



# Markets and the Future of the Circular Economy

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## Abstract

The circular economy stands at a crossroads between true systemic change and rebranded business-as-usual. It will either evolve to become *functional*—optimizing technical capabilities to mimic resilient ecosystems—or *dysfunctional*—reinforcing current destructive, destabilizing structures and incentives despite appearing to make marginal progress. This paper offers a unique critique of the circular economy: we argue that the circular economy is set up for failure precisely because it is required to conform to our current socio-economic-political system—that is, a *market system*. We identify four core characteristics of market systems: private property, competition, a market for labor, and value determined by price. Together, these characteristics create incentives that are antithetical to a functional circular economy: a requirement for infinite growth, short product lifetimes and limited material circularity, technically suboptimal products and systems, ineffective reverse logistics networks, and misplaced priorities from distorted notions of value. We then show that the fundamental organizing principle of market systems is *market efficiency*, which is based on a false assumption of scarcity. In contrast, we suggest a competing worldview of sustainable abundance based on a principle of *technical efficiency*, which optimizes technical and environmental outcomes. Using this lens, we suggest alternatives to the core market characteristics, including an ecology of complementary currencies, a new understanding of private property, an adjusted balance of competition and cooperation, labor market alternatives, a reevaluation of true value, and lessons from Indigenous peoples. If—and only if—we embrace technical efficiency over market efficiency, we can unshackle the circular economy to create meaningful system change and a future of sustainable abundance.

**Keywords** Circular economy · Rebound effect · Market economics · Obsolescence · Scarcity · Sustainable abundance · Capitalism · Industrial ecology

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## Introduction

One of the authors of this paper was recently working with a major public sector organization to realize, accelerate, and scale up existing knowledge on circular economy practices in order to achieve systemic change. The project began with a co-creation session including experts from the research community, government, and business. Interestingly, despite beginning with functional questions such as “how can we design an ecologically and socially sound solution?”, the practical starting point of the discussion quickly became: “What is the business case for this project?” Despite the participants’ noble intentions, this setup was immediately destined to fail to reach the goal of systemic change. As we will argue, starting with the necessity for a business case inevitably leads to solutions *within* the system rather than solutions that *change* the system.

The circular economy has entered the zeitgeist because of its self-evident appeal: In contrast to the traditional, linear, make-use-dispose model, products and materials can be recirculated within the economy. By applying available technical solutions, people can continue to consume and economies can continue to grow without incurring the environmental cost of raw material extraction and end-of-life disposal.

Yet, as the title of this special issue, “The Circular Economy Agenda: Between Radical Change and Neoliberal Hegemony” makes clear, the fate of the circular economy remains uncertain. Critiques about its current implementation have recently started to mount. Kate Raworth argues that we currently see segmented circularity rather than ecosystem circularity [1], while Ken Webster warns that the circular economy could have “extractive tendencies” rather than being “systems aware” or “metabolistic” [2]. Flynn and Hacking conducted interviews with waste industry actors and found worrying acceptance that the circular economy is merely a driver for growth rather than a real economic alternative [3]. Both authors of this paper have issued warnings about circular economy rebound [4, 5]. Corvellec, Stowell, and Johanssen argue that the circular economy risks “[derailing] actual and well-intended efforts to reorganize production, consumption, and more generally material flows in ways that are more respectful of planetary boundaries” [6]. Schröder and colleagues call for an analysis of how “the circular economy is constrained by the context of neoliberal economic growth” [7].

In summary, the primary concerns about the circular economy are not about whether the concept will take hold or whether material flows can be “circularized.” Instead, the fear is that the circular economy will not represent fundamental system change, but rather the same disappointing structure repackaged in new rhetoric for a new decade.

The key question is whether the circular economy will become what we will call *functional* or *dysfunctional*. A dysfunctional circular economy reestablishes and reinforces inequitable and destructive structures and destabilizing incentives that lead us to familiar undesirable outcomes. A functional circular economy truly mimics natural circular systems, creates supportive and collaborative structures, and promotes stabilizing incentives leading to the natural production of sustainable abundance.

However tempting it may be to cynically dismiss the entire concept of the circular economy as a shill for corporate interests, to do so misattributes the root source of the problem. The core concept of the circular economy is sound. Instead, we will argue that the circular economy is at a crossroads: As long as it must conform to the structures of our prevailing socio-econo-political system—that is, a *market system*—it has no chance to succeed. Thus, in order to transition to a functional circular economy, we must alter or remove the fundamental structures and incentives of market systems.

The paper is organized as follows. We begin our analysis by identifying the core characteristics of a market system before systematically investigating how they prevent a functional circular economy and instead produce dysfunctional outcomes. We then propose that these structures all stem from a fundamental organizing principle of market efficiency under an assumption of scarcity; turning instead to a perspective of abundance and technical efficiency offers a more promising set of possibilities. In response we explore what it might look like to dismantle or replace the core problematic system characteristics using this new worldview. The final section offers conclusions.

## Core Principles of Market Systems as Barriers to a Functional Circular Economy

In this section, we will make the argument that the circular economy will fail to reach its potential because it operates within a system that fundamentally cannot allow for its transformative goals. Specifically, that system is one of market economics, which now pervades nearly every corner of the globe. Focusing the analysis on economic systems allows us to see previously hidden and complex barriers to a functional circular economy.

Zink and Geyer pointed out that the standard Ellen MacArthur diagram of the circular economy (one endlessly self-renewing circle) is not an accurate depiction of how the circular economy currently functions [4, 8]. The circular economy is not a *separate* or *different* economy. Instead, the circular economy is embedded in a system of markets, as shown in Fig. 1. Thus, the “arena” of interaction in the circular economy is not a single metaphorical industrial park where wastes endlessly become inputs, but rather a globally interconnected system of markets. This means that the “rules of the game”—the structures, incentives, and limitations of the system—are those of market economics. As long as the circular economy exists within the confines of those market system rules, it will produce outcomes consistent with them.

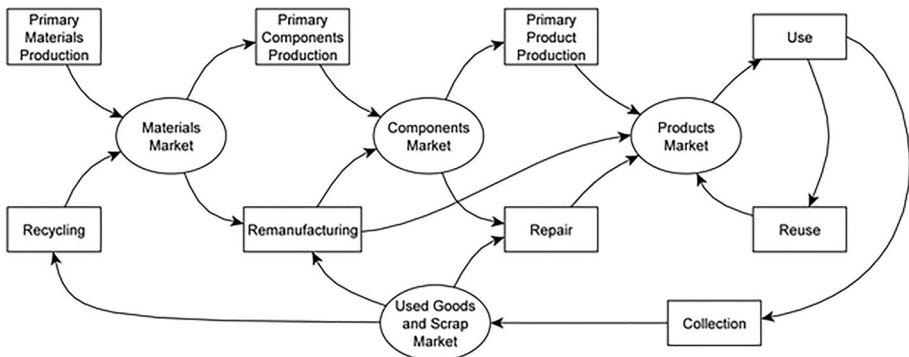


Fig. 1 The circular economy as a system of markets [4]

Because market systems and their dynamics are so pervasive, their existence—and their consequences—often go unnoticed. Like gravity or the laws of motion, what is most influential is often the most invisible. Similarly, the effects of the market system on the circular economy have remained largely hidden. In the following sections, we will systematically identify the core of market systems and diagnose how they fundamentally constrain the circular economy.

