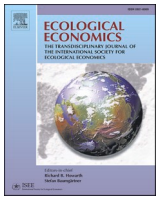
Ecological Economics 224 (2024) 108293

Contents lists available at ScienceDirect

Ecological Economics

journal homepage: www.elsevier.com/locate/ecolecon



# Turning less into more: Measuring real GDP growth in the green transition

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ARTICLE INFO

*Keywords:*
Green transition
Sustainability
Degrowth
Social constructivism
GDP
Consumer price index

ABSTRACT

Proponents of degrowth query the compatibility of ecological sustainability with economic growth and a capitalist system predicated on the ongoing expansion of economic output. This article deploys insights from constructivist political economy and recent literature on the politics of technocratic expertise to build upon and challenge this analysis. Using UK national accounting practices as a case study, it explores how current approaches to GDP measurement both facilitate and obstruct the treatment of reduced material throughput as increased economic output, of "less" as "more". Rather than advancing an alternative to GDP growth, it highlights how tensions between the pursuit of growth and the pursuit of sustainability might be reduced using conceptual resources drawn from *within* established approaches to national accounting and GDP measurement. Although far from a panacea, changes in technocratic practices of national accounting could reduce economic and political barriers to green transition policies.

## 1. Introduction

What is the relationship between economic growth and ecological sustainability? On the one hand, advocates of "green growth" emphasise the interdependence of increased economic prosperity and the achievement of climate objectives (World Bank, 2012; Brown et al., 2023). Economic growth will provide the new resources and technologies necessary for alternative sources of energy, for carbon-neutral forms of transport, for the adaptation of buildings, infrastructure, industry and agriculture to cope with changing temperatures and weather patterns. More than that, economic growth is vital to securing popular support for the net-zero agenda. Greater plenty is needed to compensate for the sacrifices that will be required and to ensure that social justice is not the first victim of the green transition.

On the other hand, proponents of "degrowth" (or variants such as "post-growth" and "agrowth") argue that economic growth is itself the problem. Historically, $CO_2$ emissions and natural resource consumption have been closely correlated with economic growth (Vadén et al., 2020; Hickel and Kallis, 2020). Although there is evidence of a decoupling of growth from emissions in some economically advanced countries (e.g. Stoknes and Rockström, 2018), many of these claims remain contested (e.g. Tilsted et al., 2021). Ultimately, achieving ecological sustainability while maintaining growth at a global level would require a rapid reversal of the historical relationship between economic expansion and natural resource throughput. Given the urgency of reductions in the ecological footprint of human economic activity (including, but not restricted to, the conversion of fossil fuels to greenhouse gases), and assuming the ongoing expansion of per-capita consumption in developing countries, advocates of degrowth argue that advanced economies must abandon a mode of capitalist accumulation predicated upon perpetual growth if there is to be any hope of keeping human activity within the ecological bounds of the planet as we know it (Hickel, 2022).

This paper takes the ecological case for degrowth seriously. However, it argues that degrowth is too quick to assume that growth is incompatible with (or must be deprioritised in favour of) ecological sustainability. This is not because, as some proponents of green growth would have it, present growth models can be made green (for example, through rapid innovation). As degrowth scholars point out, many mainstream accounts of green growth assume a heroic level of technological progress within a vanishingly small window of time (Hickel, 2022). Rather, it is because economic growth is a contingent social construction that is subject to constant revision and redefinition, albeit in subtle and often under-appreciated ways. Although the climate crisis is a quintessentially material phenomenon, the way in which it interacts with the economy is socially constructed as well as materially determined. Drawing on social constructivist literature (e.g. Fischer, 2000; Best, 2018, 2020, 2022; Clift, 2018, 2023; Widmaier, 2004, 2016), this article argues that ecologically-inspired growth pessimism overlooks the possibility of a technocratic reimagining of growth. In short, degrowth tends to *essentialise* growth, or at the very least capitalist growth. One recent volume on degrowth asserts that "economic growth is a highly ambivalent and elusive concept", but "its semantic core is *statistically*

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https://doi.org/10.1016/j.ecolecon.2024.108293
Received 8 January 2024; Received in revised form 13 May 2024; Accepted 21 June 2024
Available online 26 June 2024

*fixed*" (Schmelzer et al., 2022: 43; emphasis added). Another prominent advocate of degrowth writes.

> "GDP is not an *arbitrary* metric of economic performance. It's not as though it's some kind of mistake - an accounting error that just needs to be corrected. It was devised specifically in order to measure the welfare of capitalism. It externalises social and ecological costs because capitalism externalises social and ecological costs."
>
> (Hickel, 2022: 204; emphasis in original)

This paper contends that the tendency to neglect the socially-constructed nature of GDP in the degrowth literature leads scholars to downplay how the conceptual framework of capitalist accumulation might be adapted to treat the phasing-out of ecologically unsustainable forms of production and consumption as growth - and how this conceptual change might in turn advance the degrowth agenda. This argument builds on recent work by Semieniuk (2024) highlighting how estimates of the absolute and relative decoupling of GDP growth from resource throughput are conditioned by different methodologies for calculating GDP. Whereas Semieniuk is concerned primarily with how GDP construction affects the decoupling debate, the present article instead explores how GDP might be constructed to render reduced throughput of tangible resources compatible with ongoing GDP growth. It highlights ideational possibilities, immanent to the technocratic domain of national accounting, that might be enlisted in the transition to a less resource-intensive form of growth.

