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ECONOMIC ACTIVITY AND THE ENVIRONMENTAL DEGRADATION: AN INCONGRUOUS DISSONANCE

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Abstract: *This paper argues that the speed of economic growth or intensity of human economic activity is not merely dependent on the intensity of pollution or environmental degradation. Rather, smart choices and technological advancements have the capacity to decrease environmental degradation while also increasing economic growth concomitantly. In the arbitration of costs and benefits, this US-oriented study finds that corporate profits of the industries that are most responsible for environmental degradation pale in comparison to the cost of environmental disasters and the accompanying effects of unbalanced income distribution. The results suggest that further investments in smart technology are capable of fostering economic growth and reducing costly environmental disasters. Yet, equity within generations remains elusive and contingent on deliberate policy choices.*

JEL classification: D63, O15. O33, Q20, Q23, Q52

Key words: $C0_2$ Emissions, Corporate profits, Hurricanes, Income inequality, Ozone thinning, Pollution, Ultraviolet radiation

I. INTRODUCTION

This paper investigates the relationship between the pecuniary cost of environmental degradation and corporate profits for some of the industries that are most responsible for pollution and environmental degradation in the US. The analysis is done against a backdrop of a wealth of literature on environmental degradation that spans many decades. In the arbitration of costs and benefits, this US-oriented study finds that corporate profits of the industries that are most responsible for environmental degradation pale in comparison to the cost of environmental disasters and the accompanying effects of unbalanced income distribution. The results suggest that further investments in smart technology are capable of fostering economic growth and reducing costly environmental disasters. Yet, equity within generations remains elusive and contingent on deliberate policy choices.

The background information provided in the literature review section incorporates reasons for the emphasis on sustainability, concepts about the trade-off between economic growth and sustainability, accommodations for environmental depletion at lower levels of economic development (the Kuznets environmental curve), the importance of technological innovation for economic growth and preservation of the natural sphere, imbalances of income distribution, and competing views of the measurement of human welfare. The multi-dimensional strands of the relevant literature coalesce around the footprint of environmental degradation.

In Section III, I discuss the effects of human activities on the environment; especially in the context of the US economic activities and emission of pollutants. The discussion presents the foundation for understanding the basis of temperature changes and the related environmental disturbances that generate exorbitant costs. The sales and profits of targeted industries are evaluated against baseline pecuniary costs of hurricanes, wildfires, insurance, and unemployment. Significantly, these disturbances are associated with gaseous emissions. Yet, profits are significantly less than baseline costs, which necessitate the need for investments and technological innovation to enhance the production functions of the natural sphere presented in Section V.

Despite increasing levels of income and profits, the incongruity of income and income distribution is briefly discussed in Section IV, which is followed by discussions of the need to increase innovation in the natural and economic spheres. Accordingly, Section V is an extension of discussions about the necessities for innovation and diversification presented in Section III. Section V implicitly shows the extent to which some amount of intergenerational equity can be attained without fully accounting for the elusive problem of attaining equity within generations. A brief discussion and conclusion are presented at the end of the paper. The next section presents an overview of the relevant strands of the literature on economic growth and sustainability.

II. LITERATURE REVIEW

The literature on sustainable development and economic growth is both extensive and eclectic. However, the concept of economic growth preceded the modern versions or arguments of sustainability, which were given heightened attention in the early 1990s when the World Conference on Environment and Sustainable Development in Rio de Janeiro (1992) discussed some salient principles of sustainability to include equity within and without generations. In 2015, the issue was revisited and agreements were made to adopt a 2030 agenda for global sustainable development.

Accordingly, variations of the definition of sustainability—the equitable use of environmental resources across generations—now includes economic growth, environmental sustainability, and human development (Chivu *et al.*, 2012). Implicitly, there can be no sustainability without environmental protections or security when inefficient use of environmental resources hinders development (in contradistinction to economic growth). Maintaining a reasonable balance between economic growth and sustainability has created a curious dichotomy in the literature (Pais *et al*., 2019).

The trade-off school of thought maintains that economic growth and sustainability are incompatible or mutually exclusive. This brand of literature has been further complicated by population growth and consumption of environmental resources. Of course, Malthus (1798) had underscored the problem of population growth and limited economic resources (the inadequacy of food supply). Trade-off notions have also ventured into the substitutability of critical environmental capital by the binary classification of sustainability into weak and strong categories.

