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Land Value Tax Enables Green Growth

PAUL FORRESTER
Wharton Business School, University of Pennsylvania

Abstract: Economic growth is very good. Though most objections to growth can easily be defused, the most compelling objection is the thought that growth is necessarily at odds with the environment. This objection has led some to argue for degrowth. I argue that growth and environmental protection are not necessarily at odds; rather, the conflict between growth and the environment is contingent on the private ownership of natural resources. Under private ownership, permanent resources like land are underused, and depletable resources like fossil fuels are over-used. Land value taxes and severance taxes correct these tendencies. Natural resources are the ideal tax base because they do not cause deadweight loss. Furthermore, economic justice requires such taxes because everyone has symmetrical pre-political entitlements to natural resources. I argue that taxes on natural resources enable green growth, growth that does not require additional resource exploitation. Those who value environmental protection do not need to accept degrowth. Land value tax, not degrowth, should be the cornerstone of a green new deal.

Keywords: economic growth; land value tax; economic justice; degrowth

JEL Classification: O44; Q24; Q38; D63

> *It is a well-provisioned ship, this on which we sail through space. If the bread and beef above decks seem to grow scarce, we but open a hatch and there is a new supply, of which before we never dreamed. And very great command over the services of others comes to those who as the hatches are opened are permitted to say, "This is mine!"*
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> —Henry George, *Progress and Poverty*, Book 4, Ch. 2

High levels of economic growth sustained over the last two and a half centuries is one of the most important things that has ever happened to humanity. Growth was nearly non-existent before 1750, but then the economy of the North Atlantic world began to rapidly expand with the development of new technologies and the exploitation of resources and energy. Japan was the first country to begin growing outside of the West, and in the 20th century waves of growth have reached other Asian economies. Though there is an enormous literature in economic history about the causes of this "great divergence",[1] it is the moral consequences of growth that will concern us in this paper. Sustained economic growth is the best thing that ever happened to humanity. Without it almost all human beings would still be living at or near a state of biological subsistence. Early death and untreatable disease would be a regular occurrence. And the human population itself would be much smaller. We would not have modern technology, or the ability to travel, or stable and consistent sources of food. Our houses would be simple shacks and our clothes would be rags. However, sustained economic growth might be the worst thing that has ever happened to the rest of the natural world. Economic growth historically has been associated with additional resource exploitation. Now we are in the midst of a global environmental crisis.

Recently there has been a wave of scholarship arguing for degrowth, see Saito (2024), Kallis (2018), Kallis et al. (2018), Hickel (2021), Käyrä and Kuhmonen (2024), Weiss and Cattaneo (2017). Advocates of degrowth think that there is a necessary conflict between economic growth and reducing humanity's resource consumption. Since the economy relies on natural resources as an input to production, economic expansion requires people to use more natural resources. The ultimate objective of the degrowth movement is to reduce the amount of natural resources humanity uses to address the environmental crisis, but since they think that this is necessarily inconsistent with continued increases in GDP, they also think that the quest for economic growth should be abandoned in favor of a transition to a steady state economy or shrinking the economy to a size that sits within planetary boundaries. Degrowth scholars argue that

[1] Theories of growth typically emphasize the importance of (1) stable political institutions that protect property rights and trade (North 1990; Acemoglu and Robinson 2012); (2) the development of scientific advances and new technologies resulting from the Enlightenment (Mokyr 2002, 2009); (3) availability of natural resources, especially coal in Britain, and other geographical features (Pomeranz 2000; Diamond 1997); and (4) the extraction of human and physical capital from colonized countries (Wallerstein 1974).

we should learn to be content with consuming fewer goods and services, especially in the already-rich global north.

In this paper, I share the ultimate objective of degrowth scholars—to reduce humanity's exploitation of natural resources. However, I argue that the inconsistency between such reductions and economic growth is not necessary, but rather is contingent upon our failure to adopt just institutions for the governance and ownership of natural resources. Specifically, I argue that distributive justice requires the public appropriation of the value of natural resources through mechanisms such as a land value tax (LVT) and severance taxes. These policies enable *green growth*—economic growth that does not require an increase in the amount of natural resources that are used, but rather consists in our increased ability to add value to natural resources.

Degrowth scholars advocate for a disparate array of anti-capitalist policies, many of which bear only a tenuous connection to the environment, including but not limited to constraints on maximum and minimum income and wealth, modern monetary theory, public housing, public healthcare, job guarantees, disability and mobility justice, anti-tourism advocacy, etc. Fitzpatrick et al. (2022) review the literature and find that "most proposals lack precision, depth and overlook interactions between policies". Degrowth scholars lack the intellectual foundations that could give shape to a green new deal, because they do not have a normative theory of what environmental justice requires and what would constitute a just distribution of natural resources. I submit that the public appropriation of natural resource value could supply the normative keystone that degrowth scholars require. Adopting this foundational view would allow degrowth scholars to see that green growth is indeed possible, and that there is no need to shut down the process that has delivered the most benefits in all of human history. My analysis in this essay will show that public appropriation of natural resource value is the best, and perhaps the only, way to address the environmental crisis without sacrificing growth.