## Four Key Characteristics of Market Systems

Markets are defined in Mankiw's seminal *Principles of Economics* as “groups of buyers and sellers of a particular good or service” where “buyers as a group determine the demand for the product, and the sellers as a group determine the supply of the product” [9]. Though this broad definition may oversimplify the vast plurality of real-life market-mediated social relations through an overly theoretical lens, the purpose of this paper is not a complex analysis of various market systems—such work has been done by others, from Marx to modern critics [e.g., 10–14]. Rather, it is an attempt to identify fundamental features that define market systems so that we may investigate how these features affect the potential of the circular economy.<sup>1</sup> In order to keep the discussion approachable and broadly applicable, we identify four core characteristics that generally make up market systems.

The first core characteristic of markets is the protection of private property. Private property is so widespread in all market systems that it is barely discernible as a distinct feature; yet, without it, there can be no buyers, no sellers, and no exchange. These days, the protection of private property is taken as a foundational axiom of human rights. However, we will argue that unlimited protection of private property leads to problematic outcomes for the circular economy such as segmenting economic activity across individual actors and separating power from responsibility in circular supply chains.

The second core characteristic of market systems is competition. The aggregated behavior of sellers competing for buyers and buyers competing against one another for goods together forms “market dynamics” and results in equilibrium commodity prices. This intense competition, particularly among sellers, creates powerful incentives for self-preservation, cost-efficiency, and competitive advantage that produce many outcomes that prevent functional circularity.

The third core characteristic of market systems is that human labor is a tradable good. In a labor market, workers sell their time to employers in exchange for wages. The market for labor has the same core characteristics and resulting problematic incentives as the

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<sup>1</sup> Two notes on our scope of analysis: First, though market systems are commonly associated with capitalism, we believe our argument is general enough to extend beyond quintessential capitalist markets. However, it may be debated whether the commodification of labor and the privatization of (specifically) the means of production are uniquely capitalist traits. Therefore, we concede that our arguments are likely *most* applicable to capitalist markets, yet they still have something to offer with respect to a range of market systems that are not considered perfectly capitalist.

Second, when we talk about fundamental market characteristics holding back the circular economy, we are not talking about “market failures.” Market failures refer to situations, such as barriers to competition, externalities, or human irrationality [15, 16], that create suboptimal market outcomes. Market failures are important for the circular economy and relate somewhat to our present argument. However, market failures represent a different *kind* of problem than the one plaguing the circular economy today. Instead, it is the very structures of the market *itself* that are problematic, and correcting market failures does not change the underlying characteristics of a market system. So even if addressing market failures is in many cases helpful, it will not by itself create the conditions necessary for a functional circular economy.

overall market system; the key distinction is that the labor market is inextricably tied to human lives. If a shop goes out of business, nothing of intrinsic value is immediately lost; yet, when its workers are laid off and cannot earn money to eat or pay bills, their lives are at stake. The widespread job loss at the beginning of the Covid-19 pandemic is a visceral reminder that using markets as the basis for literally valuing human life makes for a fragile system and leads to dire consequences not only for individuals but, as will demonstrate, for the prospects of the circular economy.

The fourth core characteristic of market systems is that the price of commodities, determined by market dynamics of supply and demand, supposedly reflects their underlying value. This creates two outcomes: First, supply is necessarily assumed to be scarce—that is, goods with abundant supply cannot carry a positive price. Second, the definition of “value” is restricted to things that have market prices. As we will discuss, both the assumption of scarcity and the inability to assign value to non-market goods are deeply problematic for a functional circular economy.

In the next five subsections, we will discuss the outcomes of the four core market characteristics and why they create a system in which the circular economy cannot succeed.

### **Market Forces Create and Require Infinite Growth**

The first problematic outcome of the core market characteristics is that they create a system that both produces and requires infinite growth. Although the circular economy is sometimes portrayed as an advantageous way to accelerate economic growth [17, 18], unlimited growth is fundamentally incompatible with both a finite planet and antithetical to a functional circular economy [4, 19, 20]. Just as natural systems do not grow infinitely—indeed, individual organisms or species do not grow infinitely, but establish an equilibrium with their ecosystem regulated by negative feedback loops—a functional circular economy cannot grow infinitely. Infinite growth necessarily transgresses planetary boundaries [21, 22] and disrupts the ability of natural systems to regenerate and provide ecosystem services. If we are to achieve a functional circular economy, it cannot be within a system that requires growth.

It is therefore important to understand *why infinite* growth is an unavoidable result of the core features of market systems. Growth is sometimes framed as an “addiction,” suggesting a supposed insatiability of human consumptive appetites [23]. On the other hand, Magdoff and Foster argue convincingly that (specifically in capitalist markets) the desire to grow capital and compete against rival firms drives infinite growth [10, 24]. Others blame governments with a myopic focus on GDP over societal well-being. However, two additional factors are typically overlooked, yet, they arise directly from the market characteristics of competition and private property: Labor productivity and the creation of money from interest-bearing debt.

### **Markets Require Endless Job Growth**

In a market economy, protection of private property means that employers retain revenues minus costs, such as labor, as profit. Firms therefore have a market incentive to minimize costs, including labor inputs, by maximizing “labor productivity,” or the value of output produced per unit (i.e., hour, day, person) of labor. Firms can maximize labor productivity through more efficient production technology; specifically, they move from labor-intense

processes to mechanical and technological processes. In the process, they trade many laborers for fewer machinery technicians and then even fewer AI programmers [25].

However, during this process, the laborers and technicians are rendered obsolete and unemployed. Besides having serious consequences for individuals, unemployment is also problematic for the system as a whole: Unemployed people spend less money, meaning other businesses lose revenue and fire workers. Unemployment begets unemployment in a destabilizing feedback loop that results in collapse. The only way to improve labor productivity without destabilizing the system is to give the unemployed workers something to do to earn a wage—which means new jobs must be “created.” Job creation simply refers to the expansion of the labor market: new firms being founded or existing firms expanding into new markets or adding additional operations. Thus, the market incentive to maximize profit by minimizing labor productivity means the economy *must* continue to grow to provide employment, regardless of whether that growth adds anything of real value for society or the workers.

### Markets Require Endless Monetary Growth

Expanding enterprise to create jobs requires investment, which comes from equity investors or creditors. Funding this endless expansion of enterprise requires a well-known magic trick: the creation of money.

In a market economy, money is created through debt issued by commercial and central banks [26] through the fractional reserve system, which allows banks to loan more money than they actually hold in currency reserves [27–29]. Loans or investments are issued against collateral and with the expectation that they will be returned along with extra—the interest—to make the loan worthwhile for the creditor. Interest is thus the price of money, which has elevated money from a pure *means* to a speculative investment and therefore an *end* itself.