The binary classification generates econometric problems because capital is not perfectly substitutable and cannot be precisely operationalized. Capital is decomposed into three categories: (i) natural (k_N), (ii) manmade (k_M), and (iii) human (k_H). The categories form a stock (K), but the substitutability of capital to maintain a steady stock and unit of measurement is questionable at best.[1] Strong sustainability maintains that the natural capital stock must be preserved and excluded from the substitutability calculus:

$$K = k_M + k_H + \bar{k}_N \tag{1}$$

Strong sustainability minimizes the problem of units of measurements (equivalencies). The singular emphasis on profits and employment does no justice to social cost. The health of the environment is contingent on human activity and the external costs that are not always very apparent but prohibitively high. Equation 1 could also be denoted as a measure of per capita wealth (stock of assets) (Kunte *et al*,1998.). A critical indicator of the decomposition problem is the destruction of the ozone layer, which is partly responsible for some of the very serious pathologies that have plagued mankind; even as health care costs continue to rise unabatedly.

Hence, the concept of technological innovation continues to gain an increasing and prominent presence in the literature. However, while technological innovation can spare some environmental resources and implicitly guarantee some measure of intergenerational equity, the mechanisms for maintaining equity within generations remain elusive at best. These mechanisms are more often than not contingent on deliberate public policies of distribution.

Though Kuznets (1934) highlighted the limitations of national income or gross domestic product (GDP) as a measure of national welfare, the limitations of which have been subsequently explored and amplified by others (including Neumayer (1999)), welfare issues and use of environmental resources were also linked to stages of economic development; notably, a Kuznets' environmental curve. Kuznets' (1955) inverted "U"—the curve that showed an inverted parabolic relationship between income and income inequality—made its way into the literature in the 1950s. The practical effects of the tolerance for higher levels of environmental degradation at lower levels of economic development have turned out to be rather unconvincing (Stern, 2004). Pollution of assorted forms has monotonically increased in high income countries with glaring escalation of income inequality and costs (also see Figure 6(a)).

[1] Hanley, N., Shogren, F.J., and White, B. (2001*). Introduction to Environmental Economics*. Oxford,UK: Oxford University Press, p.135.

Over the years, the focus on economic performance and income inequality has attracted attention; especially as a result of the inadequacy of GDP to measure human welfare. The Human Development Index (HDI) was developed by the United Nations Development Programme (UNDP) in 1990 and revised in 2010 to make up for the deficient overconcentration on income that excludes distribution. Today, alternative indicators include considerations of three aspects of human existence: economic, social and environmental, which are also improvements or modifications of those proposed by Daly and Cobb (1989) and Cobb *et al.* (1995); for example, Pais *et al.* (2019) adopt variations of the index of sustainable economic welfare (ISEW) and the genuine progress indicator (GPI) to measure economic performance and welfare (sustainability).

The faltering theoretical premise of lower levels of environmental degradation in high income countries generated a renewed focus on technological innovation to sparingly utilize environmental resources while promoting economic growth. The technological appeal is more revealing of sensitivity to equity across generations rather than within generations. Though growth models had hitherto existed prior to the Solow model, technology gained prominent attention after the integration of technology into the Solow model:

$$Y = F(K, AL) = K^{\alpha}(AL)^{1-\alpha}; \qquad (2)$$

where Y is for output, K is for physical capital, A is for the labor-augmenting parameter of the model, L is for the stock of productive labor, α is for the return on physical capital, and $1-\alpha$ is for the return on labor-augmenting capital. Technological progress is contingent on increases in A over time. Though A was originally and outrightly considered to be exogenous, Romer (1990) endogenized the parameter in a series of papers. The technology parameter $A(t)$ was linked to decisive policy making decisions of profit-maximizing firms. Zhao (2019) provides a comprehensive analysis of the literary evolution of technology and economic growth.

This paper approaches the debates from a profoundly different approach. It undertakes a cost-benefit analysis of the pursuit of profits and environmental or restitutional costs in the US. By doing so, it extends the appeal for innovative forms of production in culpable industries and the reallocation of resources to industries that are responsible for less pollution. The profits of corporations that are most responsible for environmental degradation (pollution) are compared to baseline pecuniary cost of environmental damages as a result of changing CO_2 levels and other gaseous disturbances. As such, the paper extends the literature and invites further practical analyses of environmental conservation, economic growth, and equity. The next section takes a look at some consequential human activities.