The paper consists of three sections. In the first section, I define my major terms and defend the claim that green growth is desirable. In the second section, I lay out the normative case that the public appropriation of natural resource value is required by justice. In the third section, I argue for my main claim, that implementing a just distribution of natural resources will enable green growth. The only way to pilot spaceship Earth—an image that originated in the writings of land value tax advocate

Henry George—in a just and sustainable direction is to distribute natural resources equally.

I. WHAT IS ECONOMIC GROWTH?

Economic growth is typically measured by gross domestic product (GDP). This measure aggregates the value of all goods and services exchanged in the economy. The resource-intensity of GDP (GDP/R) is the GDP divided by an index of the amount of natural resources R used to produce the goods and services whose value is included in GDP.[2] Increases in GDP/R constitute *relative decoupling*—a decline in the natural resource intensity of economic output. Relative decoupling has been occurring for a long time.[3] For instance, one barrel of oil buys more than twice as much GDP today as it did in the 1970s.[4] I see no reason to expect that the oil intensity of GDP will not be cut in half or more again over the next 50 years.

But relative decoupling has not led to *absolute decoupling*—a situation where economic growth occurs but there is not an increase in the total amount of natural resources used by the economy.[5] This is primarily because of a phenomenon known as the Jevons paradox (Jevons 1866). Jevons observed that despite the fact that technological improvements in the mid-19th century increased the thermal efficiency of coal use, the demand for—and ultimately the use of—coal in England increased. Relative decoupling can lead to increased quantities of natural resources used because the efficiency gains of relative decoupling make resources cheaper to use, relative to the other factors of production, and as such people and firms demand to use more resources. To take a more recent example, the fuel efficiency of cars has increased remarkably in recent decades; this saves people money on gas, but because of these savings, people choose to buy larger cars and SUVs, and end up using more gas.

Since they believe that the Jevons paradox cannot be solved, degrowth scholars believe that shrinking the economy is necessary to prevent humanity from further increasing its natural resource use. In other words, degrowth scholars believe that absolute decoupling is impossible.[6] If we manage to achieve absolute decoupling, then I will call the kind of growth

[2] This index must be constructed out of the physical magnitudes, not the economic values of, natural resources.
[3] Solow (1973).
[4] Baffes, Streifel, and Temaj (2024).
[5] See Jackson (2017), Hickel and Kallis (2020) and Pueyo (2018) for discussions of decoupling.
[6] See e.g. Saito (2020, 42-44).

that results *green growth*. An absolutely decoupled economy would grow all while the amount of resources that it used stayed constant or declined.[7] Such economic growth has no additional environmental cost, and is entirely due to the ability of human beings to derive more economic value from natural resources, not an increase in the amount of natural resources we use.

Throughout human history, the economy has grown both by expanding the amount of natural resources it uses as inputs, and by more efficiently using these natural resources to produce economically valuable goods and services. We are now arguably at, or past, the point at which we should strive for further growth by increasing the amount of natural resources we use, because the human population and the economy are so large relative to the rest of the biosphere.[8] Further economic growth should come entirely from efficiency gains in our use of natural resources, not from using more resources.

With these terms defined, I will now briefly discuss the value of economic growth. There is a growing literature on the value of economic growth (Cowen 2018; Kogelmann 2022; Carroll 2024; Rose 2020). Though I will not directly contribute to this debate here, one structural observation about it will inform my analysis. The observation is that *everyone* ought to think that growth is good. Growth gives people access to more valuable goods and services, and consuming goods and services are a necessary part of practically every project that a person may want to pursue, and as such GDP is a proxy for the extent to which members of society are able to pursue their projects. One thing that makes a society good is that its members are able to consume a large amount and a wide variety of goods and services.

Where there is room for legitimate disagreement concerns how the value of growth should be traded off with the value of other good things, such as inequality reduction, health outcomes, environmental protection, or free time. When conceived this way, the advocates of growth have two powerful moves against growth skeptics. The first move is to show that some good that growth skeptics conceive as at odds with growth actually is further advanced by growth. The second move is to argue that growth should be conceived as the generation of more general-purpose means

[7] Conversely, if you think, like an anonymous reviewer does, that aggressive reductions from the economy's current *level* of natural resource use are required, then you should still support policies enabling absolute decoupling because these policies would allow for aggressive reductions in resource use while preserving the size of the economy.
[8] Dasgupta (2021).

that can be used on anything, including purchasing more of the good thought to be at odds with growth.

