, which could handle questions of priorities, of preventative health and of system-wide rationing. In some matters where technical knowledge is more important, votes could be weighted. For the patient in the doctor's office, there is also space for genuine participation in decision making. The results of the aforementioned patient survey show that people want not specific healthcare services from specific providers, but simply to be healthy. A healthcare system that has sufficient resources and distributes them equitably could start down this path by at least giving doctors more time with patients, thereby encouraging relationships to be less paternalistic. Further down the line, health could be integrated into planning outside the healthcare system—plans for neighborhoods and workplaces—integrating formal healthcare with democratic planning surrounding the social determinants of health.

Deeper, democratic planning would unite healthcare workers with patients, and entire communities, as active coproducers of health and collective owners of a healthcare service. The very idea of an NHS, even as it is being undermined and partly dismantled, represents the possibility of this new economy. A public, universal system—free at the point of service and paid out of taxes (as was Bevan's goal), but embodying humanist, bottom-up democracy, rather than paternalistic, technocratic state charity—is also one that builds its own constituency and creates a different kind of people—more willing to cooperate and to see their own destinies cooperatively tied up with those of others.

"Free market" capitalists, as we have seen, end up planning more than we realize. The example of the NHS shows that even the planning of ostensibly public sector endeavors is not always fully democratic—and, to the extent that it exists, it is constantly under threat of marketization. Thus, decommodification (the elimination of market provision of a good or service) is only a necessary condition of democratization of the economy; it is not a sufficient condition.

The seeds of rational, democratic, emancipatory and planned public services were certainly sown in the NHS. But for healthcare as much as any other sector, nationalization is not enough.

7

DID THEY EVEN PLAN THE SOVIET UNION?

"This business about Walmart and Amazon, even the NHS, seems all well and good," we can imagine you grumbling. "But there was this thing called the Soviet Union. Perhaps you've heard of it? Nasty business. Gulag. Secret police. Millions killed. Trousers came without zippers. No pineapples or Elvis. And the collapse of the USSR sort of irrefutably demonstrates the impossibility of planning, don't you think?"

Left critics of the Soviet Union typically seek an explanation for its failure in the backward, essentially feudal nature of the prerevolutionary economy, in the pressures of the ever-present existential military threat from the West, in the alleged democratic lacunae of Leninist organizational structures, or in the class interests of the formerly Tsarist bureaucrats upon which the inexperienced workers' state had no choice but to depend.

These left explanations of the rise of Stalinism are not necessarily incorrect. But here, we are interested more specifically in the theory marshaled by conservatives, for whom ineluctable totalitarianism can be traced directly back to a planned economy. Equally, we are interested in how the broader public became convinced of this explanation—that the Soviet Union shows not only that planning does not work, but that it is inherently authoritarian.

Our argument is that while the replacement of the market with planning is a necessary condition for an egalitarian society, it is not a sufficient condition. Planning must be democratic. Mises and Hayek have it backwards: it is not that degradation of economic information as a result of planning leads to authoritarianism, but that authoritarianism drives degradation of information, which undermines planning.

A library's worth of books have been written on the failure of the Bolshevik experiment, and to rehearse these arguments would be as tedious for us as it would be burdensome to our reader. Nevertheless, any book discussing planning cannot avoid history's largest-ever attempt—or at least, the largest-ever attempt before Walmart. Whether we like it or not, the history of the Soviet Union courses through economic ideologies across the political spectrum. Our aim, then, is to provide as concise a narrative as possible, freed of the worst examples of the last century's scholasticism and sectariana on the subject, that locates the place of planning—and lack of it—in the Soviet tragedy.

Making It Up as They Go Along

It is odd, but no less true for being so, that even though the Bolsheviks would engage in the most radical economic experiment of the last century, they did not actually come to power with a specific economic strategy. They had no real blueprints lying around illustrating how socialism could be implemented. Karl Marx and Friedrich Engels may have expertly described the political economy of

the capitalist mode of production, but they left few specific descriptions of what their hoped-for replacement would look like.

Returning to Petrograd in April 1917 from Swiss exile, Vladimir Lenin also skimped on all but the broadest strokes of an economic program. His "April Theses," a pair of speeches aimed at his fellow Bolsheviks, list the need to immediately end the war, to confiscate the big landed estates, and to transfer the entirety of state power over to the soviets—the councils directly representing the workers that had sprung up over the course of the revolution that overthrew the Romanov dynasty. This was to include the immediate union of all banks into a single national bank controlled by the Petrograd Soviet. But that's it. And the eighth thesis warns: "It is not our immediate task to 'introduce' socialism, but only to bring social production and the distribution of products at once under the *control* of the Soviets of Workers' Deputies." Unlike Neurath's detailed theorization of how socialist industries would have to be organized, Lenin and other Bolsheviks had given little attention to how the economy would be run after the seizure of power.

In his June address to the very first congress of all the soviets from across the country, Lenin declared that the program responding to the economic crisis then ravaging the country was to immediately make the profits of the capitalists public, "arrest fifty or a hundred of the biggest millionaires," and to pass "control" over to the workers. In his 1969 economic history of the USSR, Russian Scottish economist Alec Nove notes, however, that the Russian word "*kontrol*" does not mean "takeover" per se, but instead has more a sense of inspection and checking similar to the French "*contrôle des billets*": "[Lenin's] emphasis was on the prevention of sabotage and fraud by the capitalists. Yet now and again, 'kontrol' shades into control, developing into complete regulation of production and distribution by the workers, into the 'nationwide organisation' of the exchange of grain for manufactured goods, etc. But how this was to happen was left undefined."

As 1917 progressed, as the railways broke down, employers sabotaged production, famine threatened, and a general disorganization metastasized, the question of what is meant by workers' "control" began to impose itself less abstractly. Whether performed by the state or the workers, it became increasingly clear that some sort of coordination of production and distribution was required to overcome the fast-spreading chaos.

On the eve of the October Revolution, Lenin wrote that capitalism had already created within itself an excellent mechanism of coordination whose "capitalistic mutilation" could simply be lopped off: a useful accounting apparatus in the form of the banks, the "syndicates" (effectively groups of businesses) and the postal service. This apparatus could be taken "ready-made from capitalism." We begin to see Lenin alight upon the same need for economic planning that Otto Neurath had proposed: "A single state bank, the biggest of the big, with branches in every rural district, in every factory, will constitute as much as nine tenths of the socialist apparatus. This will be country-wide bookkeeping, country-wide accounting of the production and distribution of goods. This will be, so to speak, something in the nature of the skeleton of socialist society."

However, the Bolsheviks did not come to power in October and then nationalize the entirety of the economy the very next day. Centralized planning arrived in drips and drabs, on an ad hoc basis—often in reaction to the disruption or collapse of normal market relations and acute shortages as civil war spread throughout the country—rather than through the stepwise rollout of a comprehensive strategy for replacing the market. The winter of 1917–18 was a severe one. As workers left the city in search of food, factories had to close due to labor shortages, further compounding shortages, while the government attempted to ration food and other essentials through the state or cooperatives. It was

necessity, not ideology, that drove the prohibition of private trade in consumer items. As supplies ran out, not only of consumer necessities, but of raw materials and fuel, there was, according to Nove, "a fatally logical escalation in the degree of state control, state operation and finally also state ownership."

On November 27, the Congress of Soviets issued a decree on workers' control, giving greater powers to the factory committees. They could now "actively interfere" with all aspects of production and distribution, and their decisions were binding on the factory owners. However, the decree was less a green light for factory committees to take over production than it was legal imprimatur of what had already been happening for months. As Nove wonders, was this *kontrol* or *control*?

The scale and timetable on which nationalization was to be achieved were likewise vague. Soviet scholars from the period disagree whether the party even had a basic plan for nationalization of all major industrial sectors.

Nevertheless, in December 1917, the Supreme Council of National Economy, or VSNKh (Vesenkha), was established to elaborate the general norms for regulation of the economic life of the country. It had the right of requisition and of effecting compulsory "syndication" of various branches of industry. In these early days, various sections of the Vesenkha even included managers and owners, often overlapping with the sectoral business syndicates (trade associations) that had existed prior to the revolution. As Nove notes, even the offices and much of the staff remained the same.

If the essence of socialism is the generalization of the democratic principle to all economic areas that are currently superintended by the unelected owners of private companies, then what difference does it make to workers—or indeed to anyone in society—if economic decisions are made by unelected bureaucrats instead of unelected bosses? Democracy is the beating heart of socialism, and as we shall see, it is *the* crucial check against economic inefficiency.

So at the time of the October Revolution, it is likely that there were at least some currents that recognized that while nationalization was a necessary measure, it was not supposed to represent the end goal. This was certainly the case among the more libertarian socialist elements, even as others argued that an immediate withering-away of the state was an ultra-leftist delusion. While the entirety of the merchant fleet was formally nationalized in January 1918, some nationalizations were even due to the refusal of employers to accept rule by workers' councils, and their preference for state takeover as the less intolerable option.

The chaos and extent of unauthorized nationalization of industry unnerved central authorities; that same year, they decreed that no expropriation could occur without the say-so of the Vesenkha. By June, however, a wholesale reversal of the effort to apply the brakes came with the adoption of a decree nationalizing all factories, inaugurating the period commonly called "war communism." Foreign trade, urban distribution of food and other items came under direction of the state, while food requisition from peasants (which would prove to be brutal) was introduced in an attempt to come to grips with the threat of famine. The move was made less in support of nationalization from below, or to advance the cause of socialist democracy, than it was to impose some order to chaotic conditions amid growing civil war, which had spread to much of Russia, between the Bolshevik Red Army, the "Whites"—monarchist, conservative and proto-fascist forces supported by Britain, France, the United States, Japan and ten other foreign armies—and various non-Bolshevik socialists. Supplies of materials and food were cut off and communications were disrupted, exacerbating the crisis as shortages became ever more acute. Atop all this, in March, the terms imposed by Germany in the Treaty of Brest-Litovsk to bring the Great War on the Eastern Front to an end had been punitive, with

Russia losing great swaths of arable land and productive industries to the Central Powers, and the Western nations as a whole were enforcing a naval blockade against the nascent workers' government.

Between the start of the Great War in 1914 and 1921, gross output of all industry plunged by two-thirds; coal production decreased by two-thirds, and steel and electricity generation (such as existed) by roughly four-fifths, while imports plummeted by 85 percent, and exports by just under 99 percent.

Restoration of order was not just imperative, but popular. And indeed, we see repeatedly throughout history how capitalist states under conditions of total war have likewise engaged in widespread nationalization—or at least centralization of investment decisions, rationing, and much greater state control of the economy than normally obtained under capitalism in a time of peace. For the Bolsheviks, as with Roosevelt or Churchill some two decades later, winning the war came into conflict with the inefficiencies of the market. There was a fatal logic to the extension of state control.

There were Left Opposition figures such as Nikolai Bukharin and Karl Radek who opposed Lenin's inclinations toward discipline and managerial authority, and even those toward material incentives, piecework, and payment of higher wages to specialists than to other workers. So much of what was occurring seemed a refutation of the egalitarian, democratic aims of Marxism, and above all, of its desire to transcend domination in favor of a new realm of freedom. But at the same time, defeat in the civil war meant loss of the world's first workers' government. Such noble goals as Lenin himself had earlier articulated would have to wait. Russia was hopelessly underdeveloped, its economy crushed. The best that could be done was for the Bolsheviks to hold out as long as they could in the hope that the promised world revolution would spread to more-industrialized nations such as Germany or Britain, which Marx and other socialists had presumed would be the birthplace of world revolution, rather than a still largely feudal economic backwater like Russia.

After the rouble collapsed, and public spending was sourced via the printing of money, the running expenses of much of the economy began to come straight out of the budget; as a result, actual cash payments began to mean less and less. Local economic councils resolved that state industrial enterprises deliver their products to other enterprises upon the instruction of the Vesenkha without need for payment, and that they should receive the materials and services they need in the same manner. The railways and the merchant fleet should likewise transport goods for free. Subsequently, workers in the state sector, and later other urban workers and even some rural residents, were no longer charged for their paltry food ration ("Free rations, when there was anything to ration," Nove writes), while postal, transport and other municipal services were free and wages mostly paid in kind. Expenditures became more a practice of bookkeeping than exchange. As Nove describes the situation: "Money lost its effective function within the state sector of the economy."

By the end of 1918, a new body, this one called the Commission of Utilization, only tasked with the question of distribution, began to draft *material balance sheets*—the germ of what would become, over the decades, much grander Soviet systems of planning. The ideological wish for a moneyless society merged with the exigencies of a crisis economy. By 1919, the draft program of the Communist Party stated that trade should undeviatingly be replaced by "planned, governmentally-organized distribution of products," while preparations should be made for "the abolition of money." Some even theorized that it was the chaos of revolutions themselves that would produce the swift disappearance of capitalist relations, such as money and commodity exchange on the market.

At first, amid the breakdown, the best that the Vesenkha could do amounted less to central planning than it did mitigation of the disaster. It ordered what had to be produced, distributed what

could be distributed, and attempted to introduce coordination between economic sectors. Nonetheless, by September 1919, Bukharin estimated that some 80 to 90 percent of the largest industries had been nationalized. Expropriation of smaller enterprises, however, was ruled "absolutely out of the question," as it would be impossible to organize such small-scale production and distribution. A decree earlier that year forbade nationalization of workshops with fewer than five employees, although, vast, ad hoc nationalizations of businesses of this size did indeed occur, but without any coherent plan, as authorities (where they existed) hurtled "from bottleneck to bottleneck." Meanwhile, a vast underground economy exacerbated shortages and inflation, and drew resources away from war priorities. And so, in November 1920, despite the utter inability and distinct lack of desire of administrators, with their embryonic planning capacity, to handle tens of thousands of minuscule operations, a decree announced the nationalization of all small-scale industry.

While Lenin was ultimately successful in reinstalling the principle of one-person management in workplaces, this took varying forms. In some locations it meant a worker in charge, with a specialist —in essence a manager from before the revolution—advising. In other locations this meant a specialist was put in charge, with a worker-commissar advising who could sometimes query but not overrule him. Some, in a political tendency within the Bolsheviks known as the Workers' Opposition, wanted trade union control over the economy, while Leon Trotsky, the commander of the Red Army and ultimately architect of the Bolshevik victory in the civil war, sought the full militarization of labor. The urgency of the cataclysm justified the temporary establishment of an "army of labor" operating under military discipline, he believed. But it would be overly simplistic to view such arguments as taking place between a right, centralizing, more authoritarian tendency, on the one hand, and a left, more libertarian tendency on the other. The argumentation was furious, and key figures vacillated over various aspects of the question as conditions changed. Lenin, for his part—while supporting stricter discipline and more centralized management in the general interest, and even the militarization of labor on a case-by-case basis—thought Trotsky went too far. He felt that the trade unions needed to maintain their important function as sectional representation of workers. Precisely because the current dire situation demanded such bureaucratic, centralizing distortion of socialist goals, he believed there was a need for trade unions to maintain an independent ability to embody their members' interests at this or that factory. Trade union control of the economy would in effect transform the trade unions into managerial arms of the Vesenkha, representing the interest of the management with respect to workers, which would conflict with their historical role of representing the interest of the workers with respect to management. Nevertheless, the effort to establish greater discipline led to ever greater control of the party over the trade unions (in some cases willingly so, as the personnel involved were frequently members of both), and, later on, as soviet democracy was ultimately strangled, the contradiction here would ultimately be decided in favor of the state.