III. HUMAN ACTIVITIES

Human activities have generated significant effects on the global concentration and distribution of stratospheric ozone before the 1980s.[2] Scientists link the global deterioration of the health of the stratospheric ozone (ozone thinning) to rising chlorine and bromine (attributable to the manufacture and release of chlorofluorocarbons (CFCs) and other halocarbons). Halocarbons are associated with industries that produce refrigerators, air conditioners, large chillers, propellants for aerosol cans, blowing agents for making plastic foams, firefighting agents, and solvents for dry cleaning inter alia.[3] Recognizably, industries are reliable sources of employment and the durable (capital) goods make human lives very comfortable. The provision of these goods does not mean that innovation and optimal releases can only compromise the ability of employers to employ more people; employment is also contingent on innovation, structural realignment of workers, and disastrous occurrences that prevent employment.

Ozone depletion is a major environmental problem because it increases the amount of ultraviolet (UV) radiation that reaches Earth's surface, which increases the rate of skin cancer, eye cataracts, and genetic and immune system damage. The Montreal Protocol, ratified in 1987, was the first of several comprehensive international agreements enacted to halt the production and

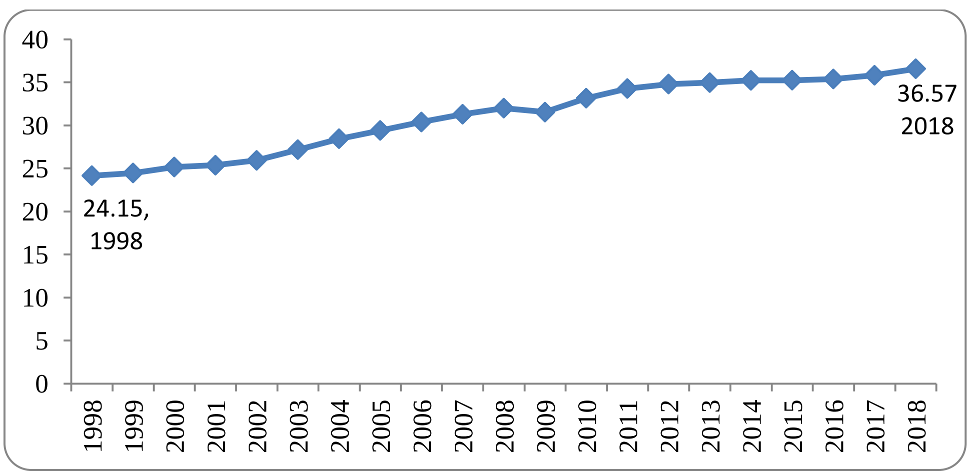
[2] Wuebbles, D. (2020, March). "Ozone Depletion." Encyclopedia Britannica, https://www.britannica.com/science/ozone-depletion

[3] Loc.cit.

use of ozone-depleting chemicals. As a result of continued international cooperation on this issue, the ozone layer is expected to recover over time (Wuebbles, 2020).

The health of the ozone is also dependent on the emission of other gases; for example, carbon dioxide CO_2 (which affects temperatures in both the troposphere and the stratosphere), methane (which affects the levels of reactive hydrogen oxides in the troposphere and stratosphere that can react with ozone) and nitrous oxide (which affects levels of nitrogen oxides in the stratosphere that can react with ozone).[4] Over the past 20 years, global carbon dioxide (CO_2) emissions from fossil fuels and industry have been steadily increasing (see Figure 1). By 2018, the increase reached a record high of 36.6 billion metric tons.[5]

Figure 1: Annual global Co_2 emissions from 1998 to 2018 (billion metric tons)*



* Fossil fuel and industry emissions, excluding land-use change emissions

Source: Statista (2020)