Consider free time as a representative example. Julie Rose (2016) argues that free time is an important resource in its own right. Rose (2020, 134–138) argues that perpetual improvements in people's welfare are desirable, but welfare should be measured by a multi-dimensional index (on which see also Stiglitz et al. 2009) where wealth is just one dimension. Furthermore, the pursuit of wealth can compete with other dimensions in the welfare index, like free time or autonomy-promoting worker-owned firms. Thus, we might be able to increase the welfare of the worst-off by having inefficient worker coops, more free time, and less goods and services, not by having more goods and services, professionally managed and shareholder-owned firms, and less free time.

Both of the above moves can be made against Rose's argument. First, economic growth is strongly associated with the amount of free time that people have, as additional time is one of the main things that people choose to purchase with the resources that growth delivers. People in rich countries have shorter working hours, better working conditions and more vacation than people in poor countries. Even more importantly, people in rich countries enter the workforce much later and they have much longer retirements compared to people in poorer countries. Growth has delivered ample free time—especially once we consider free time across the entire life cycle rather than focusing on the comparatively time-poor working-aged cohort—and will likely continue to do so. Second, treating growth as one good among many is inappropriate; growth should be understood as an expansion of the general purpose means available to members of society, which allows them to purchase more of any good. More growth means that people will have more money, which is what affords them the choice to shop at the coop instead of Walmart in the first place.

I focus on natural resource exploitation in this paper because I think these moves are least convincing in this case. Grossman and Krueger (1995) provided an influential argument that many environmental indicators improve with income per capita, consistent with an environmental Kuznets curve, but this argument may only apply to local pollutants, and degrowth scholars have done important work to point out that this relationship may be illusory as global north countries outsource polluting industries to the global south (Rothman 1998). More wealth means that rich countries can afford to buy more environmental protection, but they can also afford to move the environmental degradation somewhere else.

The second option is not available on a global level. Environmental protection is the good for which we can make the clearest case that it genuinely trades off against growth under existing institutional arrangements. Contra degrowth scholars, the resolution of the conflict is not impossible, but it will require significant changes to regulation, taxation and property rights to realize a just system of natural resource governance that reconciles growth and environmental protection.

II. DISTRIBUTIVE JUSTICE AND NATURAL RESOURCES

In this section, I will outline the requirements of distributive justice with respect to natural resources. The classical political economists identified three factors of production: land (a concept they took to include all natural resources), labor and capital. Land is different from the other two factors because its supply is fixed—land is not created by humans but rather is a free gift from nature. Labor and capital are produced by individuals, and their supply can fluctuate in response to changes in demand. All of the major classical economists—including Smith (1776, book 1, chapter 9), Ricardo (1817, chapter 2), and Mill (1848, book 5, chapter 2)—were skeptical that the income of the landlord really corresponds to the value the landlord creates for society.

The resulting normative view—implicit in much of the classical tradition but made explicit by its last major figure, Henry George (1879)—is that people are symmetrically entitled to natural resources, and as such the public should appropriate the value of natural resources, while people are differentially entitled to labor and capital which should be privately appropriated.

Two arguments can be given for this view from very different normative starting points.[9] From a utilitarian perspective, natural resources are part of any optimal tax base because they are fixed in supply. A tax on any good that has a perfectly inelastic supply does not cause deadweight loss, because the supply of the good does not change in response to the tax. Taxing peoples' wages or savings makes them work or save less, but taxing land or oil does not make it the case that there is less land or oil because people do not produce land or oil. This is an elementary result in public finance theory, and LVT garners wide support from economists, even otherwise anti-tax libertarian economists like Milton Friedman who regard it as "the least bad tax".

[9] See further Jacobson (forthcoming).

There are distinct deontological and republican grounds for public appropriation of natural resource value (Forrester 2026; Layman 2020). People are entitled to what they create. Since no one made natural resources, no one in particular is entitled to them; rather, all people have symmetrical entitlements to natural resources. People are entitled to their labor and capital goods because they create these factors of production, which explains why taxes on labor and capital are objectionable. But taxes on natural resources are not subject to this objection;[10] on the contrary, such taxes reflect our equal entitlements to natural resources. In the absence of public appropriation of natural resource value, someone may find themselves in a situation where all resources have been appropriated and consequently there is not enough and as good left for them. The landless are forced to rent resources from an owner if they are to engage in any production, and indeed if they are to exist at all, because the human body is physically dependent on natural resources.