For the avoidance of doubt, this is not about measuring something *other than* economic output, such as wellbeing, happiness or genuine progress (Kubiszewski et al., 2013). Rather, it is about *how* we measure economic output. The problem with alternatives to GDP (as many ecological economists rightly acknowledge) is that our current capitalist economic system is predicated on the pursuit of economic growth. Were organisations, households or governments to prioritise an alternative, the result would likely be a financial crisis as asset valuations crashed, coupled with a recession, lower profits, lower wages and a fiscal crisis of the state, undermining the political legitimacy of the green transition. Nevertheless, accounts that emphasise the centrality of growth to the economic, fiscal and political life of modern states overlook that our main measure of growth, GDP, is itself a contingent and somewhat malleable social construction. At the very least, this means that GDP is underspecified in degrowth accounts: proponents of degrowth must explain which *version* of GDP growth is essential to the political economy of modern capitalism. Alternatively, multiple versions of GDP growth might be compatible with the political economy of modern capitalism: in which case, some of these versions may be more favourable to the green transition than others.

The focus of this paper is on the measurement of real household consumption, using technocratic practices in the UK to illustrate how subtly different national accounting approaches could allow degrowth to register as pro-growth. Unlike some alternatives to GDP proposed in the ecological economics literature, this construct is not intended as a normative standard (progress towards GDP growth thus configured would not necessarily be ecologically beneficial). Its value lies instead in allowing certain public policies and structural economic changes that *could* reduce material throughput to occur without necessarily reducing growth as measured by GDP, potentially limiting some of the destabilising and delegitimising consequences of deprioritising growth in favour of sustainability.

It might be objected that this is a mere accounting trick or rebranding exercise, and that capitalism is configured around the reality rather than the idea of growth. But the core social constructivist insight is that there is no "reality of growth" independent of accompanying conceptions of growth, and these conceptions have material consequences for states, markets and political legitimacy (Abdelal et al., 2010). This is not to say that ideas take precedence over material realities: rather, they are inseparable from those realities. In the case of GDP growth, our economic metrics are doubly socially constructed. Firstly, a social *valuation* process translates disparate outputs (tonnes of wheat or pig iron produced; kWh of energy generated; number of hip replacements performed) into a single metric (usually nominal currency). Secondly, a technocratic *measurement* process compiles and weights this data, including adjustments for changes in price levels to ensure that GDP measurement tracks changes in output rather than the effects of inflation. Without both of these steps, there is no such thing as "real GDP".

The next section of the paper unpacks the case for degrowth. Section 3 shows how this policy agenda might be reconciled to rising GDP. Using the measurement of household consumption and consumer price inflation in the UK as a case study, it illustrates how different conceptual decisions and distinctions render reductions in the material footprint of capitalist society compatible with ongoing GDP growth. Importantly, these decisions are consistent with prevailing technocratic standards, and to some degree are already visible in or immanent to existing technocratic practices. Section 4 explores the wider ramifications of such technical changes for the political economy of the green transition, including implications for fiscal policy, private finance and popular consent. To be sure, making shifts towards sustainability compatible with GDP growth is not the same as making capitalism ecologically sustainable: it does not address issues such as the political power of incumbent industries with an interest in preserving the status quo, or the coordination needed to ensure that greener technologies and infrastructures benefit from the network effects, economies of scale and path dependencies that the fossil fuel economy has long enjoyed (Lockwood, 2015). Nevertheless, it might still prove a valuable step in a more sustainable direction.

## 2. The tension between growth and sustainability

At its core, the case for degrowth rests upon an assessment of (i) the planet's ecological limits, (ii) how capitalist growth has historically occurred, and (iii) the likely trajectory of capitalist growth in wealthier countries over the near future. The first of these elements - the diagnosis of ecological emergency - is not unique to the degrowth movement. Although environmental scientists might disagree about the finer details of the ecological boundaries of life on earth, there is widespread consensus that global heating, ocean acidification, deforestation and mass extinction caused by human economic activity will have (and are already having) catastrophic consequences for many of the natural processes that make the planet hospitable to around eight billion people (Rockström et al., 2009; Raworth, 2017). This perspective is shared by advocates of degrowth and green growth alike (Hickel and Hallegatte, 2022).

Nor is the second element - the historical account of how capitalist growth has coincided with more intensive energy consumption and resource extraction - particularly controversial. The well-known "hockey stick" graph of economic take-off, with exponential rises in prosperity starting with the agricultural revolution and continuing through to the present day (Bolt and Van Zanden, 2020), is mirrored in patterns of carbon emissions, energy usage and material footprint (Smil, 2016; Krausmann et al., 2018). Over the last century, economic growth has been inseparable from growing demand for (and consumption of) material resources, which is itself closely correlated with ecological damage (Steinmann et al., 2017) - unsurprising, given sourcing materials involves the conversion of land to agriculture and extraction, with knock-on implications for species extinction, intensified chemical usage and loss of carbon sinks.