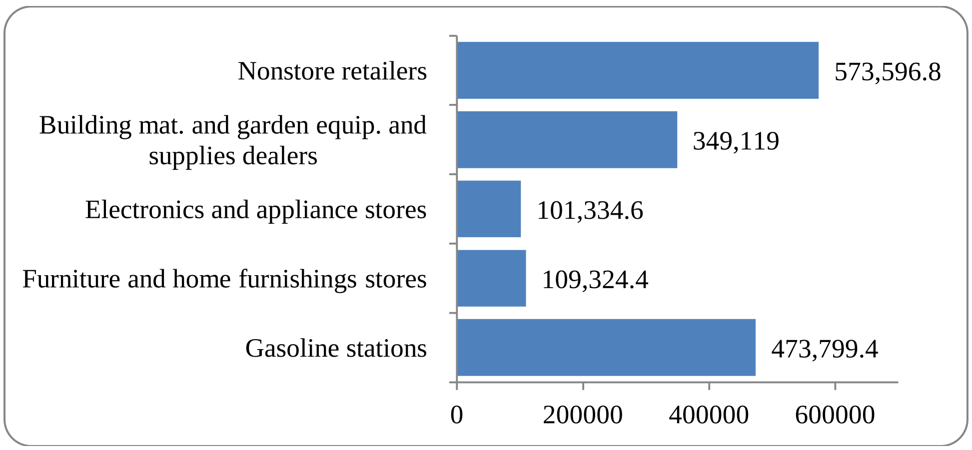
The development of Co_2 emissions is important for evaluating the counterbalancing costs of profit and employment. Economists consider counterbalancing costs to be opportunity costs;

[4] Loc.cit.

[5] See statista.com.

the costs are usually important for conducting cost-benefit (net benefit) analyses. Ozone thinning and the concomitant global warming are responsible for occasional wildfires, flooding, shoreline erosion, and hazards from storms. The disasters impose corresponding costs for loss of employment property, and environmental abatement (or restitution) that are in excess of sales/income. Information about sales and the profit margins of industries that pollute the most are presented in Figures 2 and 3. The industries that have been selected for their direct and indirect relationship to CO_2 emissions—fuel, electronics, utility, and forestry. It is noteworthy that sales must be distinguished from profits, since profits are residual income (after costs, including taxes).

Figure 2: Average sales from 2014 to 2018 (US $m)*



**Notes: Nonstore retailers =electronic shopping and mail order houses, vending machine operators, direct selling establishments, and fuel dealers. Building materials and garden equipments, and supplies dealers= building materials and supplies dealers, paint and wallpaper stores, and hardware stores. Electronic and appliance stores= electronic and appliance stores, household appliance stores, and electronics stores. Furniture and home furnishings stores =furniture stores, home furnishings stores, floor covering stores, other home furnishings stores, and all other home furnishings stores; average total income/sales =US$1.6 trillion.*

Data source: US Census Bureau

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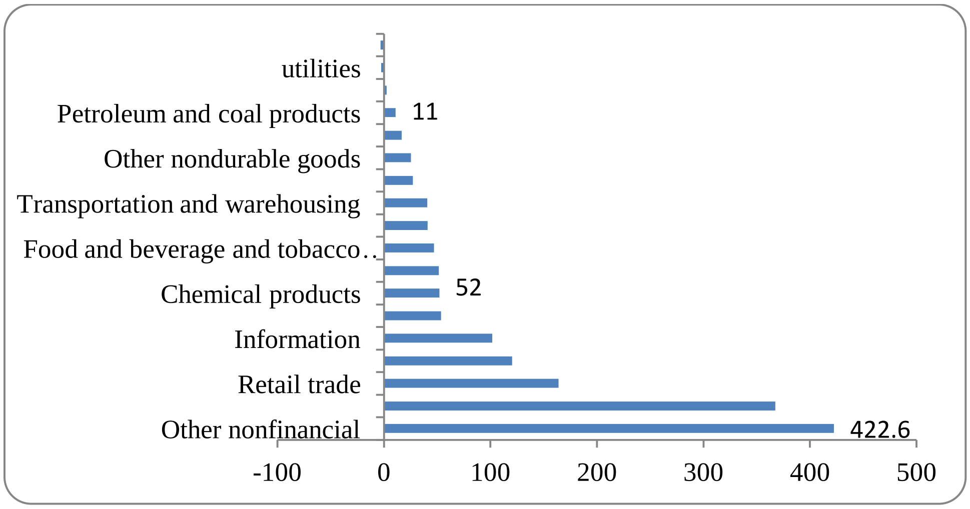
Figure 3: Corporate profit by industry in 2019 (US $b)



Source: Statista (2020)

Average sales for the selected industries over a four-year period amounted to approximately $1.6 trillion. Utilities, petroleum food, beverage and tobacco, and chemical products turned out to be relatively less profitable than most industries. Of course, the 2019 data are somewhat noisy because of the COVID pandemic and unemployment, but essential industries like utilities must do a lot better, since they nest electrical products that are essential and less sensitive to the business cycle. On the other hand, the dangers of CO_2 emissions are all pervasive and prohibitively expensive.