Since they are the paradigm natural monopoly, natural resources command *economic rents*—payments for their use above their cost of production—which is zero, as natural resources are not produced. For the classical economists, economic rent is a kind of tax that can be levied by private parties when natural resources are privately owned. Privatization of a natural monopoly enables owners to collect "an absurd tax upon the rest of their fellow-citizens" for Smith (1776, book 1, chapter 11) and for George "the profit of monopoly is in itself a tax levied upon production" (1879, book 8, chapter 3). From a non-consequentialist perspective, then, private appropriation of natural resource value is unjust because it allows private citizens to arbitrarily exercise the public power of taxation. Public appropriation of natural resource value by contrast is required to respect the symmetrical claims we have to natural resources as moral equals. Paying a tax on the unimproved value of a resource to the community is the only thing that can enable an individual to legitimately exclude others from the resource.

In the 20th century, neoclassical economists abandoned the classical three-factor model of production in favor of a two-factor model in which land was merely considered a kind of capital (Forrester and Jacobson forthcoming; Missemer and Pottier 2025). This modeling approach corresponded to the 20th century political conflict between labor and capital,

[10] Public or common ownership of natural resources are alternative institutional arrangements that would realize public appropriation of natural resource value, but I will examine only taxes on natural resource value here.

but it obscures important differences between the two factors. In the 1970s, ecological economics emerged against this neoclassical consensus, and these writers recovered the classical concept of land—which they call natural capital—to remedy the shortcomings of the neoclassical model which has no way to represent the constraints that natural resources impose on economic activity (Georgescu-Roegen 1971; Daly 1991; Daly 2010; Daly and Cobb 1989; Dasgupta 2021).[11]

The approach to distributive justice outlined here represents a synthesis of capitalism and socialism. Indeed, the very debate between capitalists and socialists only makes sense within the neoclassical understanding of what the economy is: a competition between labor and capital over the social product. Socialists think the means of production should be publicly owned because their private ownership leads to the exploitation of laborers. But the "means of production" is not a homogenous category, as it is composed of unproduced land and produced capital. Socialists are right about land, but capitalists are right about capital. The former should be publicly appropriated because no one produced it, but the latter can be privately owned because it is privately created. Thinking of production as the classical economists did enables us to see this third way in this familiar debate. Public appropriation of natural resource value is required by distributive and environmental justice, and ought to be the basis of a green new deal, since, as I will now argue, it enables green growth.

III. GREEN GROWTH

I will now argue that public appropriation of natural resource value enables green growth. It is neither strictly necessary—perhaps there could be a technological breakthrough like nuclear fusion that could produce effectively free energy—nor is it sufficient—the state could own all natural resources, but the economy would still stagnate if the citizens were too lazy and never wanted to work. Instead, I shall argue that implementing environmental justice through the public appropriation of natural resource value is the most significant step that contemporary economies can take to decouple resource use and economic growth.

[11] One important difference between this perspective and the Georgist approach I develop here is that ecological economists and degrowth scholars tend to have a pessimistic neo-Malthusian outlook, whereas George (1879, chapter 2) was a staunch anti-Malthusian and boldly speculated that the Earth's resources could support at least 1 trillion people.

To argue for this, we must first note that there are two different kinds of natural resources: exhaustible and inexhaustible. Each unit of an exhaustible resource can only be used once. Fossil fuels are the paradigm case of an exhaustible resource; once you burn a barrel of oil, no one else can burn that barrel of oil, and there is one less barrel of oil for everyone else in the world—present and future—who might want to use oil. Inexhaustible resources can be used over and over again. Locations on the surface of the Earth are the best example here. In reality many resources have some exhaustible and some inexhaustible characteristics,[12] but it will be helpful to consider these two ideal types in our analysis.

Taxes on natural resource value must be implemented quite differently for exhaustible and inexhaustible resources. Under a regime of private ownership, inexhaustible resources tend to be underused, and exhaustible resources tend to be overused. In the former case, taxes must collect the rental value of the resource in each period, which prevents speculative underuse by requiring the owner to pay the opportunity cost to other potential users. In the latter case, taxes must collect the unimproved value of the resource when the resource is developed, preventing premature overuse. As such, I will discuss land value taxes in subsection III.1, and severance taxes on exhaustible resources in subsection III.2. Finally, in subsection III.3, I will conclude with a more theoretical treatment, arguing that these taxes on natural resource value solve the Jevons paradox by making the entire economy more labor- and capital-intensive, but less land-intensive.

III.1 Land Value Tax

Most land value in the world is concentrated in cities. As such, LVT will deliver green growth primarily by greening and growing our cities. Cities are and always have been the engines of economic growth and innovation, because of agglomeration effects. Cities are, according to Ed Glaeser (2011, 6), "the absence of physical space between people and companies". They enable specialization because one can easily transact with many trading partners (Smith 1776, book 1, chapter 3).