What distinguishes degrowth from other approaches to the green transition is its assessment of the *trajectory* of economic growth in wealthier countries. Degrowth claims that it is unrealistic to anticipate a rapid reversal of the historical linkage between growth and ecologically unsustainable resource use within the short window of time available before human economic activity inflicts massive and irreparable ecological damage on the planet. The idea that growth can be "decoupled" from the material world gained currency in the 1990s and 2000s,

with many commentators claiming that the rise of the "knowledge economy" would de-materialise production and consumption. On this account, growth would increasingly be driven by more and better intangible products rather than physical goods and services (Quah, 1997; Leadbeater, 2000). Although there is evidence that some countries have achieved a degree of decoupling (OECD, 2017), these patterns weaken once embodied emissions and material use are factored into the equation, reflecting the ecological throughput of imports (Wiedmann et al., 2015; Tilsted et al., 2021). Moreover, degrowth scholars point out that to date much of this decoupling has been relative (each unit of GDP requires fewer resources than it did in the past) rather than absolute (overall GDP increasing while overall resource throughput reduces). Even in countries where absolute decoupling has recently occurred, it falls far short of the pace necessary to meet current climate targets (Vogel and Hickel, 2023).

Why is it proving so difficult to decouple growth from resource use? Perhaps most obviously, replacing a world of unsustainable technologies and infrastructure with sustainable alternatives is itself a highly resource-intensive undertaking. The adaptation of existing buildings, transport networks, production and waste management processes to reduce their future resource requirements will require physical resources in the short-term. Producing new electric vehicles, wind turbines, solar panels, domestic appliances and industrial machinery implies an intensification of mining and energy usage to extract and transform materials such as copper, iron, lithium, silicon and rare earth elements. Creating a green economy that is capable of sustaining current patterns of consumption risks overshooting planetary limits. Conversely, if the governments of wealthy countries were to introduce restrictions designed to rapidly bring their economies into sustainable levels of per capita resource usage - a hard cap on the throughput of material resources (thereby limiting the ecological damage associated with extraction, production and disposal/waste), progressively ratcheted down by the middle of the twenty-first century - then these restrictions would almost certainly trigger a fall in economic output (Hickel, 2022).

Critics of degrowth argue that scepticism about the compatibility of growth with sustainability underestimates the adaptability of capitalism. Would it not be possible for market forces to reallocate labour and capital from ecologically unsustainable activities (extraction, production) to more ecologically sustainable alternatives (repair, reycling)? To shift working patterns away from physical labour to intellectual labour, with workers focusing their efforts on developing new technologies, innovations, insights and creative content that need not be materially embodied? To replace consumption of physical goods and services with digital products in the metaverse?

The degrowth movement does not dispute that these developments may be desirable, merely that they are difficult if not impossible to reconcile with increases in economic output. Repair and recycling activities confront diminishing returns: adapting materials for reuse results in a reduction in quantity and quality the more times they are reconstituted, and/or an increase in the energy required for recovery (Georgescu-Roegen, 1971; Haas et al., 2015; Korhonen et al., 2018). While the promise of the knowledge economy was that an increasing proportion of the population would be engaged in "weightless" knowledge work, requiring little by way of capital bar a computer and an internet connection, in many cases this work has complemented rather than replaced physical manufacturing processes in overseas locations (Rosecrance, 1996). Knowledge-intensive R&D activity can be capital-intensive too: cutting-edge research in the life sciences and advanced manufacturing requires laboratories furnished with the latest high-tech equipment (O'Donovan, 2022). Even digital goods and services involve the consumption of a minimum amount of material: for example, energy and the electronic devices through which these products are experienced, which often contain rare minerals with a material footprint many orders of magnitude greater than their size due to resource-intensive extraction and processing. Moreover, the digital services accessed through these devices rely on an extensive physical infrastructure that consumes a vast quantity of energy (Di Salvo et al., 2017). Properly directed and/or incentivised innovation can make these goods and services more energy-efficient, but to the extent that economic growth implies the production of ever-increasing quantities of goods and services, this will counteract efficiency gains over the longer term (Freire-González, 2021). There is a limit to how materially weightless any product can be (Hickel, 2022), and thus quantitative increases in production and consumption imply more metabolic throughput, once this minimum of weightlessness has been achieved.

Underlying this pessimism around the prospects of individual sources of green growth is a deeper account of the political economy of capitalism as growth-dependent, rendering it fundamentally incompatible with a finite planet. Degrowth analyses emphasise that capitalism requires growth in order to secure political legitimacy. Where the economy is growing (and the benefits of growth are reasonably widely distributed), a broad range of citizens will perceive the economic and political status quo to be in their longer-term interests (Schmelzer et al., 2022).[1] Were growth to slow down or stop, this would remove a major bulwark against calls for redistributive policies that run contrary to the logic of a capitalist economy. Consequently, capitalism cannot help but pursue growth. If growth cannot help but exceed planetary boundaries, it follows that human society faces a choice between capitalism and ecological survivability.

To summarise, then, the degrowth argument is that economic growth cannot be conducted on an ecologically sustainable footing, that capitalism requires economic growth, and therefore that ecological sustainability requires an economic system other than capitalism. The next section tackles the major premise of this argument: the supposed incompatibility of economic growth with ecological sustainability. Taking the computation of household consumption for GDP purposes in the UK as an illustrative example, it shows how economic growth is socially constructed through technocratic decisions. Different decisions at both national and international levels could thus render a degrowth policy of progressively ratcheting down per-capita resource consumption in more affluent countries compatible with an expanding level of output.