The Gosplan and the Gulag

As above, there is little need for us to add to the extensive historical literature describing the purges that killed off most of the old Bolsheviks who had made the revolution, the great famine in the early '30s that was responsible for the deaths of as many as 12 million (mostly Ukrainians), the sabotage of the Spanish Revolution, the gulag, the suppression of worker uprisings in Hungary and Czechoslovakia, or the invasion of Afghanistan. We are, however, interested in considering the economics of the deterioration, and in particular whether planning causes (or even contributes to) the

rise of authoritarianism—as the market socialist Nove and indeed most social democrats, liberals and conservatives have argued—or instead whether these analysts have it backward: whether it is in fact *authoritarianism that fatally undermines planning*.

Immediately in October, the peasantry had begun seizing much of the land and dividing it up among themselves. While the land redistribution was in keeping with the stated aims of the revolution and encouraged by the emerging government, the process very quickly resulted in an unexpected inability to feed the urban masses, a crisis that set up a deep antagonism between town and country that would only be resolved via a brutality that must be counted as one of the great crimes of history.

The reorganization of farms and the large estates, of course, had a disruptive impact on agricultural production, notably as the peasants squabbled among themselves over how the land would be distributed. There were richer and poorer peasants. Some wanted the estates broken up, while others favored collectivization of production. But the hunger that stalked the cities was not a result of these struggles, but instead of a contradiction between the immediate interests of the urban workers and the peasants, however much was made of the unity of those who wielded the hammer in the factory and those who hewed with the sickle in the fields. Much of the peasantry were not agricultural workers employed by a boss, but instead more akin to feudal serfs, despite serfdom having been formally abolished in 1861, with either nobles or the state itself directly expropriating a percentage of what was produced and then selling that on the market. The great source of wealth in Russia, as in all other countries before the rise of capitalism, was this seasonal act of direct theft from the peasantry. The incentive of the peasant to produce any surplus was thus driven by their need to survive, to make sure there was enough left over to eat after the landowner had taken his cut.

Bread rations in Petrograd were so meager that workers—many of whom had, not a generation before, been peasants themselves—began to migrate back to their villages in order to be able to feed themselves; some factories even had to close their gates due to the dearth of workers. The new government was in a bind. The best option would be to produce a raft of light industrial items and consumer goods that peasants might want, thus incentivizing the peasantry—many among them reduced to subsistence farming on small redistributed plots—to produce sufficient surplus to be able to purchase such items. The disruption and chaos from revolution and civil war already made this quite a task, but the problem was compounded by the ongoing need for heavy industrial production to produce the weapons and vehicles needed to fight the war. Even as the civil war, to everyone's exhausted surprise, began to wind down in the Bolsheviks' favor by 1920, the revolutionaries felt an abiding fear that foreign armies, much wealthier and more technologically advanced, could reinvade at any moment. The Bolsheviks confronted a paradox: a shift to light industrial production would likely result in the crushing of the revolution from without; but if they did not shift to light industrial production, the revolution would likely be crushed from within.

In short, the early soviets suffered due to an agricultural sector that had yet to be integrated into capitalism. Had a countrywide emergence of capitalism turned these peasants into agricultural workers instead, as had been occurring for the last couple of centuries in western Europe, these workers would have had an immediate common interest with the industrial workers of the cities and towns in the collectivization of production. Instead, the revolution had liberated peasants by turning them into smallholders.

Food shortages drove hoarding, speculation and thus inflation, and these in turn compounded the shortages. During 1918–19, some 60 percent of urban consumption passed through the black market.

As was happening with other areas of production, distribution, and broken markets, central

authorities increasingly turned to more aggressive mechanisms of allocation. The Supply Commissariat (Narkomprod), in May 1918, was given powers to obtain food by force. Its officials, together with detachments of armed workers and the secret police (Cheka), seized the stocks of those accused of hoarding, while poorer peasants were whipped up into a campaign of confiscating grain from alleged "kulaks" (or so-called "rich peasants"). These haphazard food requisitions were over time regularized into "*prodrazvyorstka*," a system of enforced purchase for a fixed—but unattractive—price that echoed earlier grain confiscation programs of the tsar during World War I. The prices were so low that in some cases, the requisitioning might as well have been called confiscation, as very little could be purchased with such paltry sums. Quite understandably, peasants fought back, not least because what food was left after the agents of prodrazvyorstka had gone was not enough to feed themselves. Riots were not uncommon. The program only exacerbated the shortages and speculation as peasants hid their grain, sold it on the black market, or simply didn't sow seeds—for what was the point in working if the entire fruits of your labor were to be stolen? Even as procurements more than tripled, overall, production collapsed.

The civil war, prodrazvyorstka and a severe drought in the east and southeast resulted in a grain harvest in 1921 of barely more than two-fifths of the prewar average, creating a famine, accompanied by a typhus epidemic, in which millions died, despite emergency relief and the waiver of the food tax in affected regions.

Even at this point, out of fear of a return of the landlords, peasants remained sufficiently loyal to the Bolsheviks to ensure their victory in the civil war by 1922. Meanwhile, for all their fury at the "selfish" peasants' inability to produce in the interest of the greater good, Lenin, Trotsky, Bukharin and some other leading Bolsheviks began to argue that the emergency requisitions were no long-term solution to the contradiction between the interests of the urban workers and the peasantry. A boost in agricultural productivity would be impossible without some sort of incentive for the peasantry. Once a fragile peace had been achieved, the leadership considered the scale of the disaster of "war communism" and were convinced of the need for a retreat from what others had believed to be a salutary, galloping advance toward socialism. The government was not just faced with peasant rebellions: workers in Petrograd were also beginning to strike over the meager bread rations; the prodrazvyorstka was being replaced with a food tax set significantly lower than the requisitioning targets; further, a sailors' revolt at Kronstadt, home to the Baltic fleet, had at the end of the civil war cemented this view of a need to draw back. And so, by 1923, the sown area had returned to 90 percent of prewar levels, and while the harvest was still less than in 1913, food shortages were no longer desperate.

A more cautious approach that reintroduced elements of the market, with the aim of development of primarily private agriculture and a substantial private light-industrial sector, would now be the aim under the New Economic Policy (NEP)—a concession leading Bolsheviks believed would likely be needed to be kept in place for a long time. Lenin hoped for a maximum of twenty-five years; others thought that would be the minimum.

The NEP's legalization of private trade turned out to be a rapid success, particularly with respect to consumer items in the countryside. Small workshops that had been nationalized were now leased to entrepreneurs and cooperatives, while the state held on to heavy industry, finance and foreign trade. Talk of the abolition of money vanished as state enterprises would now have to operate on the basis of commercial accounting. Resources necessary for production, notably fuel, would have to be paid for with funds obtained from sales instead of with easy credit from the center. Likewise, wages would once again be paid in cash, and charges for municipal services were reimposed. Factories would

operate as autonomous, competitive units aiming for profits and avoidance of losses. Oil and timber concessions were even offered to foreign capitalists, in the hope of their introduction of much-needed modern machinery.

Due to the considerable market allocation of goods that was reintroduced under the NEP, it is hard to say how much planning was occurring. Strategic sectors of heavy industry were closely directed by the appropriate division of Vesenkha as to what to produce, and when, while consumer goods industries were left to craft their own production plans, taking their cues from the market. Here's Nove again: "The word 'planning' had a very different meaning in 1923–26 to that which it later acquired. There was no fully worked-out production and allocation program, no 'command economy.'" What emerged instead of operational planning were forecasts, recommendations and guides that permitted higher-ups to discuss priorities for strategic investment decisions. In many respects, what was obtained at this point was not radically different from some of the more statist Western economies of the postwar period, as many of the commanding heights of the economy, particularly coal and steel, were in public hands—although perhaps it had a more spasmodic character, as the disorganized new state was still establishing itself.

Simultaneous to all this, the civil war had gutted civil liberties and atrophied soviet democracy. Millions of workers, including the most politically active, were killed in combat. Those who survived had done so by returning to villages to scrape together enough to eat, engaging in black market activities, or through absorption into the new state apparatus. Day-to-day functioning of the government depended upon tsarist bureaucrats, and talk of the extinction of the proletariat was only a slight exaggeration. The soviets had truly ceased to be organs of government *by* the workers, but instead existed *for* the workers—or even by and for the bureaucrats. There was no longer any real direct exercise of power by the soviets. The constriction of civil liberties, amid total war with enemies on all sides, never let up—even as a fragile victory emerged. With most political parties siding against the revolution after October, by the end of the civil war the Bolsheviks were the only effective party left. It was through factions within the party, not between parties, that political disagreement was expressed. But in 1921, unnerved at an echo of the ideas of the Left Opposition within the Communist Party among the Kronstadt rebels—and at how many Communist Party members had joined the revolt—the leadership made perhaps its greatest mistake, laying the groundwork for the Stalinization process later in the decade: it legislated a ban on factions within the Bolsheviks. Intended as a temporary measure until things calmed down, even those backing the measure nevertheless feared what might happen as a result.

Throughout the 1920s, despite the formal ban on factions, argumentation about what was to be done was omnipresent, although debate coarsened. After the death of Lenin in 1924, Joseph Stalin, leader of the Bolshevik "Center" faction that waffled between the two poles of continuing the NEP and re-collectivizing agriculture in the name of a rapid expansion of heavy industry, emerged to a position of power. Discussion meetings would face squads of Stalinist hecklers disrupting them with taunts, jeers and catcalls, even fisticuffs. The hooliganism accompanied a creeping dominance of the secret police, the Joint State Political Directorate (OGPU). From mid 1926 onward, most opposition figures, left and right, were steadily expelled from positions of influence. Oppositionists (or anyone suspected of opposition) were dragged from their beds at night and imprisoned or exiled without charge. In 1928, Trotsky and his supporters were exiled to remote parts of the union; then, in 1929, with the Left defeated, Stalin turned his attention to the last remaining critics of authoritarian creep, among them Bukharin. Bukharin confessed to "ideological errors" and was partially and briefly rehabilitated, but a few years later, he too would join most of his old Bolshevik comrades who had

made the revolution, killed in one way or another in the Great Purge.

After the civil war, economic growth overall was rapid but largely comprised reactivating, repairing and renovating existing capacity, re-laying damaged railroads, and reabsorption of available factory labor. Industrial output—handicapped by a lack of capital and the loss of skilled laborers in the war—remained feeble. The urban/rural paradox at the heart of the confiscatory horrors of war communism did not go away, even as the economy revived. As late as 1928, the wooden plow and hand scythes remained the state of the art in agricultural technology for millions of smallholdings. To go beyond a restoration of the situation that existed prior to the war, much greater investment to develop new plant would be required.

As the middle years of the decade passed over to its later years, the NEP period was not so much ended as eclipsed. Experiments in price controls over an ever-widening series of items encouraged owners to limit production, again producing shortages in a range of goods. Thus, the choice before authorities was either a relaxation of such pricing policies, and essentially letting the market under the NEP allocate goods, on the one hand, and a more systematic control of production and distribution of key commodities, on the other. Certainly the latter had more of an ideological attraction to many, but it was the acute shortages and bottlenecks, rather than a renewed fervor for socialism, that drove the growth of administrative controls and ultimately the adoption of more centralized planning.

Ultimately, the country faced a problem of development identical to that which all developing countries have since faced: Who in society will bear the brunt of the need for accumulation of capital for the needed investment? Starting in 1926, rapid industrialization increasingly won out over balanced, slower growth that was dependent on the expansion of private agriculture and light industry, and it was backed up with a viciousness toward the peasantry that would make the requisitions of war communism appear benign by comparison.

In the fall of that year, a party conference backed favoring heavy industry in the state sector over other sectors, with the aim of catching up rapidly to—and then surpassing—the most advanced industrial nations. To orchestrate this, a long-term plan would have to be drafted. The task fell to a relatively obscure government subcommittee, the State Planning Committee, or “Gosplan.”

Established in February 1921, Gosplan was tasked with crafting a single economic plan for the entire country, to be recommended to its decision-making superiors in the Council of Labor and Defense, an economic-military cabinet itself established to move Russia beyond the ad hoc approach to planning necessitated by civil war. Gosplan was also to develop the budget and investigate options for currency, credit and banking. Under the NEP, the Gosplan bean counters, many of them experts who were not members of the Bolsheviks, crafted what was likely the very first system of national accounts in history—a complete accounting of the economic activity of a country: the aggregate of its production, income and expenditure. A handful of Western nations would begin to adopt such practices in the ’30s and ’40s, doing so more widely only after the Second World War.

After 1926, the role of Gosplan strengthened. By 1927, preparatory work for the first five-year plan was underway, amid growing political pressure to adopt ever more ambitious growth targets; an initial version would later be replaced by an optimal version, and then quickly replaced again by a version with even more fanciful targets. A colossal task, the drafting of the plan required more information and statistics from all the different sectors than could possibly be available at the time. In September 1928, Bukharin attacked the growth rates as excessive and unbalanced. The first show trial, held that year, discredited those who called for caution as “wreckers” in the pay of foreign governments. Experts who presented analysis that was insufficiently optimistic would lose their

positions.

To the extent that there had been "planning" rather than a chaotic stagger from bottleneck to bottleneck, the first five-year plan, from 1928 to 1932, involved a reorganization—a systematization of the process, with repeated further overhauls. The overlap of function between Vesenkha and Gosplan was ultimately resolved by the latter's increasing assumption of many of the functions of the former. Credit and banking were likewise reformed. Trusts had until this point been able to offer credit among themselves, but this resulted in investment occurring in unplanned fashion that was not in keeping with the overall five-year plan. Thus in 1930, inter-enterprise lending was prohibited, replaced with direct lending through the state bank and the development of a "unified financial plan" covering all investment decisions.