Cities also allow people to have more environmentally friendly lifestyles (Glaeser and Kahn 2010). People who live in the dense urban core have smaller homes that share walls and economize on energy, and

[12] Some resources are depleted by humans faster than they can naturally replenish, such as lumber. Oil is a particularly extreme case of this as its replenishment rate can essentially be rounded down to zero since it far exceeds the timescale of human civilization.

because economic activity is concentrated in the city, people can walk, bike, take public transportation and drive shorter distances to reach their trading partners. But one's environmental footprint is much higher in the lower-density suburbs of major cities (Jones and Kammen 2014).

In the city we can see absolute decoupling in action: people who live in urban areas are richer, despite the fact that they use fewer resources. Yet, private ownership of the city's land is the most significant obstacle preventing cities from reaching their potential and delivering green growth. Recent research in urban economics has found that land use regulations which restrict the supply of housing in "superstar" cities by capping density and population there have large negative macroeconomic effects, leading to the spatial misallocation of human capital and very significant foregone GDP growth (Hsieh and Moretti 2019; Duranton and Puga 2023). In the words of Glaeser et al. (2005, 335) "Manhattan is underpopulated". The same can be said of nearly all of the largest cities in developed countries. The idea behind this research is that many people would move to the largest cities to access the jobs and opportunities there—and their presence would further the agglomeration benefits of the city—but are prevented from doing so because regulations make it very difficult to build new housing in the best locations. If more people could move to the city, they would be more productive and accelerate economic growth, all while reducing their own environmental footprint.

Yet, private land ownership and land use regulations cause valuable urban land to be underutilized, preventing more people from relocating to the most prosperous cities and thwarting green growth. A simple political economy model connects private land ownership to these land use regulations. Existing homeowners lobby the city to adopt land use regulations that require land to be wasted—for example, building setbacks, single family zoning, floor area ratios, height restrictions, minimum lot and unit sizes, etc.—because these regulations increase their property values (Fischel 2001; Einstein et al. 2020). Urban economists consider such restrictions as imposing a regulatory tax on new development (Glaeser et al. 2005; Glaeser and Gyourko 2018). Homeowners do not themselves face the cost of this underuse; on the contrary, by effectively capping the supply of housing in the face of high demand, land use regulations allow homeowners to capture the gains from the city's growth, while imposing deadweight loss on society.[13] It is also possible that even in the absence

[13] Housing is constituted by land and a building. The former appreciates and the latter depreciates over time. Land use regulations further increase the value of the former by

of restrictive land use regulations, private ownership would result in the underutilization of land, because speculators with low carrying costs will hold the land out of use because they can achieve an adequate return by simply waiting for the land to appreciate, rather than by productively using it (George 1879; Tideman 2004).

Thus, private ownership of land creates a large incentive for owners to lobby for regulations that cause land to be underused. Because of the scarcity and high price of the best land close to jobs and amenities at the center, people rationally decide to occupy cheaper land in the suburbs, where they have bigger, less energy-efficient homes and commute largely in private vehicles. This dynamic does not just occur within a city, but also occurs on a nationwide scale. California has some of the strictest land use regulations in the United States, which massively inflate housing prices there and force people to live in less desirable locations further inland—indeed, sometimes several states over. Glaeser and Kahn (2010) found that restrictive land use in California pushes development activity towards places with higher emissions, such as Phoenix, Las Vegas and Texas. Because of the temperate climate on the California coast, homes consume very little energy compared to the massive air conditioning costs of the inland southwest. Land in California is being inefficiently underutilized relative to its ecological value for human life, and would be much more densely populated if land were optimally used. Many of the people in these inland cities would live on the California coast if there were more housing, and would increase their productivity and slash their carbon footprint in so doing.

A land value tax would correct these distortions caused by private land ownership, and by encouraging the optimal utilization of urban land would enable cities to deliver green growth. Currently, cities have property taxes which tax land and buildings at the same rate, and significant land use regulations restricting development. A program of land use liberalization which eliminated these regulations and moved to LVT—in which buildings were not taxed at all, and the public appropriated most or all land value—would cause a development boom in the central locations where the land value is the highest. These are also typically the greenest places people can live. Such a transition would provide ample incentives to build housing in cities. The elimination of taxes on buildings

artificially restricting supply, but do not have a direct effect on the latter. Under LVT, homeowners would own their buildings but not their land, and as such would not have an incentive to lobby for restrictive land use regulations.

and the complex regulatory process removes costly barriers for developers. And the tax on land value would bring more developable land to market by increasing the carrying cost of under-used land, and would force owners to internalize the opportunity costs they impose on the rest of society by leaving their land idle, and would highly incentivize them to develop now rather than hold out for a higher price later (since increases in land value go to the state, not land owners, under LVT).

Cities are engines of green growth. Yet, private appropriation of land prevents the city from fulfilling its environmental and economic potential. The largest cities are too small and too expensive to live in because existing residents protect their property values and favor land use policies that prevent densification and the expansion of housing supply. But this comes at a large environmental and economic cost, as it pushes people to live in the suburbs and less productive cities where developers do not have to contend with entrenched opposition from homeowners. LVT promotes economic and environmental justice by giving people more freedom to live where they want.[14] Once greener and higher wage locations become more affordable because more housing is built, more people will choose to live there.