The CO_2 emissions are linked to wildfires, hurricanes, rising sea levels, drought, loss of property, and exorbitant insurance costs; the cumulative costs of which are more devastating than can be easily imagined. In recent years, the cost of merely suppressing wildfires could be in excess of US$2 billion (see Figure 4). *Though federal firefighting costs have increased, the increase in real terms is mainly the result of an increase in acreage burned* [*deforestation*] *since the late 1980s.*[6] Suppression costs indicate large increases since 2000 and a very wide year-to-year variability. Additionally, it is noteworthy that total federal costs exceeded $1.5 billion in 9

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[6] See Brusentsev, V. and Wayne Vroman, W. (2016) "Wildfires in the United States" Urban institute, urban.org.

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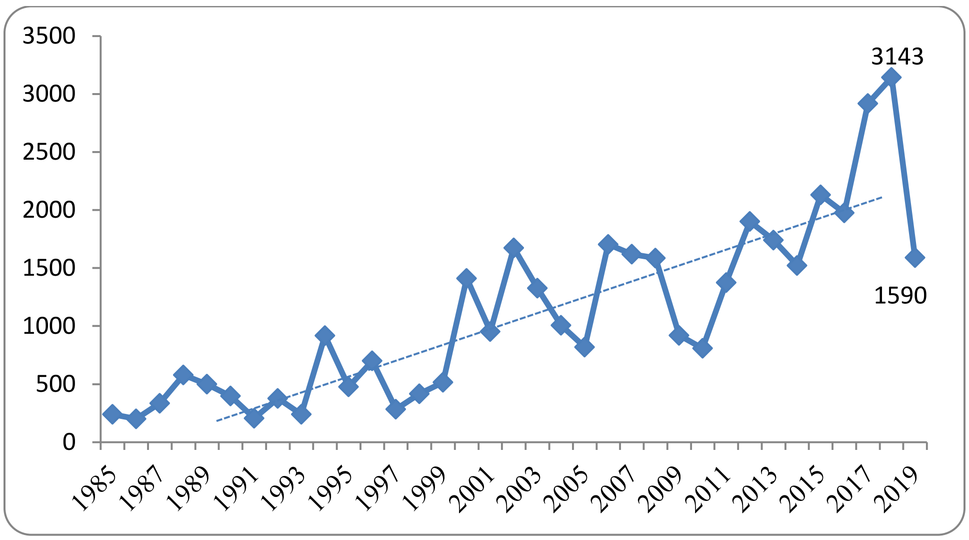
of the 14 years since 2000 but not once in the years before 2000; that is, but for a decline in cost between 2018 and 2019 (not necessarily a trend), the costs of suppression show an increasing trend. Suppression costs do not include loss of property and loss of income that are associated with unemployment. Forests, such as the Amazon rainforest, are responsible for storing over 180 billion tons of carbon per locality. Carbon is released back into the atmosphere when trees are cleared or burned.[7] Additionally, rising sea levels and hurricanes have been equally devastating and associated with ozone thinning.

Figure 4: Federal Fighting Costs (US $m, Suppression only) 1985-2019*



** Forest services and Department of Interior Agencies (rounded to the nearest whole number by author) Total cost ≈$38.5b.*

Source: National Interagency Fire Center, NIFC.gov

The National Oceanic and Administrative Association (NOAA) reports that continued ocean and atmospheric warming will likely cause sea levels to rise for many centuries at rates

[7] Environmental issues cannot be geographically isolated; see "Statistics of the decade: The Massive deforestation of the Amazon." https://heavy.com/news/2020/01/amazon-deforestation-statistics/

that are higher than those of the current century. NOAA further concludes that higher sea levels imply deadlier and more destructive storm surges that will push farther inland than in the past, which also means more frequent nuisance flooding. Disruptive and expensive, nuisance flooding is estimated to be from 300 percent to 900 percent more frequent within US coastal communities than it was just 50 years ago.[8]

In urban settings, rising seas threaten infrastructure necessary for local jobs and regional industries. Roads, bridges, subways, water supplies, oil and gas wells, power plants, sewage treatment plants, landfills—virtually all human infrastructure—is at risk from sea level rise.(NOAA).