The presence of interest creates an additional need for growth. Because debt includes interest, total debt outstanding always exceeds total money in circulation (in 2020, global debt was three times larger than global GDP [30]). Thus, if all debts were called in there would not be enough capital to cover them. In a sense, the monetary system is a game of musical chairs in which there are more players and more chairs every year, but always fewer chairs than players, forcing the players to compete. As long as the music plays and more players join the game, the system seems to work. However, if the music stops—that is, when the economy stops growing due to an environmental or public health crisis—creditors call in their loans and debtors default. As long as money is created with an expectation of additional return, debtors can only meet their obligations if the economy continues growing. If it stagnates or declines, it enters a self-reinforcing feedback loop of default and bankruptcy leading to collapse.<sup>2</sup>

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<sup>2</sup> This also relates to the growing debate around the movement of degrowth and ethical (i.e., less) consumption [31–33]. This movement calls for people to consume less, thereby reducing upstream production. Unfortunately, degrowth is untenable within a market economy for the same reasons discussed in this section. If everyone became minimalists, reduced spending would force layoffs and prevent debtors from repaying creditors, spiraling into collapse. Indeed, this is not lost on policymakers or central bankers: In September 2008 (during the economic recession) US President George Bush promised to “supply urgently needed money so banks and other financial institutions can avoid collapse and resume lending,” and after the 9/11/2001 attacks in New York City, he urged consumers to spend money as a kind of civic duty to protect the economy [34, 35].

In short, because of the self-reinforcing incentives created by competition and private property inherent to market economies, market economies are stable *only* when they grow. Meanwhile, a functional circular economy *cannot* infinitely grow; the two are fundamentally incompatible.

### Market Forces Limit Material Circularity and Product Lifetimes

The second problematic outcome of the core market characteristics is that there is no incentive to increase product life cycles, while there is a strong profit incentive to encourage product replacement over repair or refurbishment. Thus, whereas fundamental principles of the circular economy call for prolonging product life cycles and use-phases, product lifetimes for many products have been declining [36].

A persistent and relatively well-documented reason for this is *planned obsolescence* [37–39]. Planned obsolescence is defined as a sales strategy that builds in obsolescence through technical breakdown, introduction of new product features, or changes in fashion preference [40–42], which shortens product life cycles by encouraging premature replacement [37]. Many prominent companies have built planned obsolescence into their strategy, including Apple [43, 44], Philips [45], and General Motors [46]. Businesses use various means to ensure obsolescence, such as physically preventing product repair or upgrade by sealing product cases, voiding the warranty of unsealed products, or continually updating styles. Market incentives make it commercially unattractive to create strong, long-lasting products, because they saturate demand and decrease profits. Indeed, nonperishable high-quality products are seen as a “commercial tragedy” [39].

Importantly, planned obsolescence extends beyond technical longevity. Ultimately, users decide when to replace products, so companies have an incentive to convince consumers that products are outdated or unfashionable even when they are still serviceable [47]. For example, smartphone users are encouraged to replace their devices after just 12–24 months [48] and fast fashion companies have compressed “seasons” to months or even days [49]. As a result, regulatory efforts aimed solely at the material aspects of planned obsolescence are unlikely to succeed, as profit-motivated corporations will find other ways to build in obsolescence.

### Product-as-a-Service Is Limited by Market Forces

In the context of the circular economy, aside from product reuse and repair, the most relevant solution proposed to combat obsolescence is the product-as-a-service (PaaS) model [50], which shifts ownership and the accompanying incentives and responsibilities to producers rather than consumers. Circular economy theorists argue that having companies sell product services but retain ownership of products themselves can incentivize firms to increase reparability and recyclability. However, market incentives pose serious challenges to PaaS models, which is why they have failed to be truly transformative.

As an example, Rau describes an experience creating a lighting-as-a-service agreement with Philips for a new office building [51, 52]. Philips first proposed a plan to meet the building’s lighting requirements while retaining ownership of the physical infrastructure. However, the customers then added a unique demand: they would *only* pay for the light—Philips would not only retain ownership of the equipment, they would also have to pay for the electricity. With this addition, Philips created a new plan that met the lighting requirements using far less energy and now included the latest efficiency-enhancing innovations

[51]. Clearly, aligning producer and user incentives through PaaS can open innovative environmental opportunities.

Unfortunately, this story is unusual; in fact, even Philips has since ceased PaaS agreements with energy included. More commonly, PaaS models are not much more than leasing or rental models that do not comprehensively realign producer incentives. Leasing is simply a way to help finance expensive items and increase consumption for low-income groups. During the lease, the bank owns the product rather than the consumer or the producer—the bank, like the consumer, has no power to change product characteristics, so the problem remains. Rental models are also insufficient because the use-phase costs remain the responsibility of the user (e.g., car renters pay gas; apartment tenants pay for electricity), so the product manufacturers or owners have no incentive to maximize use-phase efficiency. Some business-to-business rental agreements, such as for corporate copy machines or shipping containers, might come closer to aligning incentives across the product life cycle—however, such cases are only viable in unique situations. Thus, only shifting ownership temporarily or partly is often insufficient; successful PaaS models must incentivize those with power to increase product lifespans, use-phase efficiency, and life cycle material efficiency. As the Philips example shows, PaaS only meets its full potential when the monetary and environmental costs of the entire system are the responsibility of the agents who have power to affect them.

Though PaaS as a concept is a step in the right direction and would certainly fit into a functional circular economy, most PaaS models have failed to be truly transformative because they are subject to the same market conditions that incentivize cost-efficiency and growth in a competitive environment. As a result, PaaS models currently face one of the following outcomes: either the product and its design are barely changed from a pure sales model, the company remains a niche curiosity with low profitability and scalability, or it goes bankrupt due to being out-competed by non-PaaS alternatives.

## Market Forces Preclude Technical Optimality

The third problematic outcome of the core market characteristics is that the market necessarily produces technically suboptimal products and systems. This outcome can be shown from two simple premises: First, to remain competitive, firms operating in market systems must optimize products for cost-efficiency and must prioritize investments based on net present value. Second, systems can never be fully optimized for more than one variable simultaneously. Together, these premises mean that products in competitive markets are optimized for market outcomes and are therefore *not* optimized for technical superiority (most durable, long-lasting, effective, etc.).

Similarly, investment decisions constrained by market considerations will necessarily be technically inferior to investment decisions made without those constraints. The energy transition provides a salient example. Self-evidently, a functional circular economy would include a fully renewable energy system. Assuming current technology, it is not difficult to theorize a transition to 100% renewable energy—indeed, more than 180 articles were published on the topic between 2004 and 2015 [53]. Nonetheless, despite readily available technology and ample research, progress toward a renewable energy future is slow. The reason is that energy firms must choose investments based on criteria like cost-reduction and profitability, which rules out most renewable energy plans and technologies [54, 55]. The reason we have not seen a renewable energy transition is because investment decisions



are driven by market incentives and are therefore technically inferior to decisions made without these incentives.

We can therefore conclude that markets produce *intrinsic technical inferiority*, which is the hidden, unintended shortcoming of products and investments in market systems as compared to counterfactual alternatives that are unhindered by market considerations. In other words, product and energy systems designed by teams of the world’s best system engineers optimizing for effectiveness—for instance, in the spirit of the Buckminster Fuller Challenge [56]—would look very different from those that emerge from uncoordinated market competitors. A functional circular economy requires technically optimal products and systems, so as long as market forces constrain decision-making, it will remain out of reach.