III.2 Severance Taxes

Land is unique because it does not depreciate—it is a permanent asset. Other natural resources, however, depreciate when they are used, and replenish themselves very slowly, or not at all.[15] The way for the public to capture the value of land is to impose a tax on its annual rental value. But this approach would not work for depletable resources. If the owner of an oil deposit faced an annual tax on the value of his oil deposit, this would incentivize him to extract the oil now to avoid the tax in future years. So, for the public to capture the value of depletable resources, it must impose a severance tax that is collected when the resource is extracted (that is, "severed" from the earth). The goal of severance taxes is to incentivize the owner to delay the extraction of the resource, and to incorporate the interests of future generations in using the resource in their decisions. Severance taxes should be calibrated to the *in situ* value of the resource, that is, the value of the finished resource minus the value

[14] See Roser and Ngosso (this issue) for a related argument that environmental justice is not at odds with growth.
[15] Strictly speaking, land sometimes contains such resources, such as the soil nutrients which must be replenished for sustainable agriculture.

of all improvements.[16] Just as homes should not be taxed but the full value of the land under them should be publicly appropriated, oil rigs, pipelines, lumber mills, exploration for resources, and more generally the capital expenditures that add value to exhaustible resources should not be taxed, but the unimproved value of the resources themselves should be publicly appropriated through a severance tax.

Recall the purpose of public appropriation of natural resource value. We all have symmetrical entitlements to natural resources, because no one created them. I can legitimately exclude others from a resource only if I adequately compensate the others with interests in using the resource. Taxes that fall on natural resource value are justified because they reflect the symmetrical entitlements of others in using the resource, but taxes that fall on capital goods are objectionable because they compromise individual entitlements and penalize value-creating activities.

For depletable resources this problem of respecting the entitlements of other potential users is primarily an intergenerational one. Since land does not depreciate, one generation can occupy the land without compromising the interests of the subsequent generation in using the land. But if one generation burns the fossil fuels that are easy to extract as industrialized countries did in the 19th century, then subsequent generations are permanently excluded from these resources. If one generation cuts down the old growth forests, then several generations will be deprived of these forests before they have time to grow back. There is nothing that subsequent generations can do to prevent prior generations from depleting all the resources and leaving none for them, so each generation must show restraint and consume only its fair share of depletable resources.

To determine the fair share of depletable resources that can be used by the present generation, the social planner faces a difficult distributional problem at any given time. The social planner needs to estimate at least the following five parameters:

1. How many subsequent generations there are likely to be.
2. The size of each subsequent generation.
3. What the depletable resource endowment is, including resources that are likely to be discovered in the future.
4. What the needs of future generations for depletable resources are likely to be.

[16] Some scholars (Kirzner 1989) believe that, necessarily, the *in situ* value of all resources is zero, because undiscovered resources necessarily cannot be used by humans. This is not a plausible view, for reasons I have identified elsewhere.

5. How the interests of future generations weigh against those of the present generation.

With this information the social planner would be equipped to determine how much of the existing depletable resource endowment the present generation is entitled to use, and as such, the rate at which to set the severance tax to ensure that the present generation does not use more than this amount. I cannot provide a full model with an analytical solution to this problem here, but instead I will argue for a more limited claim. Full private ownership in the absence of any severance tax is likely to result in the over-exploitation of depletable resources by the present generation, and the introduction of a severance tax will reduce the amount used by the present generation and as such will ensure that each generation gets closer to its fair share.[17]

The owner of a resource faces the decision to extract now or later, and to rationally defer the extraction until later the owner must expect the resource to appreciate at a rate greater than the opportunity cost of capital.[18] Over hundreds of years, the stock market in developed countries has achieved a real return of almost 7%. It is quite unlikely that any exhaustible resource will appreciate at this rate, as indeed the real price of many exhaustible resources stagnates or falls over time.[19] Similarly, regulatory and political uncertainty surrounding the green transition and the risk that resource deposits become stranded assets presents an additional strong incentive for private owners to extract resources now before these regulatory risks materialize (Sinn 2012).

In the absence of severance taxes, rational economic actors will deplete resources too quickly because they do not have to incorporate the interests of future generations. The interests of future generations are inadequately represented in the market for depletable resources, quite obviously, because they are not around now to bid for control of the resources that they need to use later; that is, their interests do not register as *demand* for the resource because they have no purchasing power (Solow 1974, 10). Additionally, there is a significant amount of

[17] Both full private ownership and private ownership with public appropriation via a severance tax are likely better than direct public ownership of depletable resources, for most countries. Democratic governments have short-term orientations and are thus likely to deplete the resources too quickly, and authoritarian government ownership of resources is associated with the resource curse (Wenar 2015). The strongman wants to liquidate his country's resource stock as quickly as possible to fund his Swiss bank account due to the constant background risk that his regime will be overthrown.