The social costs that are associated with hurricanes are both variable and staggering. Table 1 lists insurance costs (a subset of costs) that are associated with some hurricanes. The average of subset of cost for four years (2004 to 2008) is approximately US $33.2 billion. The 2020 Atlantic Hurricane season recorded an estimated cost of about US$60 to US$65 billion.[9] The year (2020) is also considered to be the sixth year in a row for which the US has experienced ten or more billion-dollar weather and climate disasters (National Centers for Environmental Information).[10]

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[8] See “Is Sea Level Rising?” *The two major causes of global sea level rise are thermal expansion caused by warming of the ocean (since water expands as it warms) and increased melting of land-based ice, such as glaciers and ice sheets. The oceans are absorbing more than 90 percent of the increased atmospheric heat associated with emissions from human activity.* https://oceanservice.noaa.gov/facts/sealevel.html

[9] Pedersen, J.M. (2020, December). “Record hurricane season tallies more than $60 billion in damage: report.” Orlando Sentinel; see also Louise, B. (2020, October) “Record 16 climate disasters have hit the US in 2020 costing more than $1billion each.” *Independent.co.uk*

[10] Louise, op.cit.

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Table 1: Top 10 Costliest Hurricanes in the United States ($ millions)

			Estimated insured loss	
Rank	**Year**	**Hurricane**	**Dollars when occurred**	**In 2020 dollars (2)**
1	2005	Hurricane Katrina	$65,000	$85,570
2	2012	Hurricane Sandy	30,000	33,530
3	2017	Hurricane Harvey	30,000	31,590
4	2017	Hurricane Irma	29,900	31,320
5	2017	Hurricane Maria	29,670	31,100
6	1992	Hurricane Andrew	16,000	29,360
7	2008	Hurricane Ike	18,200	21,510
8	2005	Hurricane Wilma	10,670	13,840
9	2018	Hurricane Michael	13,250	13,550
10	2004	Hurricane Ivan	8,720	11,870

(1) Includes Puerto Rico and the U.S. Virgin Islands and losses sustained by private insurers and government-sponsored programs such as the National Flood Insurance Program. Includes hurricanes that occurred through 2019. Subject to change as loss estimates are further developed. As of November 25, 2020. Ranked on insured losses in 2020 dollars.
(2) Adjusted for inflation by Aon using the U.S. Consumer Price Index.
Source: Aon. Insurance Information Institute

The cross-section of social (aggregate) costs could only indicate that environmental social costs far exceed the benefits that can be derived under the current circumstances; that is, currently, humans are inefficiently utilizing environmental resources. Notably, awareness and innovation are common remedies for the inefficient use of societal resources. Implicitly, awareness and innovation can optimize national income and employment while concurrently reducing social cost at the same time. Therefore, it is reasonable to concede that there can be no tradeoff between increases in national income (reduction in unemployment) and environmental conservation when humans harness the appropriate technologies for economic activity and conservation.[11]

Ironically, the profits that have been derived from economic activity, including environmental degradation, have not been equitably distributed; meaning that the poor tend to carry more of the social cost of environmental degradation. The social costs (as presented) have excluded the costs to subsequent generations. Additionally, the social costs exclude expenditures that are associated with the prevention and cures of diseases (pandemics) resulting from deforestation and the close proximity of humans and animals for food and money, which disrupts the ecosystem (a minimization of the social costs that are already exorbitant). A summary representation of the distributive outcome of economic activity can be found in Table 2 and Figure 5.