## 3. Reconstructing GDP

At first glance, GDP appears to be an inescapably material phenomenon. The goods and services produced in a given geographical territory over a particular period of time seem to be a matter of fact and record, rather than opinion and interpretation. Yet, as many commentators have pointed out (e.g. Abdelal et al., 2010; Coyle, 2014), it is also a highly contingent *social* phenomenon, with evolving procedural rules around what to count (and what to exclude) as output, and how to count output. Contrary to some degrowth perspectives, these rules are not statistically "fixed" but rather fluid. Since measures of national economic output first began to take shape over the 1930s and 1940s (Tooze, 2001; Coyle, 2014) there have been multiple changes in national accounting conventions, both within individual countries and internationally (Semieniuk, 2024). For example, there is ongoing debate around if and how to incorporate non-market products (such as public services, unpaid domestic labour or owner-occupied housing) into overall measures of output, as well as how GDP should account for rapidly changing technologies (Van Ark, 2002; Brynjolfsson and Oh, 2012; Watanabe et al., 2018).

Particularly important for our purposes is the question of how to measure changes in the level of economic output over time when

[1] This perspective is one shared by much of the political science literature (see e.g. Iversen and Soskice, 2019). The major difference between the perspectives is that political scientists have tended not to present growth (and thus legitimation) as occurring within rapidly narrowing ecological boundaries. For critiques of this lacuna in the political economy literature, see Paterson, 2021, and Green, 2023.

patterns of production and consumption are also in flux. In this section, we focus on a single empirical case (national accounting for household consumption in the UK), showing how current statistical practices both facilitate and obstruct treating the transition to a sustainable economy as "growth", and how they might be reformed in order to transform degrowth policies into a pro-growth agenda. For reasons of space, this analysis is intended to be illustrative rather than comprehensive, a proof of concept rather than a systematic exposition. The same principles could however be applied to other areas of GDP calculation and to international GDP comparisons, all of which employ similar indexation techniques.

As not all readers may be familiar with national accounting conventions, it is helpful to recap how GDP figures are produced. GDP can be calculated in one of three ways. The output approach (also known as the production or value-add approach) measures the value of all goods and services produced in a given jurisdiction over a set period, less the costs of intermediate goods and services consumed in the course of those production activities. The income approach measures the total corporate and individual income generated by economic activity, equating to the sum of all corporate profits, employee salaries and self-employed income. The expenditure approach measures final consumption and capital formation (the production of assets that are not immediately consumed) by businesses, households and governments, plus net exports (the value of any exports less the value of any imports). All of these approaches should lead to the same total, as the amounts in question are accounting identities. The margin generated by businesses on their sales (output approach) ends up either as profit for firms or income for their employees (income approach). All final goods and services produced (i.e. those that do not constitute intermediate consumption in the production of something else) are ultimately paid for by households, businesses or government, or else are exported overseas (expenditure approach).

Irrespective of the approach used, measurements of GDP (and its various components) are generally made using market prices in the first instance. This is because administrative data generally does not document the flow of goods through the economy, but rather the flow of money, gathered from surveys about spending patterns as well as administrative data such as tax returns and statutory corporate filings. What is measured is therefore not the full range of goods and services produced, but rather the *value* of the full range of goods and services produced - what people are willing to pay for those goods and services (in the case of goods and services that are sold on the market), or an imputed value for non-market goods and services. In the case of public services, for example, this is usually the cost of delivering the service to the general public: the sum of all salaries and expenses incurred by the public service provider over a given period.

These measurement techniques are clearly problematic when it comes to assessing economic growth over time, as they will reflect changes in price levels as well as output levels. To deal with this problem, the various components of nominal GDP are adjusted by price indices that reflect changes in nominal prices over time, so that increases in the adjusted (real) GDP figure reflect actual increases in output.

The UK's Office for National Statistics (ONS) uses all three approaches to computing GDP (output, income and expenditure), before attempting to reconcile any discrepancies. However, for the purposes of this analysis, we will focus on one particular component of the expenditure approach (household consumption) and its deflator (the Consumer Prices Index or CPI) to demonstrate how technocratic choices concerning the measurement of GDP can both facilitate and obstruct the recognition of growth under degrowth policy settings.

In the UK, CPI is used to transform the household consumption component of GDP from a nominal cash figure to a real level of output (ONS, 2023). CPI is calculated based on a 'fixed basket' approach, meaning that changes in overall price levels are assessed by reference to a selection of goods and services representative of household consumption spending more broadly, with items weighted according to their relative significance in aggregate consumer spending (as established by surveys, market research and administrative data, among other sources). Where CPI is rising rapidly, a given level of nominal growth in household expenditure translates to less real GDP than where CPI is stable or falling.

Price indices such as CPI are thus vital to the construction of economic growth. Yet in practice, the way in which these indices are compiled involves a large number of judgemental decisions: not just about what to include, but also about *how* to include it. These decisions are not arbitrary - they are debated by official custodians of national statistics and by external specialists using various forms of evidence and reason-giving processes. But they are judgemental in the sense that they cannot be reduced to a commonly-agreed procedure for achieving a definitive 'right' decision (or meta-procedures for determining procedural choice). These decisions can have profound ecological implications. The remainder of this section explores how judgements made by the UK's Office for National Statistics to date both obstruct and facilitate the recognition of reduced material throughput as growth, and how different judgements could address several of the reasons degrowth advocates are sceptical that economic growth can be reconciled with ecological sustainability.

### 3.1. Less or better? Electric cars and green energy

On the degrowth account, ecological sustainability requires a reduction in material throughput in already-affluent countries: consumers will ultimately need to make do with less. This may mean the outright prohibition of some kinds of ecologically unsustainable consumption (e.g. energy from gas-fired power plants). More ecologically sustainable alternatives (e.g. energy from wind farms) are often more expensive, at least initially, and may be produced/consumed in smaller volumes than the products that they replace. A reduction in material throughput thus implies a reduction in economic output.