### Market Forces Prevent Collaboration and Integration

The fourth problematic outcome of the core market characteristics is that they prevent meaningful system-wide integration necessary for a functional circular economy. Raworth distinguished two diverging paths for the circular economy: segmented circularity versus ecosystem circularity, shown in Table 1 [1]. A functional circular economy must include principles of Raworth’s ecosystem circularity—cooperation, supply loop coordination, information sharing, and format standardization. In contrast, the current circular economy is trending toward dysfunction because it is dominated by segmented structures: intellectual property (IP), market lock-ins, and disaggregated reverse supply chains.

In most markets—especially industries vital to a functional circular economy such as technology, chemicals, and transportation—patents, trade secrets, and “walled gardens” are a source of significant competitive advantage. However, they also inhibit strategic design standardization and therefore limit repair, upgrade, refurbishment, and recycling possibilities [57]. As a result, there are only two market-based options for closing resource loops: in-house extended producer responsibility (EPR) and disaggregated waste management, both of which have significant shortcomings.

Under EPR programs, firms maintain responsibility for their products after use and therefore have an incentive to design products to make their recovery cost-effective given the imposed regulation. However, because EPR product “loops” exist *within* large brands with protected standards and proprietary technology, they cannot consider alternate, potentially superior uses of products or components outside the single-brand loop or allow for cooperation across industries [58]. Additionally, EPR systems can create technological “lock-ins” [59–61], where firms make significant investments in recovery technology for their own products and are therefore disincentivized from

**Table 1** Segmented versus ecosystem circularity [1]

	Segmented circularity	Ecosystem circularity
Material flow	Closed loops	Nested loops/network
Material control	Return to brand	Return to ecosystem
Standards	Owned and protected	Open and shared
Governance	In-house	Network-wide
Technology	Proprietary	Knowledge commons

upgrading product designs, even when doing so would be more efficient. Lock-in is prevalent in the electronic waste sector [60], the plastic waste management industry [62, 63], and waste-to-energy plants. Like PaaS models, EPR programs are a step in the right direction in incentivizing businesses to design for recovery, but because the businesses that use them are subject to market incentives, they do not align producer incentives with circular supply loops or integrate segmented loops.

Aside from EPR programs, the only other option for waste recovery in a market economy is through disaggregated individual companies or municipalities, where there is limited recovery of products or components, little sharing of technologies, and few incentives or opportunities to route end-of-life products to their most efficient use. Instead, waste is only recovered if it is financially feasible, and even then, through inefficient brute force material recycling—grinding, sorting, and remelting materials with significant quality loss. Market incentives ensure that the most common “circular” activity in a market economy is recycling—which is also the least environmentally favorable [64, 65].

In contrast, a system with greater standardization supported by knowledge commons and decentralized democratic governance could yield cooperative circular supply ecosystems with efficient handling of products, components, and materials and with less possibility of rebound [4]. A functional circular system of waste management requires widespread collaboration, information transparency, and open-source technologies. Unfortunately, the core characteristics of markets incentivize the opposite.

### Market Forces Distort Value

The final problematic outcome of the core market characteristics is that they create a system that can only value things that are traded on the market. In common parlance, “value” refers to something that is *desirable*, *worthwhile*, or *useful*. Similarly, in classical economics, something was valuable if it could be put to productive use or fill some objective end. Since then, the notion of value has shifted to reflect subjective concepts such as perceived scarcity and preference. Whereas it was originally the value of a good that determined its price, now price determines value. Thus, if someone is willing to pay a price for a good, it supposedly has value; if a good is not traded on the market, it is deemed worthless.

As an example, consider that the protection of clean rivers is not “sold” per se and therefore has no “value,” but clean-up of polluted rivers involves the sale of labor and equipment, and is therefore “valuable.” Conversely, the market assigns value to many items that most people would (hopefully) agree are worthless (e.g., Christmas sweaters for cows, bubble gum chewed by Britney Spears, or a \$9 m license plate) [66, 67]. Such examples, which are not anomalous, strain a commonsense definition of value. Importantly, this distortion of value is more than semantic because it creates powerful incentives that alter people’s behavior—typically this results in value *extraction* rather than true value *creation*. As Mazzucato puts it, “Price-equals-value thinking encourages companies to put financial markets and shareholders first, and to offer as little as possible to other stakeholders” [68]. A functional circular economy will require us to both value and incentivize many goods and activities that a market system is simply incapable of valuing.

## From Scarce Market Efficiency to Abundant Technical Efficiency

As we discussed, the four core characteristics inherent to market systems create a variety of incentives and constraints that are incompatible with a functional circular economy. Notice that these are not *technical* problems. There is nothing technically impossible about optimizing product systems, energy grids, or, indeed, circularity. Nor are these problems that can be solved through changes *within* the market system (such as correcting market failures). Instead, what stands in the way of a functional circular economy is a system of structural incentives *inherent to* market systems.

A functional circular economy requires a transition beyond a market system—or, at least, to shed the core problematic characteristics of market systems. It is hard to imagine what that might look like. Indeed, because most humans have lived within market systems for as long as we have been recording written history, it is hard to imagine anything *but* market systems. One approach to start imagining a new system is to examine the fundamental assumptions of our current system—and then imagine what might happen if we make different assumptions more conducive to our modern paradigm and ecological predicament.

### Scarcity vs. Abundance

To begin unpacking the foundational assumptions of market systems, we turn to Adam Smith—not from the *Wealth of Nations*, in which he described how the economy works *in practice*, but from *The Theory of Moral Sentiments*, in which he argued for how an economy *ought, morally*, to work [69, 70].

Most first-year economics students will immediately recognize that the fundamental assumption of market economics is *scarcity* [71], and the virtue of markets is that they distribute scarce resources efficiently [10]. Most of these students would also readily ascribe that assumption to the fathers of economics—Menger, Hume, Mill, Malthus, and, of course, Smith. However, at least in Smith’s case, they would be only partially correct—and where they are wrong is instrumental in our understanding of market economies.

According to Peebles’ analysis, Smith recognized that scarcity arises not from the provision of goods to meet basic human needs, but the superficial desire to compete for and impress one’s neighbors with “trinkets and baubles.” Smith writes, “For to what purpose is all the toil and bustle of this world? ... Is it to supply the necessities of nature? The wages of the meanest labourer can supply them....” Peebles summarizes: “Out of this endless competition for distinction blossoms a world of socially-produced scarcity. Individuals begin to chase after wealth despite its lack of utility to their survival. Indeed, society creates wholly artificial and unnecessary needs only to ensure that a complex symbolic apparatus of distinction exists” [72].

This should, on some level, be unsurprising. After all, the market is only capable of valuing things that are considered scarce. However, the surprising insight from Smith’s observation is not about scarcity itself, but its origins: Smith says that scarcity is not inevitable—in fact, it is so *un-inevitable* that it must be socially *constructed* for the purpose of (in Smith’s view) motivating people to sacrifice hours of their lives in service of growing the economy. Again quoting Peebles, who is summarizing Smith: “By forcing individuals to earn their keep by work and exchange, artificial scarcity builds a bulwark

against the standard tendency of all animals to seek out ‘natural indolence’” [72].<sup>3</sup> Even today, 260 years after Smith, the most common argument against ideas like universal basic income is the fear that meeting people’s basic needs will make them lethargic and unproductive [73].