What came to be known internationally as the "command economy" thus lurchingly emerged over the course of the decade. State enterprises were placed under the direction of the relevant people's commissariat—what in most countries today would be called a ministry or department—with the director of each firm following the direct orders of the given commissariat. Each produced plans for its enterprises in keeping with the general policy objectives set by Gosplan and, in turn, assessed the range of consequences of different plans and worked to reconcile them through a system of "material balances"—in essence a balance sheet not of profits or losses, but of material output from all sectors and the presumed utilization needs of all sectors. As production and distribution proceeded—either meeting, not meeting, or exceeding projections—thousands of changes to the material balances were constantly being made, much as planning within any single capitalist firm in the West might do. And indeed, as we will later see, the Soviet experience here gave rise to logistical, accounting and planning techniques that were subsequently adopted by capitalist corporations and remain at the core of their internal planning to this day. In this way, a five-year plan was not an operational one, but a strategic one; operational plans, in contrast, were devised to cover periods of one year or less. And, as occurs between most departments within a Western, capitalist firm, the use of prices was fairly limited. All this required production and distribution plans for, and thus highly detailed information from, every enterprise, with the level of detail required ever more granular. By the time the Second World War began, there were twenty-one different industrial people's commissariats. One could say, and indeed many analysts have, that the USSR began to operate as a single factory, a company town stretching across one-sixth of the world.

By the early 1930s, political contestation had disappeared. As repression increasingly became the normal operating procedure of the party, the hundreds of bureaucrats involved in crafting the plans, as well as the managers of any factory, mine or railway, feared for their jobs, their families and their lives. The party purged 400,000 of its members in 1933.

Belgian Russian novelist and libertarian socialist Victor Serge, whose novels had been banned in the USSR, describes in his memoir how that same year he had gone out one cold morning for medicine for his perennially sick wife and noticed he was being followed. This was quite normal, but this time his minders were following more closely than normal. "Criminal investigation. Kindly follow us, citizen, for purposes of investigation." In a minute, windowless, powerfully lit Lubyanka prison cell, a State Political Directorate (GPU) driver—arrested for listening to friends read aloud a counterrevolutionary leaflet without denouncing them all immediately—tells him that this was where prisoners waited before being taken away to be executed. A cellmate explains that he had been arrested for allegedly deducting a commission on the sale of a typewriter by one office to another. A pair of agronomists explain that the leading figures in the People's Commissariat for Agriculture had all been scooped up by the GPU, thirty-eight in total. Their crime had been to suggest greater

autonomy for farms. A leading academic journal accused them of being enemy agents and wreckers, and of "infecting horses with meningitis." One night, Serge discovers that they have all been executed.

Anyone with any expertise was placed under suspicion, even as Stalin demanded rapid training of skilled cadre. Within Gosplan itself, those economists who urged caution were likewise accused of being saboteurs. The "modest" targets of the first draft of the five-year plan were denounced as "deliberate minimalism" of the bourgeois "wrecker-planners." But they were damned if they did and damned if they didn't. Plans that were viewed to be excessively ambitious were also attacked as intentional wrecking. Wrecking was even specified as a crime in the criminal code during the Stalin era. Later in the decade, as the Great Purge was in full swing, even the organizers of the 1937 census were sent to camps for the crime of wrecking, as the resulting data showed Russia to have 8 million fewer citizens than expected—an empirical contradiction of Stalin's public claim that the Soviet model's incredible success was resulting in the addition of 3 million citizens per year.

The Paradox of the Peasantry

Somehow, despite the tragedies and the trials, the USSR would become a superpower of the first order—the first nation to put a human in space—whose sole economic rival was the United States. How was this great leap forward achieved?

The answer can be found in the decisions of those who viewed civil liberties as an unaffordable bourgeois bagatelle, at best, and a red herring deployed by the class opponents of the construction of socialism, at worst, to resolve "the paradox of the peasantry" through force. It had long been widely agreed that agricultural production could only substantially advance through the concentration of land and the elimination of subsistence agriculture, as had occurred in the most advanced capitalist states. For a time, the failures and excesses of war communism had produced a new common sense that such a transition had to be achieved by careful, slow incentivization, rather than a revolution from above. That delicate consensus would not last.

Perhaps as a result of the goods famine and low prices for grain, procurement after the harvest of 1927 had proven to be far below the previous year's level, and the patience of the regime had worn thin. The takings were not enough to feed the towns and the army, still less to deliver sufficient supplies of industrial crops. Meanwhile the weather, and thus the harvest, had been decent that year; indeed in the Urals and western Siberia, it had actually been quite good.

Some in the Bolshevik leadership called for an increase to grain prices, and thus a reduction in the funds that could be spent on industrialization, but Stalin and his now-dominant supporters instead went on the attack. The rich peasants had to be hoarding! Using what would become known as the "Urals-Siberian method," for the first time taking direct action themselves without even feigning to assure the agreement of what remained of formal decision-making structures, Stalin sent off a troop of officials and police, shutting down markets, expelling private traders, and ordering peasants to deliver grain on pain of arrest. Stalin denounced local officials, ordering them to seize the grain of kulaks and "speculators." Other senior officials began to copy the method in other regions, even as other members of the Politburo protested. Bukharin, before being put on trial for treason and executed, denounced the "Genghis Khan" military-feudal extraction of tribute, but only did so in private. Confiding in fellow Oppositionist Lev Kamenev in July 1928, he remarked: "Stalin is an unprincipled intriguer who subordinates everything to preservation of his own power. He has made concessions now, so that later he can cut our throats. The result of this will be a police state."

Despite these coercive measures, the procurement campaigns yielded less grain than the previous year. Stalin announced he was convinced that forced collectivization—together with ensuring that the peasants overpaid for manufactured items, and that they were underpaid for their wares—would produce the funds necessary to industrialize the country. Procurements would also be easier if the 25 million small farms were consolidated into far fewer (but much larger) farms.

Earlier forced grain procurements, however ruthless, had empowered local soviets to fine or imprison households that had not delivered the quantity demanded. Now such quotas were placed on whole villages, with the aim of putting collective pressure on the so-called "kulak elements," the first wave of what would come to be termed the "liquidation of the kulaks as a class."

The year of 1929 did, in fact, result in a 49 percent increase in state procurements of grain over the previous year, perhaps encouraging Stalin to step up the pace of what he called the "Great Turn" in an article in November of that year. By February 20, 1930, it was announced that half the peasants had joined collective farms, some seven weeks after the Great Turn had been formally put into action by Stalin's fiat.

Kulaks, and anyone accused of being a kulak, were not to be allowed to join the new collectives, but instead were arrested and deported. Stalin told the Central Committee that kulaks were making ready to undermine the Soviet regime, but materially, the "dekulakization" process was likely intended to frighten the rest into the collectives, to speed up the process. Chaos, bewilderment and resistance were the predictable results, with a concomitant sharp decline in the harvest. Assuming their livestock would be taken from them, peasants slaughtered animals on a vast scale. Meanwhile the new collective farms had no experience in animal husbandry en masse, and animals died of neglect, while the party activists sent to direct the process had no better knowledge. In Kazakhstan, the sheep population dropped by more than four-fifths. A wave of panic-driven suicides swept the better-off peasants.

In many regions, a great many peasants simply walked out of the collective farms, the "kolkhoz." Perhaps most ironic amid the whole villainous process was that many such fugitives actually then formed much-simpler cooperatives in order to survive. "It is one of the tragedies of this period that this and other kinds of genuine cooperation were so quickly wiped out," Nove laments.

Many other peasants fled to the towns. The government responded to the rapid growth in the urban population by taking still more from a weaker crop. In 1931, the procurements were of such an extent that there was insufficient grain left over to eat. Despite a relaxation of measures in the face of the yawning chaos, in 1932 a great famine engulfed all the grain-producing regions of the country, taking between 3 and 7 million lives. It is this period whence we hear tales of cannibalism recounted by survivors of Ukraine's Holodomor, or "hunger plague."

Amid these horrors, we again find that far from planning leading to poor information and thus to shortages, which in turn lead to authoritarianism, it is the reverse process that obtains: it is authoritarianism that undermines the quality of information in the system. Perhaps the most instructive exemplar of how illegitimate authority undermines information occurred during the collectivization process. The government was, understandably, keen to encourage the use of tractors by peasants to increase productivity. So the "political departments" of the state-run tractor service sent specially selected, politically reliable volunteers to the villages to develop capacity to run such agricultural machinery, to introduce some order to the chaos, and also as a mechanism of political supervision of the peasants. In any normal circumstances, and shorn of such overt politicization, we would describe at least the first element of this process as "agricultural extension": extending technical and scientific

knowledge from the academy to the farm, a common practice in the West and developing countries. Put simply, it's farmer education through practice. But during the collectivization process when these volunteers arrived, the reverse happened: it was the experts that learned from the peasants. These volunteers spoke to the villagers and found out what had happened. They became convinced of the immediate need to reduce the procurement quotas and to introduce positive incentives for peasants. But in response to these findings, the state leadership concluded the collective farms had to be purged of "saboteurs" among the bookkeepers, agronomists and storekeepers—destroying, in the process, the most important information at the base of the economy.

We also cannot underestimate the profoundly economically destabilizing impact of the Great Purge from 1936 to 1938, in which almost 700,000 individuals were executed and more than 1.5 million detained, according to records declassified after the end of the Cold War. In the Moscow Trials, most of the Old Bolshevik leadership of the party from the time of the revolution were forced to confess their conspiracy against the regime, whereupon they were executed or imprisoned. By 1938, of the 1,966 delegates to the last party congress in 1934, 1,108 had been arrested; so had 98 of the Central Committee's 139 members. In death or the gulag, these Old Bolsheviks were joined by engineers, technicians, statisticians, managers, armies of civil servants and key figures responsible for planning, including the minister of finance. Those that escaped the repression were completely cowed, mechanically following orders and avoiding any responsibility or initiative out of sheer terror.

Such deterioration of information occurred at all levels of society, in all fields, as either the guardians of crucial data were jailed, murdered, became too scared to report accurate data, or otherwise were replaced by politically trustworthy incompetents who were unable to gather, wrangle or deliver accurate data. If diligent, careful and precise gathering of correct data is the foundation of planning, then the Soviet Union under Stalin has to be considered a mockery of a planned economy.

But if this is the case—if Russia was such an economic basket case—ask Stalin's defenders: How was it that the country was able to produce all the materiel necessary to win the Second World War? (For, if we are honest, it was the USSR that beat the Nazis, with the UK and US only playing supporting roles.) How was it possible, after the war, for Russia to put the first satellite, and the first human, in space? And how was it possible for Moscow to deliver free healthcare to all its citizens and transform a population of illiterate peasants into one with universal literacy, extensive postsecondary education and some of greatest achievements in science and technology outside of the United States?

First we must remind ourselves that all these successes were only experienced by those who survived the purges and the Great Famine. An improved average standard of living means little if you're not living. Secondly, if we can concede that pharaohs can build pyramids and Sphynxes, and capitalists railroads and rocket ships, we can of course concede that despots can build fleets of tanks and hydroelectric dams. The question is, however, whether this is the most efficient, maximally egalitarian method of doing so—and whether this is sustainable.

Such was the chaotic, demoralized situation in which the USSR found itself on the eve of World War II. It seems remarkable that the country was able to win the war. Yet for all the disorganization and economic decline at the end of the decade, the centralization of all resource planning over the previous decade undoubtedly helped. As the war progressed, decisions over investment and allocation of resources would likewise be increasingly centralized by the United States, the UK and Nazi Germany. It appears that total war has little patience for the lethargy of private market actors,

regardless of whether socialists or capitalists are in the driver's seat of the state. Russia, for its part, stepped up the tempo of planning, producing quarterly and then monthly plans, with much more detail than before the war.

The initial postwar period, the final decade of Stalin's rule, was largely consumed with recovery and reconstruction of an economy wrecked by war. Rather than a relaxation of totalitarian governance now that the war was over, it was a period of further constriction, with even the pretense of democratic governance abandoned: party congresses were not held, and Central Committee meetings were infrequent. Planning became ever more a prisoner of Stalin's caprice, with many important questions decided by him alone without discussion with workers, economists or specialists. The head of Gosplan was fired in 1949 and ultimately shot.

"We have knowledge of socialism, but as for knowledge of organization on a scale of millions, knowledge of the organization and distribution—that we have not. This the old Bolshevik leaders did not teach us," Lenin wrote in 1923 as the scale of the challenge began to reveal itself. "Nothing has been written about this yet in Bolshevik textbooks, and there is nothing in Menshevik textbooks either." Indeed, we might even say that the deterioration of the situation in the early Soviet Union was at least in part due to these gaps in classical Marxism upon which the architects of the new system depended.

Far from economic planning driving the authoritarianism of the Stalin period, we find that the period was riddled with arbitrariness as the Stalinist leadership jumped from whim to whim. This could in no way be called a democratization of economic decision making. Given the suspicion of experts, it could not even be described as technocratic. All levels of society, but especially those in any managerial or predictive role, lived in constant fear of the secret police, the gulag and the firing squad, petrified of submitting the wrong results or the wrong data to higher-ups, or even of taking responsibility for decisions. In such circumstances, it is manifest that such authoritarianism will undermine the quality of information needed for effective planning.

So when we ask why planning on the scale of the economy of the Soviet Union would succeed in the form of a Walmart but fail in the hands of Stalin, the answer lies within the question itself.

Far from market-less planning being synonymous with Bolshevism, as many ahistorical accounts on the right would have it, the early Soviets did not set out from the gate knowing very much at all about the sort of economy they wanted to build. It was a mess that would only begin to be cleaned up during a brief liberalizing spring under postwar leader Nikita Khruschev—an epoch that, as we will see, gave rise to innovations in planning and mathematics that would lead, ironically, to systems that have been almost universally adopted by corporations, and ultimately to the algorithms that "run the world."

8

HARDLY AUTOMATED SPACE COMMUNISM

If indeed Soviet planning was so poor in its first decades as we have suggested, we can barely call the phenomenon planning. How, then, did the country rise to become a superpower, the second-largest economy in the world after the United States? How did the USSR pass from a condition of what Marx called "rural idiocy" to building a rough and ready welfare state alongside the advanced scientific society of Sputnik and Yuri Gagarin?

These contradictions are resolved if we step away from the notion that in order to find something of utility in the Soviet Union, we have to defend the system in toto. The largest Western firms could never be accused of Communist sympathies; quite the contrary. Yet these capitalist magpies were happy to adopt linear programming methods that were devised in part by Soviet economists to internally coordinate their own efforts. Today, we can do much the same: see what lessons we can glean and figure out what went wrong.

3, 2, 1 … Takeoff

The premiership of Nikita Krushchev from 1953 to 1964 was characterized by large releases of political prisoners, an ousting of Stalinists, a sharp reduction in police powers, relaxation of censorship, opening up of foreign contact, cultural transformation, a frank assessment of statistical distortions, a relative decentralization of decision making, and above all, remarkable economic growth.

It would be incorrect to describe the Soviet Union as no longer an authoritarian state, and it was only months after Kruschchev's "secret speech" to the Twentieth Congress of the Communist Party of the Soviet Union—denouncing Stalin and his cult of personality—that Soviet tanks invaded Hungary. They were sent to suppress a workers' uprising that been inspired by similar events in Poland: a rebellion, perhaps even revolution, not unlike what had occurred in October 1917 in Russia, complete with a collapse of the government, an emergence of workers' councils and the formation by thousands of popular militias that battled both the state security police and the invading USSR. One can argue that Khrushchev was pushed into such a repressive maneuver precisely to preserve his domestic "spring" against Stalinist hard-liners who would have otherwise toppled him (and who ultimately did exactly that). But we should recognize that, for all his differences, Khrushchev was both product and architect of the same ruthless, authoritarian Stalinist system that came before.