[18] See Solow (1973), Hotelling (1931).

[19] This is the lesson of the famous Ehrlich–Simon wager.

uncertainty in each of the parameters that determine what each generation's fair share consists in, and this uncertainty itself provides a reason to delay the depletion of the resource, as there is reason to delay irreversible decisions when new information is expected to arrive, as shown by Arrow and Fisher (1974) and Henry (1974).

Finally, if resources are first appropriated under a system of first-come, first-served, this often creates an incentive to develop resources too soon (Kogelmann 2021). Lockean appropriation essentially awards all of a resource's economic rents to the first person to discover it or use it productively. But this means that people will try to discover or use natural resources so that they can appropriate the resource's rents, not because their discovery or use of the resource creates wealth or improves aggregate welfare. Public appropriation of natural resource rents corrects this because the first discoverer or user of the resource does not get to collect its economic rents, but only gets the value they add to the resource.

My proposal for severance taxes to capture the rents of depletable resources goes above and beyond familiar proposals for carbon taxation. The standard response to carbon emissions by economists is that they generate externalities that should be corrected by a Pigouvian tax, indexed to the social cost of carbon.[20] I agree with this standard response, but it does not go far enough because pricing and correcting the negative effects of carbon emissions on the climate is not sufficient to respect the interests of future generations that we frustrate when we burn fossil fuels. Carbon taxes that price formerly unpriced harms from emitting carbon are not sufficient to bring about a just situation with regard to the distribution of depletable resources across generations. Our burning fossil fuels makes future generations worse off by causing environmental harms that they will suffer, but also treats them unjustly by depriving them of useful fossil fuels to which we and they are equally entitled. Carbon taxes are designed to quantify and correct for the former harm, but not the latter. Yet, the latter factor is arguably just as important. Future generations will have some interests that will be best advanced by burning fossil fuels, such as long-distance air travel, or in the manufacture of the numerous items that require petroleum byproducts. In general, there are many goods and services for which depletable resources cannot be eliminated from the production process, even if we can make most production processes radically less resource intensive through regulation

[20] See Kelleher (2025), Fleurbaey et al. (2019).

and technological innovation.[21] Thus, when the present generation uses too much fossil fuels, harms to future generations occur through two distinct channels—the harms of climate change, and depriving future generations of the opportunity to use fossil fuels. Taxation of resource depletion has to correct for both harms, and severance taxes are necessary even when Pigouvian taxes are not because no one is directly harmed by the use of some resource.

Severance taxes, when set at the appropriate levels in addition to carbon taxes, can bring about a balancing of the interests of present and future generations with respect to the Earth's stock of exhaustible resources. Past generations have already used a significant amount of the Earth's non-renewable resources—such as extracting most of the easily accessible fossil fuels, depleting groundwater reserves and cutting down most of the old growth forests. These actions have made the present generation (and future generations) worse off. We should ensure that we do not make the same mistakes with the exhaustible resources that remain.

III.3 Taxes on Natural Resource Value Solve the Jevons Paradox

I have argued that under private ownership, non-exhaustible resources like land are underused, and exhaustible resources like fossil fuels are over-used. Public appropriation of the value of natural resources, through LVT and severance taxes, corrects these tendencies. Implementing these taxes can deliver green growth.

As I mentioned above, economic growth historically has occurred through two distinct mechanisms: (1) increasing the absolute amount of natural resources humans use and (2) increasing the efficiency with which humans use natural resources (that is, increasing the amount of value added to natural resources; relative decoupling). The argument degrowth scholars make against green growth is that these two mechanisms are inseparable in principle at the scale of the entire economy. But this is a strong claim that cannot be established by the empirical record. Arguments that absolute decoupling and green growth are impossible because they have not occurred (for example, Hickel and Kallis 2020) face the substantial epistemological limitation that green growth might be possible but inconsistent with the institutions that have been in place historically, such as the private ownership of natural resources.

[21] See Potter (2026) which discusses helium as another helpful case study.

In the absence of public appropriation of natural resource value, both channels will continue to characterize economic growth, as an expansionary dynamic originally described by Ricardo (1817) is built into the private property system. When the rents of the best resources are privately appropriated by the first-comers, later-comers are forced to find and exploit new resources on the periphery or frontier, or else to use the privately owned resources and have some of what they produce appropriated by the landowners as rent. To overcome these Ricardian dynamics, natural resource rents must be shared equally. Tax policy should change the relative prices in order to (1) discourage extracting additional resources and pushing out the margin of production and (2) encourage adding value to natural resources.