Thus, contrary to a first-year economics understanding, what we learn from Smith is that markets are not created to *deal with* scarcity but to *create* it; abundance is inevitable, whereas scarcity is manufactured.<sup>4</sup>

## Market Efficiency vs. Technical Efficiency

Proceeding from this foundational observation, we can see that our current system has been shaped, over the centuries, for a specific purpose—to incentivize behaviors that *work well for the market*. The market system incentivizes competition over cooperation, demands cost reduction and profit maximization, requires growth, encourages disaggregation over system design, and conflates price with value. With scarcity at the center of our economic view, everything must be divided, allocated, utilized, and *depleted*. Nature itself—or, as it is referred to in market terminology, “natural resources”—are viewed not as bountiful and renewable sources of abundance, but as scarce resources to be efficiently extracted [74]. As a result, markets encourage people to not only perpetuate scarcity but to actively sabotage abundance (once scarcity is solved, it cannot be monetized).<sup>5</sup> Indeed, the assumption of scarcity is a self-fulfilling prophecy. Markets have become systems designed to both perpetuate scarcity and efficiently extract (a very narrow version of) “value” from that scarcity.

In short, the fundamental organizing principle of our system is *market efficiency*.

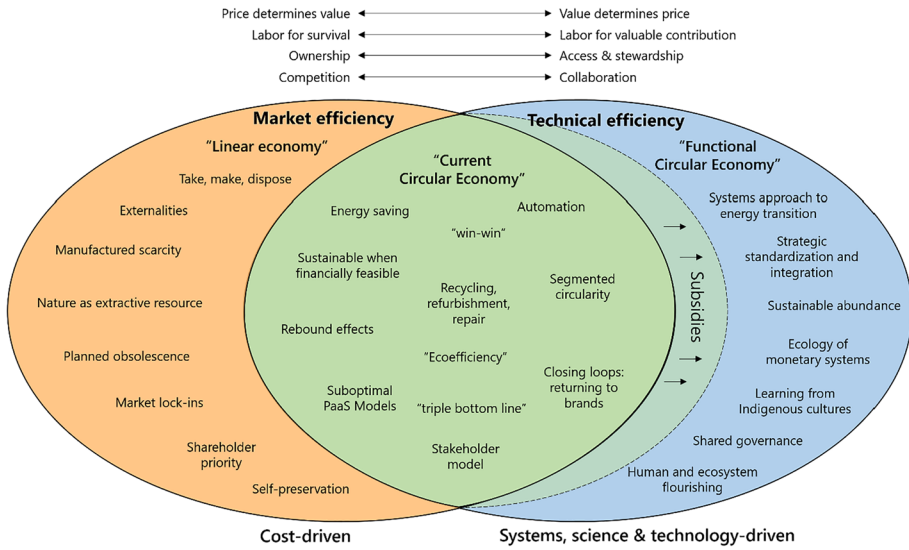
What would happen if we imagined a system based on opposing assumptions? What if we imagined a system that valued what *works* rather than what makes money? A system that prioritized solving problems rather than perpetuating them? A system that encouraged radical cooperation instead of cut-throat competition? A system that promoted sharing rather than hoarding? What if we imagined a system that produced—or, indeed, allowed for—*abundance*? In short, instead of a system that works well for the economy, what if we designed a system that *works well for a complete human habitat in a sustainable future*?

Such a system would have a different fundamental organizing principle: *technical efficiency*. In contrast with market efficiency, this principle prioritizes technical and environmental considerations such as material utility, resource-use optimization, and waste elimination, as if market considerations were not part of the equation. Technical efficiency does not suggest a single solution, or one “right” set of optimization criteria; it can allow for a plurality of efficient solutions that are based on systems thinking, science, and technology rather than market logic.

<sup>3</sup> Smith’s fear of indolence is unsupported by both anthropological evidence of pre-agricultural humanity and modern experiments with universal basic income (discussed below). More importantly, it is also potentially catastrophic: If we insist on forcing unending productivity for the “advancement of civilization,” we risk destroying not only civilization itself but most of the rest of the community of life on Earth.

<sup>4</sup> Even today, in some aspects of society, an abundance can already exist. For instance, we could easily meet the food, clothing, and connectivity needs of 11 billion people (the likely 2050 human population), and we have the technical potential to achieve abundance in many other areas such as energy, housing, and transportation.

<sup>5</sup> Consider the well-known supply manipulation of the De Beers corporation or luxury brands such as Burberry [75], or the market incentives that led to approximately 18,000 mostly empty airline flights during the latter half of 2021 to protect airport spots [76].



**Fig. 2** The range of possible activities differs between organizing principles of market efficiency vs. technical efficiency; a functional circular economy requires activities only available by ignoring market efficiency

These fundamentally different organizing principles are contrasted in Fig. 2. On the left side of the figure, we find products and activities that are market-efficient but also clearly destructive and inferior from an environmental or technical perspective. On the right, we find concepts that are technically and environmentally superior, yet not financially feasible. Today’s circular economy operates mainly in the overlapping area of technical and market efficiency: energy reduction, automation, and a spectrum of PaaS models. Certain subsidies (e.g., on renewable energy) may be able to stretch the range of market options slightly into the technically efficient sphere. Primarily, however, the current CE is constrained to areas of “win-wins.”<sup>6</sup>

Because the market demands consideration of market efficiency, the concepts on the right side of the figure have no chance of being realized within a market economy. Yet, it is obvious that a truly functional circular economy relies on those off-limits concepts and structures. In the introduction, we warned the circular economy stands at a crossroads; the two paths of that crossroads are represented by the boundaries of the two organizing principles: either we continue with a dysfunctional circular economy stuck within the realm of market efficiency, or we build structures that allow us to prioritize technical efficiency.

Circling back to the opening paragraph of this paper, we can now see that the critical question for transitioning to a circular economy is not “what is the business case for circular solution X?” but rather, “how can we implement effective solutions without needing to conform to a business case?” In other words, how can we unshackle our technical, scientific, innovative, and cooperative capabilities from the constraints of market logic to instead value the creation of abundance through system optimization?

<sup>6</sup> Interestingly, for reasons similar to those we discuss, focusing on “win-win” strategies has recently drawn criticism, even from members of the environmental business community who used to promote them [77].

## Transforming Core Market Characteristics to Create Structural Incentives for Sustainability and Abundance

Clearly, the first step to answering these questions is rethinking the core market characteristics—private property, competition, a market for labor, and value determined through supply and demand—that cannot be reconciled with the goal of full circularity. In this section, we highlight some promising economic possibilities, structures, and frameworks—and areas ripe for future research—that can supplant the market characteristics and help incentivize behaviors conducive for a functional circular economy. Specifically, we suggest (1) new approaches to monetary systems, (2) new forms of property and ownership, (3) new types of collaboration, (4) changes to the labor market, (5) reconsidering what we truly value as a society, and (6) learning from Indigenous communities.

Of course, system change cannot happen overnight, so these should be thought of as possibilities to simultaneously alleviate the dysfunctional market incentives while building alternative systems. In practice, these categories of solutions have significant overlap: they can strengthen each other, they are interlinked with interdependencies, and they can affect several of the intertwined problematic market characteristics at once. The potential applications, benefits, and complexities are too extensive to fully cover here. Thus, the aim of this section is not to produce an exhaustive list or a comprehensive plan, but rather to offer a preliminary exploration of how these ideas may facilitate a functional circular economy. Along with what we present here, we encourage readers to explore complementary attempts at next-system thinking from authors such as Magdoff and Foster, Alperovitz, Raworth, Schor, and Sweezy [12, 19, 78, 79].