Nevertheless, for around a decade, an undeniable liberalization occurred. What became known as the "Khrushchev Thaw" gave republics power over their own economies. Conferences of specialists were held, with a view to learning from foreign best practices, while directors, local officials and trade union leaders were brought into consultative discussions for draft five-year plans. Crucially,

Khrushchev oversaw a rebalancing of the flow of value between town and country through a write-off of debts, reductions in quotas, an increase in investment in farm machinery, electrification, fertilizer, and many other measures. The kolkhozes would now in essence tell the center what they would produce, instead of the other way round, and it was the job of Gosplan to reconcile these "draft plans from below" with each other and with economy-wide objectives.

Growth in the 1950s was rapid. A massive program of house building coincided with a mass migration of peasants to the cities as technological transformation in agriculture radically reduced labor requirements. Advances in education and training were among the greatest achievements of the era, along with impressive extensions of healthcare and the status of women, with many women becoming engineers, technicians and judges a goodly time before such breakthroughs were achieved elsewhere.

This was the golden age of the Soviet Union. It saw the launch of Sputnik in 1957; the first human to travel into outer space, Yuri Gagarin, in 1961; the first woman in space, Valentina Tereshkova, in 1963 (an achievement the United States would not match until 1983, by then the third woman in space); and, according to analyses made by historians after the end of the Cold War with open access to Soviet archives, economic growth rates that were surpassed only by Japan.

Today when we think of the USSR, it is the terror of the gulag in the 1930s and the grey-beige tedium of empty supermarket shelves in the 1980s that come to mind. But as Francis Spufford reminds in his 2010 novel-cum-history of this period, *Red Plenty*, where the protagonist appears not to be any one individual character but the very idea of economic planning, this was a time—at the height of the European and American postwar boom—when Soviet economic success as well as technological and scientific prowess had Western newspaper editorial writers, think-tank boffins and presidential advisors ranging in opinion from being concerned to being convinced that sooner or later, they would be overtaken by the Communist superpower.

As Spufford writes in a précis of the key ideas in his novel appearing in the *Guardian*,

> It was not the revolutionary country people were thinking of, all red flags and fiery speechmaking, pictured through the iconography of Eisenstein movies; not the Stalinesque Soviet Union of mass mobilization and mass terror and austere totalitarian fervor. This was, all of a sudden, a frowning but managerial kind of a place, a civil and technological kind of a place, all labs and skyscrapers, which was doing the same kind of things as the west but threatened—while the moment lasted—to be doing them better … The era when the place seemed to be in a state of confident, challenging, expansive maturity has fallen off our mental carousel.

Khrushchev was so confident in his country's growing prosperity that he predicted the USSR would overtake the US economy by 1970, reaching aspects of the fully equal, post-scarcity society of luxurious abundance and ever-shrinking requirements of labor promised by Marx—from each according to their ability, to each according to their need—by 1980.

But we all know that nothing remotely like this occurred. So what stalled the Soviet economy?

The economist Alec Nove, whom we have met before in this book, argues that planning inevitably leads to authoritarianism. Spufford, being more sympathetic than Nove to this period of Soviet history, evinces more nuance, but his conclusion, like that of Nove, and many other authors, is still that it was the consequence of the attempt to coordinate an economy without the use of the price signal

in the marketplace.

A centerpiece episode in Spufford's book describes the wrecking of a machine used in the production of viscose, a semisynthetic fiber, and the difficulties of obtaining a replacement. The unexpected development requires a revision of the projections and schedule of the factory that produces the viscose machines, and this in turn forces an alteration of the projections and schedule of all the factories that produce the parts that make the machine, and in turn the raw materials that make those parts. Waves of impact ripple out across the entire economy in what one reviewer called a "nightmare combinatorial explosion." And the episode is only there to illustrate what occurs, moment to moment, as a result of what happens to every single one of billions of commodities throughout the economy. Everything affects everything. How is it possible to gather all of these variables? And then, even if it were somehow possible to track all of this, using thousands of the most modern supercomputers with our early twenty-first-century processing speeds, how could we calculate all of that, and constantly reassess it on a daily or even moment to moment basis?

For all of the triumph of Sputnik and a surge in consumer durables, there remained repeated, critical shortfalls, and outputs regularly failed to match user requirements. As the economy grew, the requirements for information only increased, as did the complexity of plans, along with the need for individuals to draft the plans and continually reconcile them with results. Worse still, the priority under Stalin had been heavy industry, with its limited range of products. For the most part, the planning system had been effective with respect to the crude, large-scale decisions needed by basic industries such as mining, steel production, heavy manufacturing and electricity generation. But once consumer items became a focus, the number of commodities naturally exploded, along with the complexity of tracking, assessing and reconciling all the factors of production, and with this the probability of error.

In *The Economics of Feasible Socialism*, Nove assessed that there were some 12 million identifiably different products, from brown shoes to ball bearings to different patterns of cloth, produced by almost 50,000 different factories, not counting the various farms, transportation structures, and wholesale and retail outlets. The interdependencies of all these supply chains must be optimized according to a range of variables, incorporating such factors as repair, replacement, technological innovation, changing taste, payments to the state budget, cost reduction, productivity, and of course, time. He repeats a Soviet joke from the time: "Mathematicians have calculated that in order to draft an accurate and fully integrated plan for material supply just for the Ukraine for one year requires the labor of the entire world's population for 10 million years."

Confronted with such recurring problems, the leadership engaged in repeated experiments in reorganization of planning and administrative institutions, but they met with little success. Such constant reforms themselves began to disrupt planning. The Khrushchev Thaw, however, also permitted a sudden freedom of discussion and critique, and thus a revival of economic debate. Many planners and economists were aware of the problem: fundamentally insufficient, poor-quality data, and the inability to process what they had.

There emerged two main responses. The first sought to increase the role of the profit motive and freedom of different enterprises to contract with each other; in other words, a restoration, to greater or lesser degree, of market relations, even if firms would still be owned by the state.

The second is personified by mathematician Leonid Kantorovich, the sole Soviet citizen to ever win the Swedish National Bank's Prize in Economic Sciences in Memory of Alfred Nobel. Along with his comrades at Moscow's Mathematical Economics Institute, Kantorovich believed a solution

would be found by using newly emerging electronic computers to improve optimization. But even here, there was no way that they could imagine computers able to handle the vast information flows of millions of products, and so this had to be married to some flexibility at the firm level. In an atmosphere of greater freedom and debate, the challenge attracted some of the best mathematical minds the country would ever produce.

But to consider their responses to the crisis, and to assess whether Nove and others were correct to conclude that planning on an economy-wide scale is simply impossible—that is, to answer the question of whether there could have been any other conclusion than the collapse of the Soviet Union by the end of the 1980s—we are going to have to jump across the Atlantic to the United States of the 1940s, as well as to rewind the clock and return to the some of the arguments made in the socialist calculation debate.

What Goes In, Must Come Out

The term "input-output analysis," marking out one of the most important branches of economics, was conceived during the Second World War to describe the work of Russian-born Harvard economist Wassily Leontief and the Bureau of Labor Statistics, work for which Leontief would later earn one of those (sort of) Nobel prizes for economics. An input-output table offers a simplified representation of the flows of inputs and outputs among industries, and ultimately consumers. It is, in effect, a spreadsheet: each horizontal row represents how a particular industry's output is used as an input by another industry and consumers, while each vertical column represents all the inputs used by any one industry. The table demonstrates quantitatively the dependence of each industry on all other industries. An increase in Lego output requires an increase in input of plastic, and hence an increase in plastic production.

Such tables are used by companies, and departments within companies, to plan production to meet output targets, and to analyze what the effects on outputs would be with changes to various inputs (and vice versa). The table allows the calculation of the quantity of a particular commodity A that is required to produce one unit of commodity B. Leontief described his work this way: "When you make bread, you need eggs, flour, and milk. And if you want more bread, you must use more eggs. There are cooking recipes for all the industries in the economy."

Although he published the first input-output table in a 1936 paper, Leontief himself said that more rudimentary versions of such tables had been produced in the nineteenth century by economist Léon Walras, or even in the eighteenth century by François Quesnay (his *Tableau économique)*—and, indeed, by Marx. One of Leontief's major breakthroughs was to convert Walras's equations into linear algebra. This advance is what drove uptake of input-output analysis after the Second World War in the United States and, subsequently, internationally.

Akin to the sometimes-silly battle between Newton and Leibniz over who had been the one to invent calculus (answer: both), throughout the Cold War and after, a great deal of effort was expended on assessing the origins of input-output analysis to decide whether it was an American or Soviet innovation (and even, within the USSR, whether it was a Bolshevik or a Menshevik innovation!). What is interesting though—and recent post–Cold War scholarship suggests this is undeniable—is that the early efforts of the Soviet Union to "grope in the dark," to use Mises's term, left an impression on a younger Leontief.

In 1925, some twenty Soviet economists under the direction of P. I. Popov developed a fairly

crude national economic accounting balance—focusing on six main branches of the economy and a number of subsectors—akin to how bookkeepers prepare a balance sheet. The innovation here is the mental leap of viewing the national economy as a sort of giant, single firm. That same year, Leontief published a review of the work on national balance sheets by Popov and his colleagues. Even earlier, economist Alexander Bogdanov had proposed an iterative procedure to steadily ratchet upward the granularity of national economic tables, and Nikolai Bukharin, whom we have already met, drew on Bogdanov's work to devise a mathematical formalization of Marx's economic tables for expanded reproduction, which in turn laid the groundwork for Popov and his team.

But as we have seen, Stalin's Terror meant that little developed at Gosplan beyond these national material balances. Indeed, as contemporary economic historian Amana Akhabbar argues, most of the economists of the 1920s would go unpublished or untaught in universities until their revival during the Khrushchev Thaw. At the end of the '50s, input-output analysis, which appeared to economists amid the Thaw as a rigorous, statistical technique with considerably more precise forecasts than the crude economic sketches they had up till then been depending upon, was "imported" from corporate America back into Russia by Soviet economist and mathematician Vasily Nemchinov. Nemchinov, stressing, and perhaps exaggerating, their Soviet origins, is credited with the introduction of mathematical methods to central planning and with establishing, in 1958, the first group in the country to study mathematical economics, which would later become the Central Economic Mathematical Institute.

Conversely, throughout his career in the United States, Leontief would insist that his work did not really rely on Soviet economics. An early refugee from a Stalinizing Russia, this is more than understandable. After World War II, Leontief quickly lost governmental and US Army financial supports following accusations that federal funds were being used to develop "Communist technology," and again during the height of McCarthyism for the same reasons. It is some irony that it was only as a result of interest from private companies—notably Westinghouse Electric Corporation, who saw utility in his technique—that he was able to continue his research.

This Cold War performance of dressing up American economics in Soviet drag, and vice versa, even to the point of it taking a vast and venerable American conglomerate to rescue a Soviet economic technique, entirely out of self-interest, is a trope that we will see repeated over and over.

The initial development of linear programming, a branch of mathematics today available to an undergraduate in any discipline with a couple years' worth of math, was heavily influenced by input-output analysis. Simply put, linear programming explores methods to find the best outcome given a series of constraints. It would go on to be adopted widely within microeconomics and within corporations in the West to plan production, transportation, technology and indeed any tasks that involve multiple variables and that aim at maximization of profits while minimizing costs and resources.

Firms routinely use linear programming tools to solve complex decision problems involved in supply chain logistics, production scheduling, transportation, or any form of resource allocation. Developed in the Soviet Union by Leonid Kantorovich and published in a 1939 booklet, *Mathematical Methods of Organizing and Planning Production*, the discovery of linear programming followed a request from a plywood factory that wanted to optimize production. The technique, by taking data from input-output matrices, offered a way to solve a whole class of similar conundrums.

It was first applied during the Second World War to solve military supply problems, but it was

subsequently forgotten about, or rather repressed. The main problem, among many, was that Kantorovich counterposed "mathematical economics" to conventional Soviet "political economy." Opponents sniffed something un-Marxist. In a 2007 mathematical-biographical sketch of Kantorovich by his student A. M. Vershik, he talks of an "internal veto"—a self-censorship not only of economic matters, but even of the mathematical aspect upon which they were built—that lasted until 1956. The "declassification" of the subject arrived with the new hope presented by Khrushchev's Thaw.

Largely independently of Kantorovich, Dutch American mathematician and economist Tjalling Koopmans devised a similar method for the analysis of the optimum allocation of resources. The pair of them would be awarded another economics Nobel in 1975 for their joint discovery. A third individual, US mathematician George Dantzig, again independently of the other two but slightly later, just after the war, developed a formulation of linear programming to solve planning problems for the US Air Force. In 1947, he devised the "simplex method," or simplex algorithm, within linear programming. It would quickly be adopted by industries for their internal planning, and it remains in use today; *New Scientist* magazine recently called this American twist on the question of Soviet optimization "the algorithm that rules the world."

Mirroring the American arch-capitalists who saved the work of Leontief, in the Soviet Union, it was military specialists who were the first to delve into linear programming, as they were the only ones with access to foreign texts on the subject, translated into Russian though not yet published domestically. Their interest was not the broader question of economic planning, but systems control, itself a subset of the topic of distribution of resources, which is in the end of course the alpha and omega of economics. Not a colonel, nor a single general, had heard of Kantorovich. Vershik recalls visiting a Ministry of Defense research institute in Moscow in 1957 and telling them about his mentor Kantorovich's work. "For them, who had just started to study the American literature on linear programming, this was a revelation."

At this time, a broader rehabilitation of cybernetics was occurring, and the urgency of introducing computers into the army had increased. Kantorovich was invited to give a public lecture on his pet subject. The military specialists, who up until this point had only been using American sources obtained through secret channels, were thrilled to find that it was one of their own who had been a pioneer in this field. Kantorovich wrote:

> I discovered that a whole range of problems of the most diverse character relating to the scientific organisation of production (questions on the optimum distribution of the work of machines and mechanisms, the minimisation of scrap, the best utilisation of raw materials and local materials, fuel, transportation, and so on) lead to the formulation of a single group of mathematical problems (extremal problems) … But the process of solving them with which one is faced is practically completely unusable, since it requires the solution of tens of thousands or even millions of systems of equations for completion.

Kantorovich's idea was for the planners to assess optimal pricing, a scheme in which objectively determined valuations or "shadow prices"—a notional number assigned to items in place of a price—would be calculated from opportunity costs without the need for the "total information awareness" that the likes of Mises and Hayek said would be demanded for planning to work. Contra Mises and like Lange, Kantorovich demonstrated that rational economic calculation outside of market mechanisms was, in principle, possible.