This growth-pessimism is predicated upon GDP measurement treating these new technologies as more expensive versions of existing product categories. Consider the example of electric cars, which tend to cost more than their petrol-fueled equivalents. The lifecycle resource footprint of electric cars renders them far from ecologically neutral, though the present analysis requires only that they are less damaging *and* more expensive than petrol-based equivalents, such that shifting spending from petrol to electric vehicles would imply fewer, less ecologically harmful vehicles on the road. If prices for both types of car are aggregated into a single price level for "cars", then an increase in the share of electric vehicles sold (whether prompted by consumer preferences or government regulation) would result in a faster increase in average prices, meaning a fixed level of aggregate spending on cars would represent a lower volume of real economic output: in other words, an economic contraction.

However, compilers of national statistics have two alternative options for dealing with new technologies such as electric vehicles. Firstly, they can attempt to adjust price levels to reflect improvements in quality arising from innovation. This might involve convening expert panels or deploying quantitative hedonic regression techniques to determine how variables such as fuel efficiency, acceleration, sunroofs and touchscreen dashboards affect the baseline value of different makes and model of car (Groshen et al., 2017; Crawford and Neary, 2023; ONS, 2023). Depending on the formula used, a shift towards electric cars would not necessarily appear as a reduction in real GDP for the same level of nominal spending, and could even register as faster growth despite a lower number of vehicles being sold in total.

The second alternative available to statistical authorities is to treat electric cars as an entirely new category of spending. Statistical authorities regularly update their lists of representative goods and services to reflect changes in consumer spending habits, including growing markets for innovative new products. EU regulations require that any item that accounts for more than 0.1% of overall consumer spending be

included in the sample of representative items. Although post-Brexit the UK's ONS is no longer bound by this requirement, it has typically introduced items to the basket of goods and services well in advance of this threshold (O'Neill et al., 2017: 167). Price indices are chain-linked to ensure both that the introduction of new items has no impact on inflation measures at the moment they are introduced (e.g. by imputing historical prices for the new item at average index rates for whatever larger category of spending it replaces or augments - see ONS, 2023), and to ensure continuity in index measurements over time. Where electric cars are treated as a distinctive product category, a shift in household expenditure from petrol to electric would therefore *not* register as a reduced level of real consumption for a given level of nominal outlay, despite a lower number of vehicles (petrol-fueled and electric) being sold in total.

The same methodological choices arise with many new products and technologies. Importantly, there is no unambiguous "technically correct" way for statistical authorities to make these choices: an element of judgement is inescapable. On the face of it, the fact that people are willing to pay a premium for a new technology indicates that people view this innovation as valuable, and thus that this premium should not be accounted for as price inflation (a more expensive version of an equivalent product). By extension, assuming some people would pay an even larger premium for an electric car made entirely from recycled rather than newly extracted materials, then this genuinely sustainable model would also represent valuable technological progress to said consumers, relative to an electric vehicle with identical specifications but inferior ecological credentials. Even if material degradation means that recycling becomes more costly with each iteration, and thus a genuinely sustainable electric car made with third-generation recycled materials is necessarily more scarce and expensive than a second-generation model, each generation could be coded as a new product category, thereby preserving the possibility of economic growth despite declining unit volumes. This dynamic would preserve quantitative increases in economic growth via qualitative improvements even though a decreasing quantity of goods might be produced and consumed. (It also highlights how changes in GDP measurement might work in tandem with broader regulatory changes: just as the prospect of phased bans and/or higher taxes on petrol-fuelled vehicles have helped to create demand for electric cars, so the shift to subsequent generations of electric vehicle that are more reliant on recycled materials may require regulations to phase out or increase the costs of current-generation electric vehicles.)

In the case of electric vehicles, the UK Consumer Prices Index has moved some way towards recognising greener products as qualitatively different. Prior to 2021, the ONS collected price data for "new cars" from the websites of car dealers (inclusive of discounts) for a sample of circa 35 cars, selected from a range of manufacturers. In 2021, however, it introduced "new electric/hybrid cars" as a novel category within the CPI basket and relabelled the previous category as "new petrol/diesel cars", observing that "hybrid and electric cars have been added reflecting increased purchases of this type of vehicle and anticipating the longer-term phasing out of petrol and diesel cars" (ONS, 2021). This distinction enables a shift in consumption habits towards fewer, more expensive electric/hybrid vehicles to take place *without* registering as a decline in overall output.

By contrast, current ONS methodology treats household energy supplies as homogeneous, irrespective of whether the energy in question is derived from sustainable sources or fossil fuels. Electricity and gas tariffs are indexed using a sample of the most popular tariff bands offered by each of the UK's major domestic energy suppliers (ONS, 2023). Although price differences between tariffs and suppliers have reduced as a result of the capping of UK domestic energy charges from 2018 onwards, a small number of renewable energy suppliers are permitted to charge more than the capped rates due to the elevated levels of support they provide to renewable energy generation and investment. Even though the customers of these companies evidently perceive a qualitative difference in their energy supply arising from this additional charge (hence their willingness to pay extra), an increase in these suppliers' share of the domestic UK energy market would be inflationary according to current ONS methodology: a fixed level of consumer spending with these suppliers would register not as "better" but rather as "less". This position could however shift, were the ONS to differentiate between domestic energy supplies as it does between cars.