### Monetary Systems: from a Monoculture of Endless Growth to a Diverse Ecology of Money

As discussed above, an inherently unstable system of commoditized money that requires growth poses fundamental obstacles to the circular economy. Fortunately, research on alternative, complementary currencies and other explorations of “an ecology of money” has been growing [28, 80–84]. These alternative currencies function as a parallel economy with different incentives and market dynamics and have the potential to alter core market characteristics compared to the current, “monocultured” money system. By way of example, we will briefly discuss the Sardex (SRD) system.

Sardex is a fully digital credit system in Sardinia, Italy, focused on business-to-business transactions. It is used by over 10,000 businesses with a transaction volume over \$200 million since 2019 and has been the focus of a body of research [80, 85–89]. Sardex runs on an innovative e-pay software called Cyclos, which is also used by other local currencies in Italy and the Netherlands [86]. Cyclos enables the Sardex cooperative to add “rules” to the currency; these rules allow the cooperative to intentionally create fundamentally different incentives than in the current monetary system. For example, SRD can only be used among people and businesses on the island of Sardinia who are members of the Sardex circuit, so it encourages local trade and collaboration. Additionally, SRD credits lose value over time, making SRD unattractive as an investment or speculation vehicle and therefore less susceptible to financial instability. In addition, the Cyclos software and SRD allow for

interest-free loans for small and medium enterprises, which stimulate local entrepreneurship especially in times of economic downturn [90].

Research on the Sardex system shows that it increases the economic resilience and health of the local community in more profound ways than simply bringing financial security [80, 86, 90]. SRD has improved cohesion and fostered trust and cooperation in Sardinia through “social mechanisms that cannot be attributed solely to traditional utilitarianism” [90]. Dini and Kioupiolis conclude, “a market that mediates the (local) real economy only and shuts out the financial economy can provide economic sustainability by supporting SMEs, supply a shield against the adverse effects of financial crises, and counteract the fetishization of money ... within a controlled environment of mutual responsibility, solidarity, and trust” [80]. In other words, it appears Sardex has helped people to reconceptualize and recontextualize money, embedding it in systems of collaboration rather than competition.

Of course, local currencies like Sardex are just one type of novel currency that could be a part of an ecology of money. Cryptocurrencies based on blockchain technology represent another possibility to experiment with new types of money that can solve the problems of our current monetary system. Blockchain technology, for instance, can help break the oligopoly of money creation, provide opportunities to unbanked populations, and potentially support the energy transition [91] (despite concerns over its current energy consumption [92]).<sup>7</sup> Complementary currencies on different scales could be organized for specific purposes, each with rules and dynamics that would be conducive to the role it fulfills in the ecosystem, reshaping markets with unique characteristics [28]. For instance, while SRD-like currencies may play an important role on the local or regional scale, blockchain-based currencies could facilitate international exchange.

Overall, new currencies such as Sardex represent money that functions as a pure *means*—constructive, connecting, and enabling—as opposed to an *end*. Despite having only discussed a sample of the potential advantages, Sardex and cryptocurrencies show that an ecology of complementary currencies could facilitate a functional circular economy, for example, by enabling cooperative regional circular value chains or rewarding valuable things outside the market’s reach. In addition, complementary currencies can structurally emphasize localization over globalization, which constitutes another crucial systemic shift within the larger transition, as thoroughly explained by the works of Norberg-Hodge [93, 94]. Further research into local currencies as vehicles for the circular economy is needed.

### **Property: from Ownership and Control to Access and Stewardship**

Because private property is a core market characteristic that inhibits the development of a circular economy, we must consider alternatives. In a world with a functional circular economy, not everyone needs to own a car, a ladder, or a washing machine; we only need to be able to access them sufficiently and conveniently. In the same way, organizations do not need to own machines, material, or knowledge; they need to be able to access them to add (real) value and deliver it downstream.

While our relationship with the concept of ownership has grown increasingly rigid both culturally and legally over time, its interference with our ability to maintain ecological

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<sup>7</sup> To date, cryptocurrency has not offered a true alternative to our current monetary system as it is strongly influenced by market dynamics, with incentives for speculation and yield-seeking. However, future innovations like proof-of-stake models show more promise to disrupt monetary markets.

integrity is beginning to inspire new access models. For example, PaaS models are a step in the right direction with regard to aligning incentives with principles of circularity and sustainability. Yet, as we argued earlier, many such business models either fail to truly alter companies' incentives or are financially unattractive. Part of this is due to our current conception of private property. Even when producers retain ownership and responsibility of their products, the complexity of contemporary global supply chains makes it very difficult for them to create truly circular products, as they do not have the “power” needed to honor the responsibility. Since the producers are also dealing with suppliers, who in turn are dealing with other suppliers, their ability to design for recycling or longevity decreases at every step at which ownership and responsibility changes hands.

Additionally, a functional circular economy requires the preservation of the “integrity” of materials, components, and products—that is, material quality must be maintained, components must be both repairable and interchangeable, and products must be taken care of. However, the power to ensure this integrity is currently disaggregated over dozens of individual actors across the supply chain. To solve this, we might imagine a version of a PaaS contract among actors higher upstream. Buyers throughout the chain would have to be able to return the resource, material, or component to an upstream supplier in an agreed-upon state and composition. Every actor in the chain would become a steward of the material, with both the power and the responsibility to maintain the integrity of the material. Thus, “management” would be democratic, but “ownership” would remain at the source: nature. As described by Rau and Oberhuber, such a system would transform buildings into urban material depots and products and components into small resource banks supported by *material passports* [52, 95, 96]. This would naturally incentivize modular design, strategic standardization, design for recovery, and vertical supply chain cooperation.

Besides ownership of physical items, private property of ideas—that is, intellectual property (IP)—presents a particular hurdle for a functional circular economy. In a functional circular economy, chemical makeup, treatment methods, and other material properties and product characteristics need to be transparent throughout circular networks in order for individual actors to properly handle these resources. On the one hand, this should be easy and desirable since information is a public good and information transfer is a non-zero-sum game: if one party gives or sells information to another, they both have it. Unfortunately, the incentives of profit, self-preservation, and competition give rise to IP, trade secrets, and patents, which effectively turn information into a private good, which prevents cooperation and circularity. Even the new wave of Internet decentralization known as Web 3.0, which promises to democratize digital infrastructure and ownership, has been distorted by market incentive structures. For instance, in contrast to the stated collaborative aims of Web 3.0, market incentives instead push people to use Web 3.0 tools, such as blockchain, to search for opportunities to monetize rather than share assets. For instance, non-fungible tokens (NFTs) allow the “privatization” and verifiable “sole ownership” even of previously un-ownable artifacts, such as digital images.

In a post-scarcity world that facilitates a functional circular economy, however, IP must play a significantly smaller role [97]. If the guiding principle for the circular economy is technical efficiency, IP laws should facilitate rather than stifle creation, sharing, and innovation.

The idea of limiting the institution of private property may sound surprising, perhaps even heretical, since market systems view private property as a fundamental right. However, a broader view shows us that outside market systems, where scarcity is not artificially manufactured, private property is extremely uncommon. Indeed, for 95% of human history,



private property was basically nonexistent. As we know from anthropological research and current Indigenous communities, humans do not naturally relate to land or possessions as “private property” [98, 99]. Not only *can* systems of limited property work, they *have* worked for most of human history.