IV. ECONOMIC GROWTH, PROFITS, AND WELFARE IMPLICATIONS

The maldistribution of income resulting from economic activity and transactions is not a new phenomenon. It has been considered to be a major economic issue in the minds of some economists who also care about democracy (or capitalism) and equity (equality of opportunity). Krugman attributes the average-median disparity to inequity in the distribution of income when the incomes at the top of the scale are rising faster than the average; implying that income at the bottom of the scale must grow less rapidly than the average. The disparity was more pronounced in 1989 (for the time period under consideration).[12]

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[11] See Van den Berg for a detailed discussion of human interaction with the natural and economic spheres; Van den Berg, H. (2017). *Economic Growth and Development* (3rd ed.). Hackensack, NJ: World Scientific; pp.277-285.

[12] Krugman, P. (2020). *Arguing with Zombies: Economics, Politics, and The Fight for a Better Future*. New York, NY: W.W. Norton; pp.267-8.

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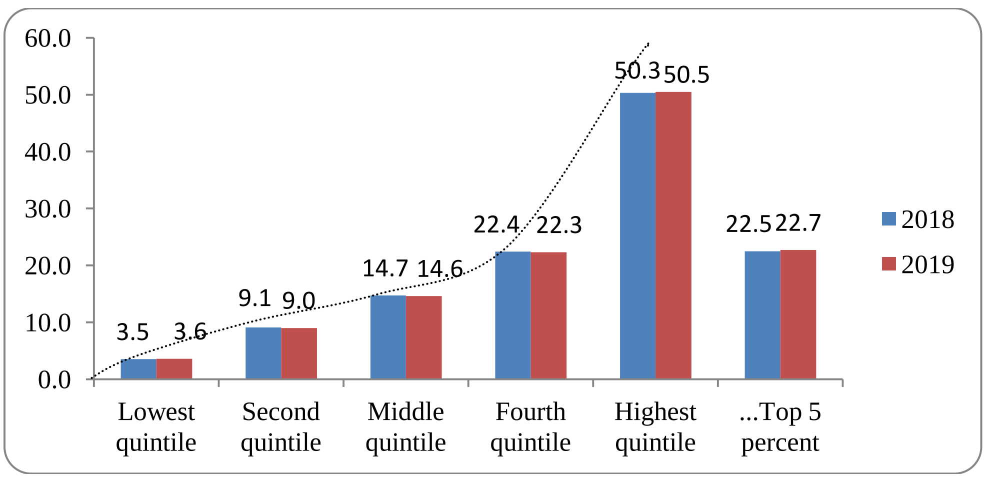
Table 2: Average vs. Median Income (1979-1990)

	Average	100
1979	Median	100
	Average	99
1984	Median	96
	Average	111
1989	Median	104
	Average	108
1990	Median	102

Source: US Census Bureau and Krugman: 268; abbreviation by author.

Figure 5: US Income Distribution Measures Using Equivalence-Adjusted Income (2018 and 2019)



Notes: *Share of national income of the highest quintile and top 5 percent grew while the shares of the second middle and fourth fell. Median household income was $68,703 in 2019, an increase of 6.8 percent from the 2018 median of $64,324. The 2019 real median incomes of family households and nonfamily households increased 7.3 percent and 6.2 percent from their respective 2018 estimates. The 2019 real median incomes of White, Black, Asian, and Hispanic households all increased from their 2018 medians.*
Source: US Census Bureau

For both 2018 and 2019 (Figure 5), the lowest quintile (20 percent of the population) received less than 10 percent of national income while the highest quintile received more than 70 percent of national income. The middle quintile received about 15 percent (rounded) of national income. The top 5 percent received a percentage that is equivalent to the fourth quintile. The more ambitious reader (inquirer) can undertake a comparative analysis by relating the US income distribution to comparable countries. Countries with Lorenz curves that are closer to the 45^o line tend to have relatively fairer distribution of national income (income distribution can never be equal but the disparities can be made less perverse).[13] Therefore, more pollution does not necessarily generate sustainable employment, profit and equity within and without generations. Awareness and innovation can minimize imbalances between social costs (that are attributable to environmental degradation) and employment benefits (derived from economic activity). Innovation does create jobs by structural realignment of workers while also accommodating optimal pollution and conservation of environmental resources. The next section models the essential thoughts about scientific progress and economic activity.

V. INNOVATION, ENVIRONMENTAL PRESERVATION, AND ECONOMIC GROWTH

The relationship between sustainable economic growth and conservation can be vividly conceptualized and illustrated; see Figures 6 (a) and (b): where y is for output per capita associated with both the natural and economic spheres, $f(k)$ is output associated with capital per worker (k), S is for services provided by environmental resources, $c(s)$ is for environmental conservation costs, and f(s) is for the production function in the natural sphere.