These two examples highlight how the technocratic distinction (or failure to distinguish) between relatively green products and their less sustainable counterparts can have a decisive impact on whether reductions in material throughput are compatible with growth. This in turn dictates whether policies that incentivise (or force) households to abandon ecologically unsustainable products in favour of (a smaller quantity of) more sustainable goods and services will necessarily harm growth. The same logic applied here in the case of electric vehicles and domestic energy supplies could be extended to any other significant component of household expenditure where more sustainable (but potentially more expensive/scarce) alternatives are conceivable: sustainably-farmed foodstuffs, intercity rail services operated using only renewable energy, and so forth. The willingness of some consumers to buy a more expensive, more sustainable alternative opens up the possibility of technocrats treating the sustainable alternative as a distinctive category, which in turn enables governments to force a subsequent shift in consumption towards the more sustainable alternative through regulation without necessarily compromising growth in real output. It is thus possible to imagine a set of technocratic judgements that would permit a government-regulated reduction of material throughput to register as economic growth, consistent with technocratic norms, provided at least some consumers are willing to express their belief that "green is good" through their revealed spending preferences when both options are available.

### 3.2. *Priceless growth: Durability and energy-efficiency*

The technocratic possibilities described in the previous section only apply to situations where there is a marketable product that replaces ecologically unsustainable alternatives. What about cases where new technologies and consumption patterns remove certain forms of activity from the market altogether? Some ecologically-sound household spending (such as improving home insulation, installing solar panels, or buying longer-lasting and more easily repairable electronic devices) has the potential to reduce the need for future spending (on energy and/or replacement goods). Some elements of the green transition may entail a shift away from private consumption towards goods that are publicly or socially provided (exercising in a park as opposed to a private gym; consumption of media content made by one's peers as opposed to by an entertainment conglomerate). Proponents of degrowth point out that all these developments imply a reduction in market transactions, and thus lower levels of output (see e.g. Hickel, 2022: 162–164).

Some of these problems could be addressed by incorporating further quality adjustments into price measurements. For example, in the UK, spending on clothes is not presently adjusted for the relative durability of garments, and thus a shift in spending towards garments that cost twice as much but last four times as long would be inflationary in the short-term (equivalent items are being bought at higher prices) and detrimental to growth in the longer term (assuming fewer garments are purchased, the contribution of consumer spending on clothes to GDP will fall). By contrast, adjusting CPI for product quality would register the less-expensive-per-wear product as a *fall* in prices (as it costs less per use than the item it replaces), and thus treat a shift in consumer spending towards these products as an *increase* in real GDP. Increases in durability are effectively an inverse form of "shrinkflation", the process whereby manufacturers disguise price increases by reducing the size of their products. The ONS deals with shrinkflation through a routine "quantity adjustment", altering "the base price pro rata for the change in weight" – so a chocolate bar that has reduced in size from 50 g to 45 g over a given

period would have changes in its price level assessed relative to 90% of the price of the 50 g original (ONS, 2023). In the case of the aforementioned item of clothing, a pro rata approach would mean that every purchase would contribute twice as much to real GDP as the half-price but quarter-durability product it replaced.

Statistical authorities might object that it is difficult to differentiate between genuine improvements in durability as opposed to changing cultural norms (a willingness to wear older clothes for longer, for example). Yet, it is impossible for statistical authorities to *avoid* taking a position on this question, one way or the other: a common feature of domains in which technocratic expertise is exercised (see e.g. Clift, 2023). At present, CPI embodies the judgement that less frequent turnover in one's wardrobe would be a matter of cultural-economic trends among purchasers rather than qualitative improvements in what is purchased, but the opposite judgement could be made instead. Similar logic could be extended to other products, as consumption shifts towards longer-lasting alternatives (which may be more durable in the first instance, or easier to repair/upgrade). This would involve a substantial increase in the work associated with price index compilation, requiring national statistical authorities to collect data on average durability for a wide range of products – although the rationale for doing so remains immanent to current practices, as it is analogous to price collectors noting fluctuations in product size (ONS, 2023).

Quality-adjustment is not the only option available to statistical authorities that could help to treat ecologically-beneficial shifts in household consumption as economic growth. Where spending creates an asset that delivers long-term returns (energy generated by a rooftop solar panel; energy saved by domestic insulation upgrades), GDP calculations could conceivably impute a value for the service received from that asset annually. Such imputations already occur with regard to owner-occupied housing. The UK (in common with other jurisdictions) considers owner-occupied housing to provide "a flow of services" that are "assumed equal to the rent that the dwelling might attract in the rental market" (ONS, 2023). Otherwise, a shift in ownership of the housing stock from landlords to owner-occupiers would equate to a fall in output, as money spent on rent contributes towards the household expenditure component of GDP (or towards landlord's profits, on the income approach). Energy generating or energy saving upgrades to the housing stock could be treated similarly - either benchmarked at the price of the energy they generate/save in a given period, or at the premium that such features would command on equivalent rental properties.[2]

In summary, options exist for GDP growth to continue despite degrowth restrictions on certain kinds of consumption, and despite a transition to the consumption of fewer but more sustainable alternatives. These options do not require a radical rupture from existing technocratic practices surrounding the measurement of growth: they are already immanent to existing practices for calculating real GDP. While we are some distance from seeing a comprehensive statistical framework capable of recognising substantially reduced material throughput as increased economic output, it is not inconceivable that measures of GDP growth may move in this direction over the near future. The judgements outlined above could be extended to other deflators, such as indices of producer prices used to assess real changes in capital investment. If final consumers increasingly value products made using sustainable materials and processes, then sustainably-produced production inputs may need to be recognised as distinctive categories for indexation purposes too. While the challenges involved are formidable, supply-chain management systems are becoming increasingly sophisticated, providing information that might offer both firms and governments greater insight into the provenance of particular inputs. These techniques are a presupposition of new policy initiatives designed to reduce ecological harm, such as the EU's Carbon Border Adjustment Mechanism. New approaches to GDP measurement could also be employed in calculations of purchasing power parities between countries as well, which similarly rely upon representative baskets of goods and services for comparing price levels internationally (O'Neill et al., 2017).