We cannot fully depict here what a system with limited property rights might look like. As Hardison points out, our current system of open commons vs. private property “is not opposed by a single type of commons, but a vast plurality of local commons” [100]. Or, as J.K. Gibson-Graham and the Community Economies Collective show, there are not simply two alternatives between capitalist privatization or Marxist socialism; a vast array of community-based, participatory, shared economic alternatives are possible [101]. Rethinking access to goods and services, incentivizing sharing and cooperation, and facilitating the exchange and development of knowledge can open possibilities for a functional circular economy.

### Competition: From Survival to Friendly Match

Competition as the governing condition of our economy is so pervasive that it might be viewed as a natural condition, inherent to either human nature or to natural systems. This is the premise of social Darwinism, which applies the idea of “survival of the fittest” to human society. It is inspired by a Malthusian view of humankind, thereby justifying competition around assumed scarcity. However, the view that competition is inherent is an inaccurate representation of both human nature and society. Besides the fact that social Darwinism was based on a misreading of Darwin [102], the assumption of scarcity, as we have shown, is a myth. More careful thinking suggests that complex cooperation, not competition, is our most defining human quality [103].

And while competition can sometimes propel people to achieve great things, when competition is about survival, most other (ethical, social, or ecological) considerations usually make way. Currently, many of the economic choices individuals and organizations make are ultimately (albeit indirectly) motivated by competition for survival. The result is an apparent inability to cooperate, engage with one another, or value our common prosperity.

To achieve a functional circular economy, we must explore ways to alleviate competitive and survival pressure from markets and place new forms of cooperative and democratically planned structures at the heart of our economy.

The solutions discussed in the monetary systems and private property sections have a vital role in creating an economic context friendly to more cooperation. Within a context of a purposeful ecology of money and limited private property, organizations could focus on cooperation over individualized financial gains. Currently, cooperatives around renewable energy, housing, and farming are growing in popularity [75, 101, 104, 105]. Also, there are sporadic examples of collaborations among competitors who have similar waste streams to improve recycling potential [5]. Efforts in triple or quadruple helix collaborations, many in relation to circular economy goals, are also realizing higher levels of technical efficiency [106, 107]. However, these remain niche examples because they exist within a competitive market structure; to grow, they would need to financially compete with organizations focused on growth and profit, which is not something cooperative organizations are designed (or generally want) to do.

By analogy to natural ecosystems, Klompf and Oosterwaal explain that healthy forests are rooted in cooperation and resource sharing: “Instead of a competitive system of single

agents ... the forest economy is a cooperative system in which trees talk to one another and produce a collaborative intelligence and a system of resource distribution” [108]. Similarly, embracing cooperation can open opportunities in the technical efficiency realm of Fig. 2 and create the interdependent networks of value creation needed for a functional circular economy. Simultaneously, we can envision deliberately nurturing *pockets* of competition that serve as stabilizing feedback loops and quality drivers—not as the fundamental modality for survival. For example, limited prize-based competitions could stimulate rapid technology innovation and adoption in a specific sector or region. Simultaneously, we can organize cooperative networks around broad societal goals while removing survival as a competitive driver (covered further in the next section). This would create the “friendly match” environment needed to foster the optimization of technical efficiency and thus support a functional circular economy.

### **Labor Markets: from Subsistence as a Commodity to Subsistence as the Standard**

As we introduced earlier, half of the requirement for endless market growth comes from monetary systems; the other half comes from unemployment due to automation. The problem is that as automation destroys jobs, unemployed workers cannot spend, which forces other businesses to close, spiraling to system collapse. The market system’s solution is to create new, often pointless jobs [109] through never-ending economic expansion.

However, an alternative solution that does not require endless growth is to simply ensure that all people, employed or not, have enough money to survive with dignity. This simple idea is known as universal basic income (UBI). UBI can be designed in many forms, but the basic premise is to guarantee an unconditional income that elevates recipients out of poverty. UBI programs exist in multiple places today including Alaska, Namibia, Iran, India, and several US states and cities. In contrast to fears that UBI programs will stifle motivation and innovation, they have been found to not only effectively reduce poverty and child malnourishment but also stimulate local economies, increase earned incomes (net of UBI), and reduce crime [73]. Indeed, UBI may *increase* innovation by allowing both the freedom and the funding to experiment with local open-source cooperatives and by democratizing entrepreneurial opportunity [73].

A universal basic income could help alleviate several core market characteristics and facilitate a functional circular economy. Most importantly, it would allow for the acceleration of automation and mechanization without collapsing the system, solving the zero-sum game between technological development and human employment. Thus, UBI can enable higher levels of technical efficiency necessary for a sustainable and abundant circular economy. Additionally, UBI can free people to perform tasks that machines cannot or should not do, thereby valuing labor more appropriately. By removing survival from decision-making in the labor market, workers would have more bargaining power to pursue meaningful and fulfilling roles in society. Ultimately, by removing the boot from people’s necks, UBI would help produce a vibrant and diverse society of producers rather than impoverished consumers.

The concept of a basic income can be extended to organizations that fulfill a vital ecosystem role (such as organic farms, energy grid operators, or medical production). In this way, organizations can start to collaborate to produce abundance. Normally, this would eliminate their margins, rendering them either redundant or insolvent. However,

an organization-level UBI could ensure the stability of the vital ecosystem service these organizations provide. Importantly, this would allow organizations to cooperate in a context in which bankruptcy and the ability to pay wages are not at risk, fostering a “friendly match” environment that encourages innovation. This form of UBI would allow organizations to consider technical efficiency above cost efficiency, opening possibilities on the right side of Fig. 2.

UBI is only part of a potential menu of solutions for a future-proof labor market. Other elements include targeted taxes that lower the price of labor compared to resources [110, 111]. Encouraging labor inputs also has double-dividend benefits, as labor is essentially environmental impact-free [112]. Furthermore, forms of complementary currencies as described in the section on monetary systems could provide useful support to strengthen the resilience of the labor market and might even play a role in the realization of a UBI [77]. Overall, uncoupling labor from survival creates opportunities to rethink how and why we work and how we incentivize people to invent, create, and collaborate.

## Rethinking Value

Markets equate value with price, which means that only certain types of things are valued and incentivized; other things that might be more truly valuable for a sustainable future are ignored. At a minimum, the circular economy could be improved by simply correcting the market failure of externalities. If the full cost of products (including environmental degradation and social welfare damages) were captured in their price, people would make different consumptive choices and circular technologies would be more competitive with linear alternatives. However, as we argued when we introduced the four key characteristics of market systems, merely correcting this market failure will not sufficiently change the systemic incentives of a market system.

Instead, rethinking the core market characteristic of price and value challenges us to reevaluate our priorities and realign our economic system to incentivize things we *actually* value (i.e., things that meaningfully contribute to human well-being and flourishing) rather than artificially scarce things the market has trained us to value (e.g., status and material “wealth”). Changing system incentives to favor functional circularity means moving from a system where people’s preferences *alone* determine value, to valuing things that can meet some need or solve some problem—in other words, no longer constraining “value” to just the market-efficiency side of Fig. 2.