Remember that economic planning can be useful to both capitalist firms and socialist economies. Internally, firms are planned economies no different to the Soviet Union: hierarchical, undemocratic planned economies to be sure, but planned economies all the same. The difference lies in their objective function (the goal) and how it is determined. In the capitalist firm, the technique is put in the service of maximizing profit for the gain of the owners, and indeed, most linear programming textbooks and software manuals assume profit as the objective. In the socialist society, the objective function may still be an increase in wealth, but that of the society as a whole; that is, mathematically akin to profit-maximization, but socially determined. The steady expansion of leisure time might be another objective function, as might the maximization of ecosystem services and minimization of their disruption. In this way, we see how while the replacement of market allocation with economic planning may be a necessary condition for the realization of socialism, it is not a sufficient condition: it must be married to democracy.

The Yugoslav Centrifuge

There is a simple squaring of the circle here, partisans of the notion of *market socialism* maintain. Capitalism uses the market to allocate resources; therefore, there can be no capitalism without the market. But there can be a market without capitalism.

Note that market socialism is distinct from social democracy. We can describe social democracy as a philosophy that accepts the insurmountability of the market while recognizing its inevitable inequalities, thus aiming for a mixed economy that balances market and nonmarket allocation between the state and the private sector, while promoting robust labor rights. In a social democratic society, the public sector retains the responsibility for essential goods and services such as healthcare, education, and emergency services; natural monopolies such as electricity generation, water management and the railroads; and strategically important industries such as steel manufacture, forestry, oil and mining. (Although in most countries, since the 1970s, few public services—bar policing, necessary for the impartial protection of property rights upon which the market depends, and the armed forces, necessary for the maintenance of integrity of the state—remain decommodified, most utilities have been privatized, and there is almost no public ownership of industry at all.)

Market socialism, however, is something different entirely. Under market socialism, there is no private ownership of industry, but allocation of goods and services still occurs via the market. Workers own their own enterprises, in the form of cooperatives, which in competition with each other sell their wares, and survive, expand or fail depending on the demand for them. Due to the vagaries of the market, as in social democracy, some key sectors, such as healthcare, may still be held by the public sector, but it remains a market society. Such a system benefits from the alleged efficient allocation of the market, avoiding bureaucratic sclerosis while eliminating the "owning class," the bourgeoisie. Further, there are no bosses, and the workplace is democratically managed.

But partisans of market socialism have to set aside the reality that the goods and services produced in markets, even socialist markets, will still only be those that can turn a profit. And, as we have discussed, the set of things that are beneficial overlaps only in part with the set of things that are profitable. New classes of antibiotic, rural high-speed internet, and crewed spaceflight would all be as difficult to deliver under a socialist market as under a capitalist one, without significant, planned intervention into the market. Meanwhile, items that are profitable but actively harmful, such as fossil fuels, would still likely be produced.

The anarchy of the market also inevitably suffers from duplication and overproduction, and their concomitant manufacture of economic crisis. Just as capitalist markets run on profit—the difference between how much it costs to produce something, including wages paid to workers, and how much the product can then be sold for—under market socialism, use of the price signal would also generate excess revenues for the more efficient firms (even if transformed into worker cooperatives) and losses for the unlucky ones. Market socialists, then, have to explain how this system would redistribute "profits" equitably among the population. More importantly, how would their solution ensure that the profit motive—one that squeezes more work out of workers and creates incentives to overproduce—does not reemerge? Scaled up, the market and the profit motive create economy-wide cycles of boom and bust that hurt people and waste resources. By their very nature, markets produce inequalities—inequalities that, so long as a market exists, are only ameliorable, not eradicable. And it has consistently been inequality that has driven extra-economic conflict throughout history.

This is no abstract discussion. After World War II, Yugoslavia under Marshal Tito embraced a variation of market socialism. The Stalin/Tito split of 1948 sent leaders of the young multinational republic off to seek an alternative path to the bureaucratic Soviet model for the construction of socialism, leading them to experiment with what they called "workers' self-management," or *radnic̆ko samoupravljanje*. Under this system, while factories remained formally under state ownership, the workers directed production (again, admittedly not with full control) at their workplace, the commodities produced were sold on the market, and then the workers at a particular enterprise kept the surplus revenue themselves.

As the role of market forces steadily expanded under Tito, particularly with the abolition of central determination of wages and the advent of personal income's dependence upon the success or failure of a particular enterprise, competition between enterprises increased, and inequality grew between workers, skill categories, workplaces, sectors and, most ominously, regions. Inevitably, some factories will be superior to others at producing commodities, or have the luck of being located in a more developed region, with higher education levels, better transport infrastructure or any number of advantages. The state tried to balance this out through redistribution: regionally preferential policies such as the taxation of more profitable enterprises to fund the industrialization of less developed regions or to support agricultural areas. But this in turn provoked regionally based contestation of policies and investment decisions. University of Glasgow economic historian Vladimir Unkovski-Korica has argued that particular workplaces tended to identify less with the polity as a whole than with the interests of their enterprise management or their regional government. The first labor strike in the young country occurred as early as 1958, in an older mine in the wealthy republic of Slovenia, driven by resentment at the channeling of what workers viewed as their wealth into the amelioration of regional inequality. But this was not merely better-off workers getting humpty about high taxes; any effort to balance out inequality, necessarily a centralized endeavor, risked being seen as a return to Serb hegemony.

As if it were not enough to be caught between the twin dangers of an egalitarian centralism viewed as Serbian chauvinism, on the one hand, and a revival of regional nationalism, on the other, Yugoslavia also faced the challenge of a rising balance of trade deficit, and as much as a third of inward investment being dependent on foreign aid. Worse still, while initially this aid had come in the form of grants, by the '60s, these grants had turned into loans. The government responded with a greater orientation toward exports, which in turn benefitted some factories and regions more than others. The strategy of integrated development of the whole country was ultimately abandoned in 1963 via the dissolution of the Federal Investment Fund under regionalist pressure, its funds

distributed to local banks, which only accelerated the centrifugation of Yugoslavia while undermining economies of scale and a rational, regionally appropriate division of labor. The market logic of enterprise competing against enterprise predictably drove the reestablishment of workplace hierarchies, as well as ever-greater emphasis on financial shenanigans and marketing skills at the expense of production—the latter largely historically viewed by socialists as a wasteful carbuncle that squanders otherwise useful resources, the quintessence of capitalist irrationality. Wasteful investment and unsustainable loans proliferated as underperforming enterprises attempted to improve their position in the market. To service these onerous debts, the reestablished managerial hierarchy, aided by a withered self-management apparatus, did what any normal capitalist manager does: squeeze wages and conditions. Unemployment made its return to the land. And all this before the global economic crises and oil shocks of the 1970s.

Does this mean there is no room for market socialism or cooperatives in any conception of a just society? It depends on what time frame we consider. Let us abandon the view of market socialism and democratic planning as rivals. Instead, view cooperatives and market socialism (or elements of it) as bridging mechanisms toward decommodification and planning that build the confidence of ordinary people in their own capacity to govern a workplace without bosses—and ultimately to govern the entirety of the economy.

There may also be particular commodities or sectors that are harder to decommodify than others. As we saw in the early Soviet Union and Mao's China, while much of heavy industry was relatively straightforward to decommodify (at least as easy as was its decommodification by any capitalist state, such as for steel and coal production in postwar Western Europe), attempts at decommodification of agriculture underlay the barbarisms for which these two regimes are most known: the Holodomor and the Great Leap Forward.

One of the key lessons from the history of "really-existing socialism," that is, the Stalinist, Maoist or Titoist variety, is that we need to keep an open mind as to what works, experimenting with different economic forms and being comfortable with changing course, abandoning hypotheses in the face of new evidence.

Planning in Practice (Again)

So what went wrong in the Soviet Union? Francis Spufford's novel *Red Plenty* is, at least in part, the tale of how Kantorovich failed in his efforts to have his scheme adopted, but was nevertheless so convinced of the strategy that, as Spufford notes, he was still writing letters to the Politburo pushing it until he died in 1986. The challenge was the need to go beyond "in principle" and toward "in practice."

The practical algorithm Kantorovich offered, in an appendix to his 1960 work on the subject, could be solved with paper and pencil, but it was only tractable for problems of limited scale. When it came to solving more complex problems, Kantorovich recommended an approximative technique of aggregating similar production processes and treating them as a single process. At this time, in the USSR as in the United States, such exercises were largely performed by human "computers" (demonstrated in the 2016 film *Hidden Figures*, about the women "computers" who made NASA's early space missions possible). While Kantorovich's ideas were met with varying levels of enthusiasm, computing power at the time was too limited to employ the technique for detailed economy-wide planning, and it was instead used for drawing up plans for particular enterprises, or at

most, sectors.

The field of cybernetics had been ideologically taboo, officially condemned as an American mechanism of neutering worker control. Under Khrushchev, a reversal had occurred: the Academy of Sciences was now publishing the journal *Cybernetics in the Service of Communism*, and Moscow had ordered the building of computer factories. Victor Glushkov, the founder of Soviet cybernetics, even got the green light from the premiere to develop a decentralized computer network—a Soviet internet—but it was never completed. It was too little, too late. By the time the Thaw drew to a close, with the putsch toppling Khrushchev and the return of the Stalinists in 1964, Soviet computing was far behind its Western counterparts. There was no common standard, and computers and peripherals were frequently incompatible. The country's limited computing power was a primary reason for the failure of its manned lunar program, and in the early 1970s, the Soviet leaders decided to abandon development of a domestic computer industry, opting for pirating Western computers instead.

Added to this abandonment of computation, authoritarianism did not disappear, and it was revived under Brezhnev, once again undermining the quality of information needed to engage in planning. And once the great economic cushion of oil was discovered in Siberia, the cyberneticians, computer scientists and economic reformers who were still committed to planning appeared no longer to be needed. The next version of economic reformers, in the '80s, would be a more market-oriented variety, who had all but given up on the idea of planning and socialism.

After the fall of the Soviet Union, the debate naturally became something of an academic discussion, rather than a live controversy, and certainly a discourse that was lost to those engaged in day-to-day social justice struggle.

But in the 1990s, two progressive computer scientists, Paul Cockshott at the University of Glasgow and his collaborator, economist Allin Cottrell at Wake Forest University, began to argue in a series of academic papers that improved algorithmic techniques had once again made the question worth exploring.

In their 1993 book, *Towards a New Socialism*, a text that in places reads less like a left-wing polemic than a university programming textbook, Cockshott and Cottrell argue against the idea that planning is destined to fail, employing new knowledge from the world of computer science: "Modern developments in information technology open up the possibility of a planning system that could outperform the market in terms of efficiency (in meeting human needs) as well as equity."

Computers are better than markets—so went the argument. All the worries of Mises and Pareto—that while in theory, socialist economic calculation is no different from market calculation, it remains impractical—were being made moot by technological change. However, they contend, while the project is made easier by some level of technical sophistication, it is not so much the availability of superfast central computers that has been the major constraint. A distributed planning network of quite modest personal computers, linked by an economy-wide telecommunications system and employing a standardized system of product identification and computer databases, would be sufficient. It would, however, require universal access to computers and the free flow of information.

Given a new lease on life by the advent of new technologies, the debate has continued into the 2000s. A 2002 rejoinder to the Cockshott-Cottrell perspective from Polish logician Witold Marciszewski of the University of Warsaw argued that socialist planning would require what are called super-Turing machines, or hypercomputers—theoretical computers that go beyond the computability of standard computers, which some claim are not only physically impossible to build, but logically impossible to devise. And in 2006, Robert Murphy, a young Austrian School economist

with the Pacific Research Institute, a Californian free-market think tank, employed set theorist Georg Cantor's diagonal argument to claim that the list of prices in any planning board's matrix would need to contain not merely billions or trillions of prices, but—as with the set of all real numbers or set of all subsets of integers—an uncountably infinite number of them, therefore making economy-wide socialist calculation impossible in principle, not just in practice, because the full list of all prices could never be listed. Think about it this way: however large the set of integers is, stretching off into infinity (0, 1, 2, 3 … ∞), given an infinite amount of time, you could count them just listing one after the other. But the infinity of real numbers that fits just between 0 and 1 is even larger, containing an infinite number of such infinite strings of integers! And so it could never, even with an infinite amount of time, be counted. It is this second sort—an uncountable infinity—that Murphy says describes the full set of prices needed to engage in planning.

Essentially, Cockshott, Cottrell, Marciszewski, Murphy and a handful of others had revived the long-dormant calculation debate but recast it as a problem for the field of computational complexity theory, a branch of theoretical computer science that seeks to classify the inherent difficulty of different sorts of problems, and the resources needed to solve them. In the same way that neuroscientists have in recent decades stolen debates over the theory of mind away from philosophers, complexity theorists and computer scientists are stealing this debate away from economists and political scientists.

However, the discussion still largely remains hidden within the realm of scientific journals—and even there, for many, it has become something of a mathematical parlor game. There is no active audience outside a tiny sprinkling of academics. Again, it's capitalist realism: "Of course a nonmarket economy is absurd, Jim, but just as an exercise for my students …"

Published just a bare two years after the 2008 financial crisis, Francis Spufford's novel about economic planning, *Red Plenty*, prompted a burst of responses, particularly online. Perhaps the most interesting among them was a lengthy essay from self-decribed "vaguely lefty" Carnegie Mellon statistician Cosma Shalizi, who "learned linear programming at my father's knee as a boy." In it, he argues against Spufford's hope that as processing power improves, the idea of planning can return. He shows how computation of a list of optimal prices by planners turns out to be as complex as computation of the optimal plan itself, due to the interdependency of all the possible variables within an economy. Roughly speaking, he is making a similar argument to those of Murphy and Marciszewski, although he does at least concede that rather than being outright impossible, the problem could become technically tractable after a century of Moore's law (which posits that computing power doubles approximately every two years) holding true.

But this places optimal planning in the realm of science fiction, rather than that of serious options that can be considered today. We fall back on the depressing position that prices in the market are just a better mechanism for the processing of all the information needed to efficiently allocate resources. Why expend such vast energy constructing what is otherwise immanent in market exchange?

"We need … some systematic way for the citizens to provide feedback on the plan, as it is realized," Shalizi writes. "There are many, many things to be said against the market system, but it is a mechanism for providing feedback from users to producers, and for propagating that feedback through the whole economy, without anyone having to explicitly track that information." Now, unlike Murphy and Marciszewski, Shalizi is no arch–free marketeer. He acknowledges, and is horrified by, what markets produce: "At the extreme, the market literally starves people to death, because feeding them is a less 'efficient' use of food than helping rich people eat more."

He recognizes that in many domains (at least in some countries)—such as education, healthcare, policing, the fire department, search and rescue, and disaster response—planning, rather than the market, is used to allocate resources and does a far better job. So, like Nove, he advocates a mixed economy where some goods and services are removed from market allocation.