## 4. Benefits and limitations of pro-growth degrowth

Why would such a technical fix be desirable? Changing statistical definitions of growth such that degrowth can count as pro-growth might appear to be little more than an accounting trick: altering the social construction of economic output without affecting its material underpinnings. Yet the fact that GDP is a social construction does not prevent it from exerting a very real influence on what gets produced and consumed, where, by whom, and under what conditions (Abdelal et al., 2010).

Perhaps the most obvious benefit of this technical fix is temporal: it makes progress towards a sustainable economy easier here-and-now, without first creating entirely new arrangements for economic governance. Degrowth scholarship offers a wide-ranging critique of how existing institutions such as the capitalist state, the profit-seeking firm and international financial markets are all calibrated to advance growth. Abandoning growth means evolving alternative institutions and processes capable of effectively allocating resources and coordinating production at scale, at a historical moment when an unprecedented global economic realignment is required with near-immediate effect. As the political scientist Matthew Paterson observes, "capitalism took something in the region of 500 years to become globally dominant, so how would transcending it occur so much more quickly?" (2021: 401). Given the urgency of the ecological emergency, facilitating progress towards sustainability within the prevailing economic system is valuable, irrespective of whether or not the endpoint of the green transition might be some form of post-capitalist system of economic governance (Mason, 2015; Hickel, 2022). If economic growth can be rendered compatible with a reduced level of material throughput, then existing institutions can be adapted to govern the early stages of the green transition at least, and the green transition need not necessarily throw these institutions into a disruptive and potentially counterproductive crisis.

Consider, by contrast, a scenario where governments introduce regulations that incrementally reduce material throughput in ways that register as reduced output. Although individual investments may still return a profit, at the aggregate level fewer investments will pay off. The aggregate level of investment will fall, and existing investments incur heavy losses. In a financialised economy, where crises in particular industries and asset classes can have far-reaching systemic effects, the result is likely to be a disorderly series of debt defaults and bankruptcies. Rational individuals operating in a context where money's ability to act as a store of value is called into question may be reluctant to invest, and may prefer to consume more today rather than better in the future (potentially also stockpiling goods, not cash, for future consumption): a dynamic that has the potential to accelerate resource throughput and/or push up the price of essentials for less affluent households. By contrast, registering degrowth interventions as pro-growth allows financial markets to continue their coordinating function, reducing uncertainty that might encourage consumers to accelerate consumption and/or hoard goods.[3]

The state exemplifies both the risks of upending existing institutions

[2] The ONS does not currently recognise energy efficiency as one of the dimensions along which properties are comparable for indexation purposes (ONS, 2016).

[3] Some hoarding incentives will persist, though even consumers who do not consider ecological sustainability a desirable (or affordable) feature will need to consider the implicit flexibility of saving now to purchase fewer products in the future (that are by definition better suited to their future needs), as against spending now to hoard a larger quantity of specific products (that may not satisfy those future needs as well).

and the potential benefits of coopting them. To date, the state has played an ambivalent role in degrowth thinking (D'Alisa and Kallis, 2020). On the one hand, degrowth scholars are often suspicious of the state, recognising the myriad ways in which the state supports the kind of ecologically damaging growth on which its own legitimacy appears to depend. Many prefer "interstitial" strategies, whereby communal self-organisation along degrowth lines incrementally crowds out the nation state and the existing capitalist economy (Trainer, 2012; Schmelzer et al., 2022). On the other hand, degrowth requires regulation of consumption, management of collective resources and coordination of production. Although these are all possible at a local/communal level (Ostrom, 1990), on a larger scale these functions are often performed by state actors, and thus the state would seem to be an essential accomplice in any green transition (Duit et al., 2016; Koch, 2020).

Unfortunately, much as degrowth policies risk triggering a crisis in financial markets, they also risk triggering a crisis in state finances. The governments of advanced capitalist democracies are in general heavily indebted, with public borrowing secured against the promise of future growth and rising tax revenues. These fiscal pressures are likely to increase as the state underwrites the growing costs of climate-related catastrophes (Hay, 2023). In this context, the cessation of growth would imply increasing taxes, decreasing spending or defaulting on debt (with implications for the state's future ability to borrow, as well as for households, firms and financial institutions that hold government bonds). As Bailey (2020) has argued, abandoning growth reduces the fiscal capacity of the state both to invest in the green transition and to mitigate socioeconomic inequalities associated with that transition. Direct monetary financing of government expenditures, as proposed by modern monetary theorists, might relax cash constraints somewhat (Bailey, 2020; Olk et al., 2023), though this will also increase inflationary pressures once underutilised productive resources have been brought into use, all the more so if ecological considerations compel governments to restrict which societal resources can be utilised.