For example, consider the US Apollo program. The market did not ask to put a human on the surface of the moon; there was no supply or demand curve for this project. Much like environmental problems facing us today, there was a clear objective but no profit motive. Consequently, the project did not need to conform to market logic and NASA was free to design the mission according to principles of technical efficiency.<sup>8</sup> It

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<sup>8</sup> Critics, such as Apollo astronaut Harrison Schmitt, have claimed that governments are too inefficient for a return to the moon [113]. However, his comments reveal that he is referring to *market* inefficiency. By contrast, judged by technical efficiency, one cannot help but notice that NASA succeeded in landing humans on the moon in less than 11 years following President John F. Kennedy’s Congressional address in 1961. Meanwhile, the commercial enterprise SpaceX has existed for over 20 years and has yet to make extra-terrestrial landfall. Why? Certainly not because SpaceX engineers are inadequate. Rather, because market efficiency rewards things like Internet satellites, but not moon landings. Lastly, note that even though the space race was between two competing economic worldviews, it required the market-based team (the USA) to engage in fundamentally *non-market* means to win.

was the freedom to *ignore* market efficiency that allowed NASA to succeed. The lesson here is what we introduced in the distinction between market efficiency and technical efficiency: Some things are simply not achievable through market structures alone. A functional circular economy—and the complex technical and scientific efforts necessary to achieve it—is one of them. Instead of requiring it to conform to market logic, we should think of a functional circular economy as a “moon shot” achievable only through non-market, socially planned, collectivist, and democratic means.

The success of the circular economy relies on moving away from a market-based value system. Even though, we generally accept platitudes like “money can’t buy happiness,” we still effectively subscribe to a system that *only* values things that money *can* buy, and we are thus duped into pursuing Smith’s “trinkets and baubles.” In fact, we know a great deal about what makes human beings truly happy, fulfilled, and satisfied over the course of a life. The fields of positive psychology and Indigenous anthropology contain a library of research showing that, beyond subsistence levels, money and material consumption contribute almost nothing to happiness or well-being—what matters for a life well-lived are genuine human connections, meaningful work matched with one’s abilities and interests, and a contribution to something larger than oneself [20, 114–121]. We must not pretend that endless consumption and wealth competition are *valuable*. We must be willing to say—and, critically, create systems that recognize—that some things are *worth* more than others to the preservation of a sustainable future.

## Indigenous Knowledges for the Circular Economy

Circular economy scholars and practitioners should recognize that Indigenous communities have practiced functional circularity for millennia. Recently (finally), both the academy and global organizations such as the UN Development Programme have started to look to Indigenous Knowledges for wisdom on issues like climate change and resource management [122–124]. In 2020, the journal *Current Opinion in Environmental Sustainability* devoted a special issue to Indigenous conceptualizations of “sustainability” [125]. One early outcome of this emerging scholarship is the plurality of perspectives, approaches, and experiences of Indigenous communities with respect to sustainability issues [126, 127]. However, perhaps a more striking finding is how similar Indigenous approaches are in their fundamental opposition to market systems. As Nishnaabeg scholar Leanne Betasamosake Simpson writes:

My Ancestors didn’t accumulate capital, they accumulated networks of meaningful, deep, fluid, intimate collective and individual relationships of trust.... When Nishnaabeg are historicized by settler colonial thought as “less technologically developed,” there is an assumption that we weren’t capitalists because we couldn’t be .... This is incorrect. We certainly had the technology and the wisdom to develop this kind of economy, or rather we had the ethics and knowledge within grounded normativity to not develop this system, because to do so would have violated our fundamental values and ethics regarding how we relate to each other and the natural world.... Our knowledge system, the education system, the economic system, and the political system of the Michi Saagiig Nishinaabeg were designed ... to generate life—not just human life but the life of all living things[99].

The breadth of potential lessons from Indigenous knowledge spans all of the preceding subtopics in this section. Indigenous cultures can teach us about effective economic systems; about what different conceptions of property, the “commons,” effective sharing, and personal sovereignty can look like; about systems of limited competition and shared prosperity; about caring for and valuing each member of a community rather than forcing everyone to conform to the same version of “work” and “worth”; and about consumptive restraint, frugality, self-sufficiency, and abundance [100, 128–132]. We suggest the interested reader begin with Simpson’s *As We Have Always Done*, Coulthard’s *Red Skin, White Masks*, and Whyte’s *Indigenous Climate Change Studies* [99, 123, 133]. Our point here is that Indigenous communities have been living for millennia in ways that are regenerative, nurturing, circular, and deeply satisfying to human beings—and these ways of living bear no resemblance to modern market economies. Despite the clear difference in scale and complexity of the global society, there is much we might learn from Indigenous communities, particularly on alternative economic principles that may facilitate an effective circular economy [25].<sup>9</sup>

## Conclusion

The circular economy offers an alternative to our linear economy that can provide much-needed solutions to our impending environmental crises. However, it currently stands at a crossroads between a functional circular economy that creates true systemic change and a dysfunctional one that reinforces current structures and fails to realize its environmental potential. In contrast to previous critiques, this paper argued that the shortcomings of the circular economy are symptoms of it being forced to conform to the constraints of a market economy. We identified four core characteristics of market economies, revealed their resulting structures and incentives, and diagnosed their problematic outcomes for the circular economy as it is practiced today.

We found that private ownership, competition, labor market conditions, and valuation based on price often lead to structural incentives for “linear,” segmented, growth-driven choices. Thus, the only way for the circular economy to create meaningful systemic change is to actively address and transform these core market elements. Magdoff and Foster argued that our struggle for an ecological and democratic economy must begin “by opposing the logic of capital” [10]. We echo this to assert that the struggle for a functional circular economy must begin by opposing the logic of markets.

At the heart of market logic is an assumption of scarcity, which produces a system based on market efficiency. However, assumed scarcity turns out to be both artificial and unnecessarily limiting. Instead, embracing the possibility of sustainable abundance allows for a fundamentally different set of outcomes based on technical efficiency.

This new perspective suggests alternatives to the core market characteristics, such as complementary currencies, new property models, a form of basic income, innovative collaborative structures, and a more grounded conceptualization of value. Overall, our argument seeks to show the interrelations of the market characteristics and their problematic

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<sup>9</sup> Though, we must be vigilant to not perpetuate colonial exploitation and extractivism in this process. Just because Indigenous Knowledges may be helpful, we must not assume that Indigenous communities are willing to share them. For an introduction to careful, respectful ways of engaging with Indigenous Knowledges, see Hardison, and Smith & Sharp [100, 121].

outcomes for the circular economy and suggests solutions by differentiating between the fundamental organizing principles of market vs. technical efficiency.

There may still be a limited place for markets. Markets are effective in providing for individual preferences, enabling creative expression, inspiring innovation, and building networks. It is not necessarily market relations per se, but certain characteristics of these relations that create incentives that are incompatible with environmental protection and human flourishing. The challenge is to preserve the desirable attributes of economic interaction while centering the organizing principle of technical efficiency that will enable a functional circular economy. Thus, we would encourage the introduction of sustainable abundance and post-scarcity economics into circular economy discourse.

If—and only if—the circular economy is free to exist within a paradigm of sustainable abundance rather than market, scarcity can travel down the path of meaningful system change after all.

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## Declarations

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