But this is a fudge. If the market allocation argument is correct, it should be correct for these realms as well. Why should healthcare, education and the fire department work so well if the theory shows that they should entail monstrous inefficiencies? (Indeed, libertarians make exactly this argument: that there should also be a market not merely in health and education, but also in policing, fire services and the armed forces). In another inversion of the old rightist canard that communism works in theory but not in practice, communism again appears to work in practice but not in theory.

But between gross inefficiencies in allocation of resources and absolutely perfect, immaculate optimization, there is reality—where people actually live. There is a series of confusions here that relate to the complexity of coming to an *exact algebraic solution* to a problem, as opposed to getting an *acceptable economic answer* to a problem. According to Cockshott, if you take a large economy and use standard input-output techniques—the method developed by Russian American economist Wassily Leontief to represent interlocking economic relationships, today commonly used to calculate GDP—you can represent it as a huge matrix, with columns for every industry and the rows for how much of each output of another industry one will consume. So for, say, the steel industry column, at the bottom it will say how much steel is produced, while the rows will indicate how much coal, how much iron-ore, or how much limestone it uses.

Now, in principle, the number of steps in this matrix calculation to reach a certain mixture of final output will grow as the cube of the size of your matrix; so if you have a matrix with, say, 10 million entries in it, it will appear that to come up with an answer, the number of steps required will be 10 million to the power of three. But this is only if you choose to write it out as a matrix—because if you did that, you'd find almost all the entries in the matrix would be zero since you don't use, say, limestone in the making of a book. Most things aren't used in other processes. Therefore, most products require only a small number of inputs.

"The conception that everything affects everything," says Cockshott, "is not true. You can disaggregate many aspects of the economy." Through experimentation, Cockshott and his colleagues suggest that this disaggregation allows the number of steps to grow logarithmically rather than exponentially, enormously simplifying the complexity of the problem. In essence this means that at first there is a rapid increase in the number of steps, followed by a period where the growth slows. But the growth nonetheless keeps going, as opposed to a case where the number of steps begins slowly and then increases very rapidly as you go on.

Cockshott explains: "You say: 'I only want to get an answer to three significant figures, because how many businesses really can plan their output to more than this?' Because you don't want an exact solution, but an approximation to a certain number of significant figures." This rougher requirement for the calculation also limits the number of iteration steps you have to run on the algorithm. "So when you actually look at it in terms of a practical problem in terms of how the data is really structured, what the real world demands, you find you're dealing with something very much simpler than the abstract algebra would suggest." This is something that is now relatively well known in computer science. There are many algorithms attacking problems that are in principle intractable, but in practice we can use them to solve a lot of problems because they're only intractable for certain ranges of numbers.

Cockshott has pushed the debate from the realm of theory to experimentation. It's very difficult to do practical research in planning for obvious reasons, but after testing his ideas with a modestly advanced departmental computer costing around £5,000, he claims to have solved such optimizing equations for an economy roughly the size of Sweden in about two minutes. He projects that if he had used the sort of computers used by his university's physics department or any weather-forecasting center, then it would be a very simple matter for larger economies, with the cycle time for computation on the order of hours, rather than months or years or millions of years.

"It's relatively easy to show that these algorithms are tractable. They're polynomial or subpolynomial. They're in the best tractability class. They're easily amenable to industrial-scale economies with a fraction of the processing power that Google has."

The question, then, turns to the collection of the right information. But this too is becoming easier, as products are increasingly tracked using barcodes, and purchasers and suppliers share vast databases containing information monitoring every aspect of production, the ordering of components, calculating of costs, and so on.

Now, all of this is an extraordinary claim. Cockshott's methodology and results need to be interrogated and replicated by other researchers. But some of this replication has already happened right under our noses. The colossal multinational corporations and financial institutions already engage in planning internally, but on a worldwide scale, coordinating economic activities continents apart. Cockshott points to air transport as the first industry to be subject to comprehensive computerized planning, under the Boadicea airline booking system that launched in the 1960s. Shipping clerks are also long since a thing of the past.

To be clear: a non-market economy is not a question of unaccountable central planners, or equally unaccountable programmers or their algorithms making the decisions for the rest of us. Without democratic input from consumers and producers, the daily experience of the millions of living participants in the economy, planning cannot work. Democracy is not some abstract ideal tacked on to all this, but essential to the process.

And most importantly, computer-assisted, decentralized, democratic economic decision making will not arise as a set of technocratic reforms of the system that can simply be imposed. First there must be a fundamental transformation of the relations and structures of society, including the confection of new networks of interdependence—frameworks that the masses of people will have to fight for, build and ultimately sustain. While such a system can and must be built from the ground up, to reach the scale of what is realistically required both to construct a just economy and to deal with the ecological crisis, this system will have to be global and throughgoing in its demands for both human liberation and technological advance.

9

ALLENDE'S SOCIALIST INTERNET

The story of Salvador Allende—president of the first-ever democratically elected Marxist administration, who died when General Augusto Pinochet overthrew his barely three-year-old administration in a US-backed coup on September 11, 1973—is well known and lamented among progressives. For much of the Left, the crushing of the Allende administration represents a revolutionary road not taken, a socialism unlike that of the Soviet Union or China, committed to constitutional democracy, the rule of law and civil liberties, even in the face of fascist paramilitary terror. The litany of human rights horrors committed under Pinochet and tales of *los desaparecidos*, or "the disappeared"—a euphemism for the more than 2,000 of Pinochet's secretly abducted victims whose fate the state refused to acknowledge—have until recently eclipsed a bold and pioneering experiment in cybernetic economic planning that was initiated under Allende.

The project, called Cybersyn in English and Proyecto Synco in Spanish, was an ambitious (perhaps overambitious) effort to network the economy, and indeed, society. It has been described in the *Guardian*, not without reason, as a "socialist internet"—an endeavor decades ahead of its time.

Largely unknown for decades, it has finally received its due. Around the time of the fortieth anniversary of Pinochet's coup, a suite of articles appeared in the mainstream media, from the *New Yorker* to the popular podcast *99% Invisible*, many drawing on the extensive research and interviews with the architects of Cybersyn performed by electrical engineer and technology historian Eden Medina to produce her 2011 volume on the triumphs and travails of the Cybersyn team, *Cybernetic Revolutionaries*. The reason for the flurry of interest in Cybersyn today, and for the recovery of its story, is due in part to its remarkable parallel to the US military's Advanced Research Projects Agency Network (ARPANET)—the precursor of the internet—and the revelation, like something out of an alternate universe, that an internet-like structure may first have been developed in the global South. The attraction to the tale of Chile's socialist internet is likely also due to the raft of lessons for today offered by this artifact from Allende's democratic revolution—"flavored with red wine and empanadas," as he put it—on privacy and big data, the dangers and benefits of the Internet of Things, and the emergence of algorithmic regulation.

Our interest here, though, is primarily to consider Cybersyn in terms of its success or otherwise as an instrument of non-centralized economic planning. Freed from the Cold War's constraints, we can today consider Cybersyn more objectively and ask whether it might serve as a model for leaping over both the free market and central(ized) planning.

Cybernetics as Herding of Cats

In 1970, the newly elected Popular Unity coalition government of Salvador Allende found itself the coordinator of a messy jumble of factories, mines and other workplaces that in some places had long

been state-run, in others were being freshly nationalized, while some were under worker occupation, and others still remained under the control of their managers or owners. The previous centrist administration of Christian Democrat Eduardo Frei had already partially nationalized the copper mines, the producer of the country's largest export. Frei's government had also developed a massive public house-building program and significantly expanded public education, all with substantial assistance from the United States. Washington was fretful that if it did not pay for social reforms, it would witness social revolution within the hemisphere that it viewed as its own. Thus, substantial sections of Chile's relatively small economy were already in the public sector when the socialists took over, stretching the bureaucracy's management capability to its limit. A more efficient strategy of coordination was required.

The then-29-year-old head of the Chilean Production Development Corporation, Fernando Flores, responsible for the management of coordination between nationalized companies and the state, had been impressed with the prolific writings on management cybernetics of a British operations research scientist and management consultant named Stafford Beer. Flores had studied industrial engineering at the Catholic University, but in doing so, he had also trained in operations research, that branch of applied mathematics in search of optimal solutions to complex decision-making problems. It's a salmagundi of a discipline, drawing on modeling, statistical analysis, industrial engineering, econometrics, operations management, decision science, computer science, information theory, and even psychology. In the course of his studies and early work for the Chilean railways, Flores had come across Beer's texts on cybernetics. While Beer's work, for which he had gained a substantial international reputation, focused on more efficient management techniques, according to Medina's interviews with Flores, the latter was captivated by how the "connective, philosophical foundation" of Beer's management cybernetics could serve Allende's vision of an anti-bureaucratic democratic socialism in which workers participated in management and that would defend individual civil liberties. Management cybernetics, Flores reasoned, could assist the young government in "herding the cats" of the public and worker-managed sectors.

The term "cybernetics" today has something of a naively techno-utopian aura, or even a body-horror, dystopic dread about it. But at its fundament, the field of cybernetics simply investigates how different systems—biological, mechanical, social—adaptively manage communication, decision making and action. The first edition of Beer's 1959 book on the subject, *Cybernetics and Management*, does not even make reference to computers, and, as Medina is keen to stress, Beer himself was an intransigent critic of how business and government deployed computers. Cybernetics is not management by algorithm. It is not digital Taylorism.

During World War II, MIT mathematician Norbert Wiener and his engineering colleague Julian Bigelow were tasked with developing ways of improving the targeting of enemy aircraft. Following consultations with an early neuropsychologist, the two developed an apparatus that automatically helped the human gunner to correct their aim through what they called feedback, a circular method of control through which the rules governing a process are modified in response to their results or effects. Today, this may seem obvious (and its very obviousness is likely a product of how influential cybernetic notions have become in our culture; this is where the word "feedback" comes from), but at the time, this was a revelation wherein linear, "if this, then that" control systems dominated. As Richard Barbrook recounts in his 2007 history of the dawn of the computer age, *Imaginary Futures*, despite the military engineering origins of the field, Wiener would go on to be radicalized by the Cold War and the arms race, not only declaring that scientists had a responsibility to refuse to participate in military research, but asserting the need for a socialist interpretation of cybernetics. "Large

corporations depended upon a specialist caste of bureaucrats to run their organisations," Barbrook notes. "They ran the managerial 'Panopticon' which ensured that employees obeyed the orders imposed from above. They supervised the financing, manufacture, marketing and distribution of the corporation's products." Wiener, and later Beer, on the other hand, conceived of cybernetics as a mechanism of domination *avoidance*: a major challenge that the managers of any sufficiently complex system face, according to Beer, is that such systems are "indescribable in detail."

Echoing this concern, three years before the Prague Spring uprising of workers and students was crushed by Soviet tanks in 1968, two Czechoslovak authors, Oldřich Kýn and Pavel Pelikán, published *Kybernetika v Ekonomii*, a book that challenged the top-down central planning system. In it, they focused on the key role of accurate information in the coordination of economic activities, whether via the market or through planning, arguing that the human capacity to receive and process information is inherently limited. A high degree of centralizing hierarchy requires that the top-level decision makers have a large information-processing capability. At the same time, in addition to the poor quality of decision making resulting from the inability of an individual or even a small group of humans to process more than a certain amount of information, overcentralization can also result in the costs of transmitting and processing information being "many times higher than the most pessimistic estimates of loss that could occur with an effective reduction of information and a decentralization of a large part of the decision-making." Instead, Kýn and Pelikán proposed that the amount of information be gradually reduced along the hierarchy, with each place in the hierarchy enjoying a certain degree of freedom for independent decisions: "Not all the information collected below can arrive at the highest places. The problem, of course, is how to reduce information without losing what is essential for making decisions."

Conversely, as Beer was aware, too much decentralization and autonomy could produce chaotic results that undermine the well-being of the system as a whole, producing either debilitating overproduction or shortages. Thus his model aimed to promote a maximum of self-organization among component parts via redundant, lateral, multi-node communication networks, while retaining some channels of vertical control to maintain systemic stability and long-term planning. Instead of the abstract dichotomy of centralization versus decentralization, he asked: What is the maximum degree of decentralization that still permits the system to flourish?

Allende was attracted to the idea of rationally directed industry, and upon Flores's recommendation, Beer was hired to advise the government. Beer, for his part, frustrated at only ever seeing partial implementation of his ideas by the firms he advised, was attracted to the possibility of putting his full vision into practice, and on a much wider scale than he had yet attempted.

And that vision would involve the linking-up of a realtime communication network, connecting factory floor to factory floor, and upward to the State Development Corporation (CORFO), rapidly dispatching data both laterally and vertically and thus allowing quick responses at all points in the system to changing conditions. The data collected would also be crunched by a mainframe computer to produce statistical projections about likely future economic behavior. In addition, the system would involve a computer simulation of the Chilean economy as a whole, which Beer and his colleagues termed "CHECO" (CHilean ECOnomic simulator). However, upon his first visit to Chile, Beer was confronted with the reality of the country's limited computer resources: just four low- to mid-range mainframes owned by the National Computer Corporation (ECOM), which were already largely locked up with other tasks. At most, ECOM could offer processing time on one such device, an IBM 360/50. As Medina puts it, Beer would be building a computer network of one computer.

But the key was the network, not the type of machine doing the networking. And so as a solution, Beer suggested connecting to the single IBM mainframe a communications network of telex machines—those very '70s automatic typewriter–looking devices you see in *All The President's Men*, direct descendants of the telegraph system and first manufactured in the 1930s—which were common enough in Chile and at the time were even more reliable than telephones. Initially, Beer thought he was working on a project to develop a more accountable, more responsive communications and control system between government-appointed factory managers, or "interventors" to use the Chilean terminology of the time, and CORFO. He envisaged that the interventors at each enterprise would use the telex machines to transmit production data to the telex machine at the National Computer Corporation. Computer operators there would then translate this information into punch cards that would be fed into the mainframe, which would in turn use statistical software to compare current data with past performance, seeking anomalies. If such an anomaly were discovered, the operators would be notified and they would then notify both the interventor concerned and CORFO. CORFO would then give the interventor a brief period to sort out the anomaly on their own, offering the enterprise a certain degree of autonomy from higher decision making while also insulating those government decision makers from what could otherwise be a tsunami of data by transmitting only what was crucial. Only if the interventor could not sort out the problem would CORFO step in. In this way, instead of all production decisions being made in a centralized top-down fashion, there would be an iterative "roll-up" process, as Beer described it, with policies transmitted downward to factories and factories' needs transmitted upward to government, continually adapting to new conditions. Beer, a severe critic of Soviet bureaucracy, also believed that the statistical comparisons produced centrally would reduce the ability of factory managers to produce false production figures, as happened in the USSR, and enable much-faster discovery of bottlenecks and other problems. The aim was real-time economic control—in this period a staggering ambition, socialist or otherwise—or as close to it as possible. Up until this point, Chile's conventional economic reporting methods involved extensive, lengthy printed documents detailing information collected on a monthly or even yearly basis.