By contrast, reconstructing GDP growth as green allows state financing (and the broader financial sector, often heavily reliant on state-created assets as collateral) to continue operating through established channels, the difference being that ownership of government bonds secures a share in future output that has been deemed qualitatively superior by some market actors because it has a diminished quantitative material footprint. Admittedly, there is a possibility that this will push international financial capital towards developing countries, if investors view the larger quantitative output of these countries as a more promising prospect than a lower volume of more sustainable output in advanced economies. However, assuming effective regulation and/or taxation of products provided cross-border (services as well as physical goods) to ensure an ecological level-playing field for producers in more affluent countries, as well as the further development of international institutions to catalyse cooperation, there should be incentives for emerging economies to adopt more stringent rules themselves over time (Hale, 2020). This highlights how shifts in national accounting practices are not sufficient in isolation: they must be accompanied by broader policy change and institution-building if they are to prove effective and durable, both at national and international levels.

The limits of a technocratic redefinition of growth are particularly clear with respect to popular legitimacy. National statistical practices that treat the purchase of a kilowatt-hour of sustainably generated electricity as equivalent to multiple kilowatt-hours of fossil-fuel generated electricity do not guarantee that the wider population will share that valuation (aside from the minority who are already willing and able to purchase greener electricity at higher prices). Yet, these statistical practices do at least emphasise that the products in question are qualitatively different to the ecologically-unsustainable alternatives they replace. Advocates of degrowth often note that a vital part of the ecological transition is a cultural shift whereby affluent groups accept "better but less" (Spangenberg, 2014). The economist Giorgos Kallis argues that, although "income and material comfort is to be reduced for many along the way… the goal is that this is not experienced as welfare loss" (Kallis, 2011). The technocratic fix to calculating growth outlined above formalises this cultural shift without enforcing it, recognising qualitatively better ecologically-compatible output as quantitatively superior in GDP terms where economic agents actors already express this value-judgement through their spending. It might also facilitate this shift: by framing what is green as growth, by reducing the risk of destabilising financial and fiscal crises that could delegitimise green transition policies in the eyes of voters, by enlisting capitalism's in-system growth imperative to impel ecologically sustainable forms of economic activity. Nevertheless, it cannot fully substitute for this shift. Ultimately, without popular support, technocratic changes of the kind outlined in this paper will always be vulnerable to political reaction (Mair, 2013; Clift, 2023).

## 5. Conclusion

This paper has outlined how degrowth policies can be made compatible with ongoing economic growth. Through an examination of the social construction of GDP measurement, it explains how existing technocratic decisions already both enable and obstruct the measurement of lower levels of greener consumption as higher levels of output. It highlights how different decisions could facilitate a green transition without detriment to economic growth.

Importantly, this paper argues that these decisions are consistent with existing technocratic logics and practices. As scholars of political economy have emphasised, technocratic practices such as economic measurement and forecasting often require decisions between alternative interpretations, procedures and models, in circumstances where there is no objectively correct method or definitive evidence base to which technocrats can appeal (Best, 2008, 2022; Clift, 2023). Recent work has illuminated these decision-making processes among elites such as central bankers (Riles, 2018) and fiscal watchdogs (Clift, 2023), but to date little research has been done into the epistemic community of national accounting practitioners. Further research into the ideational and institutional constraints under which these experts operate would help to test and refine this analysis, and assess whether resistance to change varies in different national contexts. On the face of it, however, the greening of GDP measurement appears immanent to normal technocratic practice: it does not presuppose the election of politicians committed to genuine sustainability.

More broadly, this paper points towards a potentially productive engagement between degrowth scholarship and constructivist political economy. The planet's ecological limits are non-negotiable, although human understanding of where those limits lie is of course imperfect and continually evolving. By contrast, the economy and its attendant concepts are malleable social constructs. This does not mean that these constructs can be manipulated into any configuration whatsoever, but it does mean that there is a degree of contingency and potential for change. The account provided in this paper illustrates how one component of GDP can be reconceptualised in order to recognise what is green as growth. Further investigations could explore how other components of GDP might be recalibrated to facilitate the green transition.

The idea of leveraging the expertise and influence of epistemic elites runs contrary to a strong preference for direct democracy, deliberation and movement-building within the degrowth literature (Kallis et al., 2018). Yet, it is also complementary to wider political mobilisation. Top-down technocratic change offers the prospect of immediate action and can alter the strategic landscape in which sustainability is pursued. In reconstructing growth as green, policies designed to ratchet down the material throughput of affluent countries cannot be so easily dismissed as "anti-growth". Growth-dependent institutions, from the financial sector through to the state, can be enlisted in a green transition with degrowth characteristics without necessarily being thrown into crisis. At the same time, movement-building, cultural transformation and

international coordination can and must run parallel to technocratic change. Statistical authorities cannot treat greener alternatives as more valuable than their less sustainable counterparts unless at least some market participants do so first (at least, not if those authorities want to operate within the established conventions of technocratic expertise). Popular support is necessary to ward off political reactions against changes in technocratic practices. The regulations necessary to push profit-seeking firms and investors towards greener alternatives rely on political action rather than national accounting conventions. All changes to these conventions can do is to reduce the tension between these policy interventions and economic growth. Yet, if contemporary capitalist societies are as growth-dependent as many degrowth scholars claim, this could still constitute a valuable step forward.

## Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## CRediT authorship contribution statement

**Nick O'Donovan:** Writing – review & editing, Writing – original draft.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Data availability

No data was used for the research described in the article.

## Acknowledgements

Thanks are due to Kate Alexander-Shaw and Daniel Bailey for insightful discussions early in the development of this paper, and to the two anonymous reviewers whose feedback helped to improve the final version immensely. All remaining errors are mine.

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