Shifting the tax base from labor and capital and onto natural resources—as I have urged in this paper —does both. Regarding (2), shifting the tax base from labor and capital onto natural resources would fundamentally reshape the entire economy. Today labor and capital bear the double burden of rent and taxes. Labor and capital accumulation are penalized by the public fiscal authority, and some of the surplus value from the productive activities of labor and capital is appropriated by natural resource owners in the form of rent. Eliminating taxes on labor and capital in favor of shifting the collection of rents to the public sector will unleash the productive forces of labor and capital. Shifting the tax base onto natural resources would encourage people to add value to natural resources since they get to keep all of the value that they add, as increases in the value of the natural resources are what funds the state. Shifting the tax base onto natural resources would also accelerate growth by reclaiming the deadweight loss of taxation that is associated with taxes on labor and capital. In short, economic output will become less natural resource intensive and more labor and capital intensive when people are free to add value to natural resources. This is exactly the formula for green growth.

Regarding (1), well-designed taxes on natural resources—those that capture all and only the unimproved value of the resources—will automatically adjust in ways that counter the rebound effect Jevons observed. Consider for instance the shale revolution which occurred when economical horizontal drilling technology was developed in the 2000s. The shale revolution transformed the United States from an energy importer to an energy exporter. Before, deposits of crude oil that were not accessible using conventional drilling technology were cheap, because costly to extract.

But now that a technological change made them easier to extract, the value the resources have *in situ* increased dramatically. Similarly, mountaintop removal mining made coal deposits in central Appalachia much cheaper to access, making them more valuable. Finally, the invention of the car made the land surrounding cities that would become the suburbs much more valuable. In each of these cases, technological advancements increase the value of unimproved natural resources. The same is true of economic growth and population growth. The world's natural resource endowment is worth much more today than 500 years ago because we have much more labor and capital today, making natural resources the relatively scarce factor of production. This phenomenon is the titular problem of George's *Progress and Poverty* (1879), which argues that economic progress does not cause everyone to become better off because one of its main effects is to increase the value of natural resources.

Taxes that capture the value of natural resources, then, will automatically increase when we become able to use the resource more efficiently, because they ultimately track demand to use resources. As such, they will increase when demand to use resources increases for any other reason. In the absence of such taxes, the Jevons paradox sets in because technological improvements make resources cheaper to use, which creates more demand to use the resource and may result in an increase in the absolute amount of resources used. But when accompanied by a corresponding increase in the taxes on natural resources, efficiency improvements need not cause people to use more of the resource because the taxes will raise the total cost of using the resource.

Raising taxes to compensate for efficiency gains for natural resources is the way to achieve absolute decoupling. If severance taxes are not recalibrated in light of the increase in demand that efficiency improvements can cause, present generations will get to deplete too many resources and not leave enough for future generations. Severance taxes can establish a throughput limit on the economy's use of depletable resources that respects the equal entitlements of all generations to the natural endowment, so that increased efficiency in the use of depletable resources does not rebound to cause an increase in the total amount of resources used by the present generation. Similarly, a land value tax, by encouraging densification and the optimal utilization of urban land, can ensure that enough land is left for wilderness and conservation uses.

Thus, in the presence of taxes that capture the full unimproved value of natural resources, the Jevons paradox dissolves because the price

reduction for the resource is offset by a tax increase on the unimproved resource. Without shifting the tax base onto natural resources, green growth is unlikely to occur because the private returns to exploiting new natural resources will be too high, and the private returns to adding value to natural resources will be too low, leading rational individuals and firms to deprioritize adding value in favor of resource extraction.

In conclusion, I have argued that green growth is desirable, that natural resource value ought to be publicly appropriated, and that the public appropriation of natural resource value would lead to green growth. Economic growth is not intrinsically environmentally harmful as degrowth scholars think, but rather, it can be made to harmonize with the environment once we have a fair distribution of natural resources, which are the equal and common entitlement of present and future generations. Our aim should not be to shrink the economy, but rather, it should be to embrace and maximize the *human* side of the economy that adds value to natural resources through labor and capital, but this can occur only when we achieve a just distribution of natural resources.

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Paul Forrester is an assistant professor of legal studies and business ethics at Wharton Business School. His research covers a variety of topics related to economic justice. One major strand of his research examines the justification for property rights. He also has research projects examining the nature of well-being and rationality. Dr. Forrester's research is inter-disciplinary, using tools from normative ethics and political philosophy, while incorporating insights from other fields such as economics and political science. He has presented his work at leading philosophical and interdisciplinary venues in the United States and internationally. In 2025, he was awarded a PhD in Philosophy from Yale University for his dissertation titled "A Theory of Economic Justice." He graduated with a BA in philosophy and political science from Duke University in 2019.
Contact e-mail: <pforr@upenn.edu>