Paul Cockshott, the computer scientist whom we met earlier, who has written extensively on the possibility of post-capitalist planning aided by contemporary processing power, is a big admirer of Cybersyn: "The big advance with Stafford Beer's experiments with Cybersyn was that it was designed to be a real-time system rather than a system which, as the Soviets had tried, was essentially a batch system in which you made decisions every five years."

Allende, too, as soon as he was familiar with precisely how the system worked, pushed Beer further to expand its "decentralising, worker-participative and anti-bureaucratic" possibilities. Allende's desire that Proyecto Synco not be a technocratic answer to economic planning along Soviet lines, but a tool in the hands of workers on the shop floor to engage in decision making themselves, impressed Beer and hinted at a much-wider application of the system than just the nationalized sector. But then, Beer was also being radicalized by events in the country beyond the consulting work he was performing for CORFO. Allende was pushing at an open door.

Even before the election of Allende's six-party Popular Unity coalition government, the United States had spent millions on propaganda efforts against the Left and to support the Christian Democrats. Upon the nationalization of the copper industry (even with the unanimous support of the opposition Christian Democrats), Chile's primary export, the United States cut off credits, and the multinational companies that had been the owners of the mines worked to block exports. Factory and land owners took to the courts to try to block reforms, and sections of the Right openly called for a military coup, an option supported by the CIA. While substantial wage increases for manual and

white-collar workers had initially slashed unemployment and contributed to strong economic growth of 8 percent a year, this de facto blockade soon crippled the economy and limited the availability of consumer items. With wage increases chasing fewer items, shortages and crippling inflation appeared, in turn provoking accusations of middle-class hoarding. Allende's Popular Unity government—very much believed by the working class to be their government—was being threatened internationally and domestically. The workers and peasants were radicalizing; society as a whole was sharply polarizing.

The circumstances of a government under threat forced Beer's team to work under a crash schedule. The project was challenged on a number of fronts that were not eased by the acceleration of the timetable, but the difficulties were less technological than they were social. Operations research scientists had to perform studies of every nationalized company and establish which production indicators the software would need to track and which ones it should ignore. This was no simple task, even for a simplified model that was intended not to represent the full complexity of the Chilean economy, but simply to uncover the key factors that had the biggest impact on outputs. Nevertheless, the CHECO model was to go beyond production factors—productivity and demand—to consider the currency supply—investment and inflation. But the team was having difficulty simply getting hold of the necessary information to test the model. Mining data was two years old. Agricultural data was sparse. In some enterprises, advanced information collection processes did not even exist. In the end, while CHECO was able to run experimental models exploring inflation, foreign exchange and national income, as well as simplified models of the whole economy and of a handful of sectors, the team viewed these efforts only as a testing ground, not to be used to develop policy.

In addition, for all of Beer and Flores's desire and Allende's insistence that the project achieve a participative, decentralizing and anti-bureaucratic system, the role of workers on the factory floor was sometimes negligible, with Cybersyn engineers tending to speak first to enterprise upper management, then to middle management, and then finally to factory production engineers. Medina's history of the project is careful not to romanticize the results. The engineers did consult with workers' committees, but not on a regular basis. On top of this, to be able to model individual factories, they needed postsecondary training in operations research, and Chile at this time had a very limited pool of graduates who had been so trained. The team faced resistance from factory managers, whose class position made them less sympathetic to the project, or who simply did not understand what its purpose was. Despite direction to factory engineers that they work with workers' committees, again class divisions posed a barrier: engineers were instead condescending to workers and preferred talking to management. Medina, in her research, found very little evidence that rank-and-file workers played much of a role in shaping the modeling process.

But one can also imagine the same system being used in a very different way, arming instead of disarming workers. Indeed, even in embryo form, the Cybersyn communications network helped groups of workers to self-organize production and distribution during what would otherwise have been a crippling trucking strike, mounted by conservative business interests and backed by the CIA, in 1972. In so doing, it offered the struggling Allende administration a brief stay of execution.

Cyber Strikebreaking

It was during the strike that Cybersyn came into its own. The network could allow the government to secure immediate information on where scarcities were most extreme and where drivers not

participating in the boycott were located, and to mobilize or redirect its own transport assets in order to keep goods moving. But this was not a simply a top-down operation, directed from La Moneda Palace by the president and his ministers. The strike had forced public sector operations that were near to each other to work together in "*cordónes industriales*"—literally, "industrial belts"—in order to coordinate the flow of raw materials and manufactured products. The cordónes in turn worked with local community organizations, such as mothers' groups, to assist with distribution. The autonomous operation of these cordónes mirrored forms of spontaneous worker and community self-direction that appear to pop up regularly during times of revolutionary upheaval, or otherwise at times of crisis or natural disaster, whether we call them "councils," "*comités d'entreprises*" (France), "soviets" (Russia), "*szovjeteket*" (Hungary) or "*shorai*" (Iran). Liberal commentator Rebecca Solnit describes in her social history of the extraordinary communities that emerge at such extreme moments, *A Paradise Built in Hell*, how, far from the chaotic, Hobbesian war of all against all of elite imagination, it is calm, determined organization that on the whole prevails. She repeatedly discovered how remarks by those attempting to survive through earthquakes, great fires, epidemics, floods and even terrorist attacks that despite the horrors experienced, reflect how truly alive, full of common purpose and even joyful they felt. It is no wonder that a rich, long-lived stream of libertarian socialist thought, running through the writings of the likes of Rosa Luxemburg, Anton Pannekoek, and Paul Mattick emphasizes such organization, such "councils," as the foundation of the free society they wish to build. The great challenge is the scaling-up of such democratic, market-less organization. This is the distilled version of the economic calculation debate: relatively flat hierarchies seem perfectly capable of democratically coordinating production and distribution for a limited number of goods and services, for a small number of people and over a limited geography. But how could the myriad products needed by a modern, national (or even global) economy—with its complex web of crisscrossing supply chains, thousands of enterprises and millions of inhabitants (billions, if we consider the global case)—be produced without vast, metastasizing and inefficient bureaucracies? How are the interests of the local production node integrated harmoniously with the interests of society as a whole? What may be in the interest of a local enterprise may not be in the interest of the country.

What happened in Chile in October of 1972 may not be the definitive answer to these questions, but it hints at some possibilities.

On October 15, Flores suggested to the director of the CHECO project that they apply what they had learned from their experimentation to battling the strike. They set up a central command center in the presidential palace, connected via the telex machines to a series of specialized operational units focusing on different key sectors: transport, industry, energy, banking, supply of goods and so on. This network allowed the government to receive minute-by-minute status updates directly from locations across the country, and then just as quickly to respond, sending orders down through the same network. A team at the palace analyzed the data coming in and collated them into reports, upon which government leaders depended to make decisions. If one factory was short of fuel, spare parts, raw materials or other resources, this data flowed through the network to another enterprise that could help. Information was also shared on which roads were clear of oppositionists, allowing the trucks that remained under public control to redirect themselves and avoid blockades. Medina notes how some historians emphasize, instead, the role of popular mobilization from below in breaking the strike, but she argues this is an unnecessary dichotomy. While it did not eliminate vertical hierarchy, the network did connect the government command center to the horizontal activities on the ground. Medina writes: "The network offered a communications infrastructure to link the revolution from

above, led by Allende, to the revolution from below, led by Chilean workers and members of grassroots organizations, and helped coordinate the activities of both in a time of crisis." She argues that Cybersyn simply faded into the background, "as infrastructure often does." The system did not tell the workers what to do; the workers and their representatives in government simply used the system as a tool to aid them in doing what *they* wanted to do.

The reality of Chileans directing a technology rather than the other way round should assuage potential concerns that our hypothesis—that contemporary processing power and telecommunications networks can work to overcome the economic calculation challenge—is a technocratic solution; that we are arguing that we offload the responsibility for constructing the democratic, marketless society to an algorithm. This gets it absolutely backwards.

Meanwhile, Flores's strategy proved a success, shaving the edges off the shortages. Government data showed food supplies were maintained at between 50 and 70 percent of normal. Distribution of raw materials continued as normal to 95 percent of enterprises crucial to the economy, and fuel distribution at 90 percent of normal. Economic reports now relied on data that had been collected and delivered from across the country just three days earlier, where previously such government assessments had taken up to six months to produce. By the end of the month, the strike was all but broken, and it had clearly failed to achieve its goal of paralyzing the country. Chile still functioned. A minister told Beer that if it had not been for Cybersyn, the government would have collapsed on the night of October 17.

The result inspired Beer to envision still-wider applications of cybernetics to support worker participation. This former international business consultant had moved in an almost anarcho-syndicalist direction (anarcho-syndicalism is the political philosophy arguing for a government-less society coordinated directly by workers through their trade unions): "The basic answer of cybernetics to the question of how the system should be organised is that it ought to organise itself." Science and technology could be tools used by workers to help democratically coordinate society, from the bottom up, leaping over the centralization/decentralization dichotomy. Instead of having engineers and operations researchers craft the models of factories, programmers would be under the direction of workers, embedding their deep knowledge of production processes into the software. Instead of the Soviet model of sending large quantities of data to a central command point, the network would distribute, vertically and horizontally, only that amount of information that was needed for decision making. For Beer, Medina writes, Cybersyn offered "a new form of decentralised, adaptive control that respected individual freedom without sacrificing the collective good."

But for us, more than four decades later, we have a few outstanding questions, not least of which is whether a system used in emergency, near–civil war conditions in a single country—covering a limited number of enterprises and, admittedly, only partially ameliorating a dire situation—can be applied in times of peace and at a global scale.

After the strike, the government continued to use the network and had plans for its extension, but we will never know whether it all would have worked. On September 11, 1973, the Chilean armed forces finally initiated the coup against Allende that the United States had long sought. According to most assessments, including a 2000 report on the matter by the US Intelligence Community, the plotters proceeded with an implicit nod from Washington. At seven o'clock that morning, the Chilean navy rebelled, seizing the seaport of Valparaíso. Two hours later, the armed forces controlled most of the country. At noon, the general of the army, Gustavo Leigh, ordered Hawker Hunter jets to bomb the presidential palace, while tanks attacked from the ground. When Allende learned that the first floor of

La Moneda had been taken, he ordered all staff out of the building. They formed a queue from the second floor, down the stairs and toward the door that opened to the street. The president moved along the line, shaking hands and thanking everyone personally.

President Salvador Allende then walked to Independence Hall on the northeast side of the palace, sat down, and placed a rifle that had been given to him by Fidel Castro between his legs, setting its muzzle beneath his chin. Two shots tore off the top of his head.

The military regime of General Augusto Pinochet immediately halted work on Project Cybersyn, physically destroying much of what had been constructed, although the most important documentation survived due to the rapid actions of key figures involved. By 1975, in addition to murdering, disappearing and torturing thousands, forcing thousands of others to flee as political refugees to places such as Canada, the junta had also implemented the world's first experiment in what would come to be known as neoliberalism, prescribed by economists, most of whom had studied at the University of Chicago under Milton Friedman, who would go on to advise Republican US President Ronald Reagan and Conservative UK Prime Minister Margaret Thatcher. The junta followed the recommendations of these "Chicago Boys" to the letter: shock privatization of much of the public sector, slashed public spending, mass civil servant layoffs, wage freezes and economy-wide deregulation.

Variations on this neoliberal theme have since been adopted, with varying degrees of zeal or reluctance, by almost all governments the world over, producing a yawning inequality across much of the West—admittedly not always accompanied by CIA-trained death squads shoving trade unionists out of helicopters mid-flight or cutting off fingers and tongues of left-wing guitar-playing folk singers. Reigniting the dream of planning from the bottom up today means first undoing the harms, including in the world of ideas, of the neoliberal half century.

10

PLANNING THE GOOD ANTHROPOCENE

What is profitable is not always useful, and what is useful is not always profitable. This, one of the principal themes of this book, applies on scales both granular and grand. As we have seen, no matter how beneficial new classes of antibiotic may be, they are insufficiently profitable, so they will not be produced. Meanwhile, many other commodities, such as fossil fuels, that undermine human flourishing or even threaten our existence, remain profitable, and so without regulatory intervention, companies will continue to be produce them. The market's profit motive—not growth or industrial civilization, as some environmentalists have argued—caused our climate calamity and the larger bio-crisis. The market is amoral, not immoral. It is directionless, with its own internal logic that is independent of human command.

It would be very useful to wind down our species' combustion of fossil fuels, responsible as it is for roughly two-thirds of global greenhouse gas emissions. It would be useful, too, to increase input efficiency in agriculture, which, together with deforestation and land-use change, is responsible for most of the remaining third.

We know how to do this. A vast build-out of dependable baseload electricity from nuclear and hydroelectric plants, supported by more variable renewable energy technologies such as wind and solar, could replace nearly all fossil fuels in short order, cleaning up the grid and delivering enough clean generation to electrify transport, heating, and industry. Decarbonizing agriculture is more complicated, and we still need better technology, but we understand the overall trajectory. Unfortunately, wherever these practices do not create profit, or do not create enough profit, companies will not put them in place.

We hear regular reports claiming that investment in renewable energy is now outpacing investment in fossil fuels. This is good, though it is often the result of subsidies for market actors, themselves typically derived from hikes in the price of electricity that hit working-class communities, rather than from taxes on the wealthy. Even if, in relative terms, more money is going toward wind and solar than toward coal, the absolute increase in combustion from India and China, among other nations, will likely push us past the two-degree-Celsius limit most governments have agreed is necessary to avoid dangerous climate change.

Simply put, the market is not building enough clean electricity, nor abandoning enough dirty energy, nor doing either quickly enough. The relatively simple directive to "clean up the grid and electrify everything" that resolves the fossil fuel part of the equation doesn't work for agriculture, which will require a far more complex set of solutions. Here too, as long as a particular practice rakes in money, the market will not abandon it without regulation or public sector replacement. Liberals and greens argue that we should include the negative impacts of fossil fuel combustion (and its agricultural corollaries—some suggest a nitrogen tax) in fuel prices. In their estimation, once these externalities increase the carbon price to $200 or $300 per tonne (or as much as $1000 per tonne,

according to the US National Association of Manufacturers), the market—that efficient allocator of all goods and services—will resolve the problem.

Leaving aside the grotesque inequalities that would result from steadily ratcheting up flat taxes, even as working-class and poor people spend a larger proportion of their income on fuel, carbon-tax advocates have forgotten that their solution to climate change—the market—is the very cause of the problem.

Think Bigger

How will a carbon price build a network of electric vehicle fast-charging stations? Tesla only builds them in those areas where it can rely on profits. Like a private bus company or an internet service provider, Elon Musk won't provide a service where it doesn't make money (or at least, one that doesn't convince investors that it will someday make money; Tesla is currently a loss-making black hole for venture capital). The market leaves the public sector to fill the gap.

This is no abstract argument. Norway provides free parking and charging for electric vehicles, allows these cars to use bus lanes, and recently decided to build a nationwide charging network. Thanks to its interventionist policy, electric vehicles in the country as of January 2018 account for over 50 percent of total new sales, more than anywhere else. For comparison, barely 3 percent of cars in eco-friendly but market-enthralled California are electric.

The up-front costs of some of these changes pose one important obstacle. Take, for instance, nuclear power. From a system-wide perspective, conventional nuclear power still represents the cheapest option thanks to its mammoth energy density; it also boasts the fewest deaths per terawatt hour and a low carbon footprint. The only energy source with a lower carbon footprint is onshore wind. But, like large-scale hydroelectric projects, construction costs are considerable. The Intergovernmental Panel on Climate Change notes that while nuclear energy is clean and non-intermittent, and has a tiny land footprint, "without support from governments, investments in new … plants are currently generally not economically attractive within liberalized markets." Private firms refuse to begin construction without public subsidies or guarantees. This explains why the most rapid decarbonization effort so far occurred before European market liberalization wrapped its fingers around the neck of its member-state economies. The French government spent roughly a decade building out its nuclear fleet, which now covers almost 40 percent of the nation's energy needs.

Similarly, to integrate intermittent renewables to their maximum potential, we would need to build load-balancing, ultra high-voltage, smart transmission "super-grids" that span continents or even the entire globe so as to shave off as much as possible their volatile swings. While the wind might not be blowing and the sun not shining in one region, there is always somewhere else on the planet where the wind and the sun are doing what we want them to do when we want them to do it. We need to plan this project on the basis of system reliability, i.e, need. A patchwork of private energy companies will only build out what is profitable. And the up-front costs here are immense. China has its eyes set on precisely this through its Global Energy Interconnection initiative. The price tag for a worldwide electricity grid? $50 trillion.

The Regulatory Limit

Many greens call for a retreat from scale, a return to the small and local. But this, too, misdiagnoses the source of the problem. Replacing all multinationals with a billion small businesses would not eliminate the market incentive to disrupt ecosystem services. Indeed, given small businesses' gross diseconomies of scale, disruption would only intensify.

At a minimum, we need regulation, that toe-dipping exercise in economic planning. A government policy that requires all firms that manufacture a particular commodity to use a nonpolluting production process would undermine the advantages gained by high polluters. This is the social-democratic option, and it has a lot going for it. Indeed, we should remember how fruitful regulation has been since we gained a deeper understanding of our global ecological challenges.

We patched our deteriorating ozone layer; we returned wolf populations and the forests they inhabit to central Europe; we relegated the infamous London fog of Dickens, Holmes and Hitchcock to fiction, although coal particulates still choke Beijing and Shanghai. Indeed, much of the climate challenge we face comes from an underdeveloped global South rightly seeking to catch up.

But regulation only temporarily tames the beast, and it often fails. Capital so easily slips its leash. So long as a market exists, capital will try to capture its regulatory masters. Everyone, from pipeline-blockading bullhorn wielders to Paris Agreement–drafters, recognizes that this fundamental barrier stalls our attempts to curb greenhouse gas emissions: if any one jurisdiction, sector, or company undertakes the level of breakneck decarbonization needed, their goods and services will instantly be priced out of the global market.

Thus, only a global, democratically planned economy can completely starve the beast. But this proposal raises some basic questions: Can we impose global democratic planning all at once, in all countries, and across all sectors? Outside of world revolution, this seems unlikely. But we can, nevertheless, keep that ideal as a lodestar, as something to work toward over generations, steadily extending the dominion of democratic planning over the market. Further, should we fully eliminate the market? Wouldn't that simply replace the rule of the market with the rule of the bureaucrat? Public ownership is sufficient for neither social justice nor environmental optimization, and the fear of bureaucracy and its close relative—statism—is a rational one.

But democratic planning doesn't have to entail state ownership. Unless they believe democracy has an upper limit, even classical anarchists should be able to imagine a global, stateless, but nevertheless planned, economy. Whether state-administered or otherwise, we must ensure that any nonmarket mode of global governance adheres to genuinely democratic principles.

We should certainly debate the public sector's role and size. Could we seize logistics and planning powerhouses—the Walmarts and the Amazons of the world—and repurpose them for an egalitarian, ecologically rational civilization? Could we turn these systems into a global "Cybersyn," Salvador Allende's dream of computational, democratic socialism? Let's first discuss whether that's possible and desirable—then figure out how to ensure that we rule the algorithms and that they don't rule us.

Climate change and the wider bio-crisis reveal that multiple local, or regional or continent-wide, decision-making structures are obsolete. No jurisdiction can decarbonize its economy unless others do as well. For even if one country figures out how capture and store carbon, the rest of the world will still face an acidifying ocean. Similar truths hold for nitrogen and phosphorus flows, closing nutrient-input loops, biodiversity loss, and freshwater management.

Moving beyond environmental questions, we could say the same about antibiotic resistance, pandemic diseases, or near-Earth asteroids. Even in less existential policy areas, like manufacturing,

trade, and migration, too many interlinked nodes tie our truly planetary society together. One of capitalism's great contradictions is that it increases the real connections between people at the same time as it encourages us to see each other as monadic individuals.

All this demonstrates both the horror and marvel of the Anthropocene. Humanity so fully commands the resources that surround us that we have transformed the planet in mere decades, on a scale that leviathan biogeophysical processes took millions of years to accomplish. But such awesome capability is being wielded blindly, without intent, in the service of profit, rather than human need.

The Socialist Anthropocene

Climate researchers sometimes talk about a "good Anthropocene" and a "bad Anthropocene." The latter describes the intensification, and perhaps acceleration, of humanity's unintended disruption of the ecosystems on which we depend. The former, however, names a situation in which we accept our role as collective sovereign of earth and begin influencing and coordinating planetary processes with purpose and direction, furthering human flourishing.

Such an attempt at dominion over the earth system may appear, at first glance, to be the ultimate in anthropocentric hubris; but this is in fact precisely what we argue when we say that we want to stop climate change, even if we don't realize that's what we're saying. Because why would Planet Earth care about the particular temperature that predominated for most of the past few centuries, a highly unusual period of global temperature stability? Life on this rock, since it first emerged four and a half billion years ago, has experienced much-higher average global temperatures than even the worst projections of anthropogenic global warming. The late paleontologist, socialist and committed environmentalist Stephen Jay Gould once pooh-poohed all suggestions that we need to "save the planet." "We should be so powerful!" he responded. "The earth will be perfectly fine. It is humanity that needs saving!" Even making very simple, unobjectionable statements such as "global warming will increase extreme weather events and so we should try to avoid that," we are inescapably embracing an anthropocentric stance: that we aim to stabilize an optimum temperature for the sake of humanity.

We cannot reach this worthy goal without democratic planning and a steady overcoming of the market. The scale of what we must do—the biogeophysical processes we must understand, track, and master in order to prevent dangerous climate change and associated threats—is almost unfathomable in its complexity. We cannot trust the irrational, unplanned market with its perverse incentives to coordinate the earth's ecosystems.

Counteracting climate change and planning the economy are projects of comparable ambition: if we can manage the earth system, with its all its variables and myriad processes, we can also manage a global economy. Once the price signal is eliminated, we will have to consciously perform the accounting that, under the market, is implicitly contained in prices. Planning will have to account for the ecosystem services implicitly included in prices—as well as those that the market ignores. Therefore, any democratic planning of the human economy is at the same time a democratic planning of the earth system.

Global democratic planning is not merely necessary for the good Anthropocene; it *is* the good Anthropocene.

11

CONCLUSION: PLANNING WORKS

Planning exists all around us, and it clearly works; otherwise capitalists would not make such comprehensive use of it. That's the simple message of this book and one that strikes at the heart of the dogma that "there is no alternative." Today, this Thatcherite slogan is already wilting under the pressure of its own success. It has created an anti–social compact: a world of rising inequality and widespread stagnation. But it is under attack from within as well. From Amazon's warehouses to Foxconn's factories to all major branches of industry, the capitalist system operates without prices signals and markets. It plans—and it plans well.

However, if the good news is that planning works, the bad news is precisely that it currently works within the confines of a profit system that restricts what is able to be produced to that which is profitable; and so long as this is profitable, the system allows what is harmful to continue to be produced. Profit pushes capitalist planning to achieve remarkable efficiencies in resource use and human labor. But nothing stops long hours at poverty wages, climate-busting production methods and fossil-fueled transportation from being inputs into plans—in fact, a host of economic incentives encourage just this. Amazon is as much a complex planning mechanism based in human ingenuity as it is an inhuman place to work. Some 150 years later, we have much the same reaction of awe and terror at the contradictions of twenty-first-century capitalism as had Marx in the face of its Victorian antecedent.

Our world, of course, is very different than his—one in which a haphazard quest for profit was driven by steam power and colonial expansion. Ours is a time of ubiquitous computing and increasingly sophisticated predictive algorithms, layered on top of centuries of accelerated technological and social change.

And, here, Thatcher was wrong on another count. She didn't just say that there was "no alternative," but went further, claiming, "there is no such thing as society." Silicon Valley's slogans about bringing people together may appear corny, but in that corn, there hides a kernel of truth that disproves this second Thatcherite dictum. Capitalism brings us closer together, now more than ever. Our individual actions rely on globe-spanning chains of activities of others. It takes hundreds, if not thousands, of workers to make one gadget and all its components. Many of these links are invisible to us: from the miners in Africa digging up rare earth metals to the workers in Vietnam manufacturing OLED displays to the millions putting phones together in Foxconn's factories that resemble small cities, much of their labor is performed in conditions little different than those of the mills and mines of nineteenth-century Britain—ones that are dangerous, overcrowded, and demand inhuman pace. And all that work relies on a second, even more hidden economy of household production, whose uncompensated weight is still largely borne by women. All we see is that final anonymous, yet also indispensable, individual, often a retail worker on minimum wage, who hands over a box.

The accuracy of a Google search result or a recommended product on Amazon is built from the unpaid labor of millions of others across the globe, clicking and liking, sending untold numbers of

tiny packets of information—that supposed stumbling block to large-scale planning—around the globe.

The glimmers of hope for a different way of doing things are foreshadowed in the sophisticated economic planning and intense long-distance cooperation already happening under capitalism. If today's economic system can plan at the level of a firm larger than many national economies and produce the information that makes such planning ever more efficient, then the task for the future is obvious: we must democratize and expand this realm of planning—that is, spread it to the level of entire economies, even the entire globe.

The foundations for this alternative mode of production have, in many senses, already been laid; we already carry, in our pockets, access to more information and computing power than could have been dreamed by any of the protagonists of past debates about the possibilities of planning. At the same time, we cannot underestimate the potential for abuse that stems from the vast quantities of information that planning requires and unleashes. Profound challenges to the expansion of both democracy and planning inhere in this technological advance, including the protection of individual freedom and privacy, and it would be dangerous and irresponsible to minimize them.

It is not enough to say, "Nationalize it!" We have to think hard about how to ensure that the already enormous amounts of information controlled by large, unaccountable corporate bureaucracies do not become the basis for *new* unaccountable bureaucracies (state-run or otherwise). As the two twins of undemocratic planning, Soviet Union and Walmart, show, planning on its own is no synonym for socialism. It is the precondition, certainly, but it is not a sufficient condition. This means we need to have hard conversations about the state and nationalization. Nationalization decommodifies, but does it democratize? Friedrich Engels, in *Socialism: Utopian and Scientific*, warned against the notion that nationalization on its own is the panacea:

> Of late, since Bismarck went in for State-ownership of industrial establishments, a kind of spurious Socialism has arisen, degenerating, now and again, into something of flunkyism, that without more ado declares all State-ownership, even of the Bismarkian sort, to be socialistic. Certainly, if the taking over by the State of the tobacco industry is socialistic, then Napoleon and Metternich must be numbered among the founders of Socialism. If the Belgian State, for quite ordinary political and financial reasons, itself constructed its chief railway lines; if Bismarck, not under any economic compulsion, took over for the State the chief Prussian lines, simply to be the better able to have them in hand in case of war, to bring up the railway employees as voting cattle for the Government, and especially to create for himself a new source of income independent of parliamentary votes—this was, in no sense, a socialistic measure, directly or indirectly, consciously or unconsciously. Otherwise, the Royal Maritime Company, the Royal porcelain manufacture, and even the regimental tailor of the army would also be socialistic institutions, or even, as was seriously proposed by a sly dog in Frederick William III's reign, the taking over by the State of the brothels.

In any case, for so many of today's transnational firms, from Walmart and Amazon to Google and Shell, which state would do the nationalizing? The United Nations? One day, perhaps, but today it is still an intergovernmental talking shop, yet to be a democracy.

We shouldn't suggest planning is simply a matter of "taking over the machine"; still less "the government" taking it over and otherwise leaving the machine as it is. Since so much of our social

world—our rules and customs, habits and preconceptions, these very systems of planning—have been influenced by the logic of the market, it is not simply a world that must be taken over but one that must be transformed.

Likewise, we cannot let go of concern for human freedom—from all forms of domination. The capitalist economy is already a realm of "unfreedom"—a term used by the Marxist economist Gerry Cohen to include the most basic coercions of capitalism, such as the inability of the vast majority to refuse to work for a wage. Without a thorough democratization of any postcapitalist planning apparatus, we risk creating new unfreedoms. Therefore, rather than a society run by technocratic planners, we want a democratized society of citizen-planners.

How precisely do we build such a democracy, one more thoroughgoing than our current crop of parliaments? That would be another book in itself. For much of the history of the Left, its grand battalions came overwhelmingly from the working classes. However, over the last two generations, a great many progressive thinkers (though certainly not all) have come from the academy, in particular from the humanities—history, law, philosophy, literature—and from the social sciences—sociology, anthropology, economics, political science. Any future Left that takes the question of planning seriously will also have to depend heavily upon talents from computer science, operations research, combinatorics and graph theory, complexity theory, information theory and allied fields. And the transformation needed if it is to be democratic, rather than technocratic, will have to be led by, not on behalf of, workers at Walmart, Amazon, Facebook and other transnationals.

Humans have long relied on planning, from the simple distribution carried out by the first settled civilizations, to the complex calculations that undergird today's corporate behemoths, to those rare instances, like war or disaster, when the rules of today's complex economy are temporarily suspended and planning takes over on the grandest scales. It is our hope that the Left, and indeed society as a whole, can recapture the ambition to make such planning a beacon for its long-term vision. To do so, we need to study how it works today, design transitional demands to expand its reach, and dream of transforming its workings completely to deliver a future realm of true freedom.

Planning is already everywhere, but rather than functioning as a building block of a rational economy based on need, it is woven into an irrational system of market forces driven by profit.

Planning works, just not yet for us.