Figure 6(a) shows that when environmental costs are relatively negligible at lower levels of output and s_1 and s_2 of nature's services are required. As output per worker increases from y_2 to y_3, there is a corresponding environmental cost ($c_1(s_3)$) associated with the derivation of s_3 environmental services. Available environmental services in the future fall from s_3 to s_2 if the costs are not satisfied. Output per capita falls from y_3 to y_2 as the cost function rotates from $c_1(s_3)$ to $c_2(s_2)$.

[13] See Todaro, M.P., and Smith, S.C. (2015). *Economic Development* (12th ed.). Upper Saddle River, NJ: Pearson; pp.219-24.

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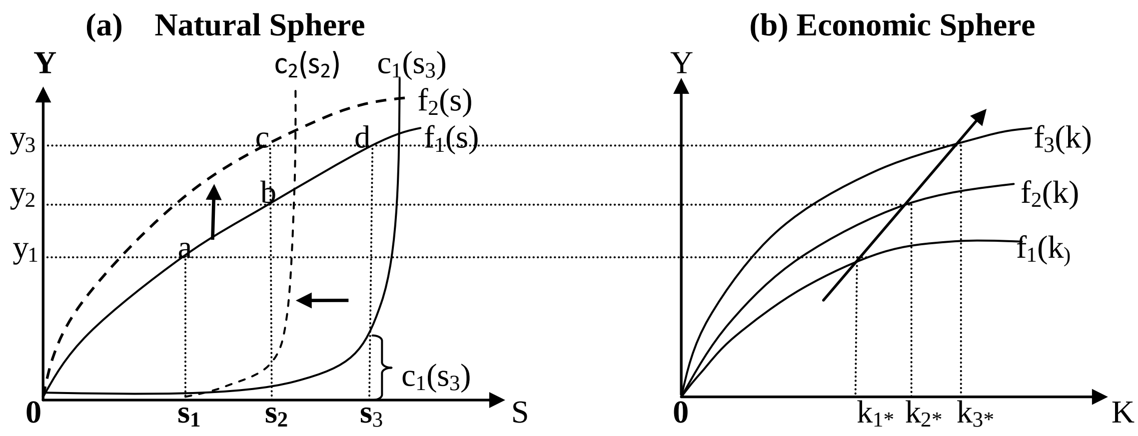
Figure 6: The Interaction of the natural and economic spheres*



** The **a**uthor has consolidated multiple arguments into two illustrations and eliminated the saving functions of the economic sphere for clarity, brevity, or parsimony.*

Source: Van den Berg, Economic Growth and Development: 279-283

Beyond the capital accumulation that is essential for the expansion of capital per worker and output per worker in the Economic Sphere, technological innovation that directly impacts the Natural Sphere increases the production function of the Natural Sphere from $f_1(s)$ to $f_2(s)$. The innovation increases output from y_2 to y_3 without demanding more environmental services (s_2 - s_3). The services required for the increase in output per worker (b-c) are represented by s_2 (less than s_3).

The technological appeal for emission reduction has attracted some amount of attention Their empirical findings of Pang *et al*. (2015) for 87 countries—between 2004 and 2010—show that clean energy consumption significantly increases the total-factor emissions reduction efficiency (TFCE), slightly improves the total-factor economic output efficiency (TFYE), but significantly decreases the total-factor energy efficiency (TFEE). They further reveal that European countries have higher comprehensive efficiency in economic growth, energy conservation, and emissions reduction when innovation is applied to the reduction of emissions; for which international cooperation is needed to facilitate technology transfer and reduce the gap in efficiency. Empirical evidence suggests the efficiencies can be derived from innovation that reduces emission.

DISCUSSION AND CONCLUSION

Economic data show that economic growth and sustainable development are not mutually exclusive. While growth theories predated contemporary discussions of sustainability, sustainable development is now an integral part of the consumption of environmental resources to ensure intergenerational equity and the minimization of costly environmental disturbances. The global awareness of sustainability affirms the importance of the concept for individual and collective actions. A fundamental and elusive problem remains the integration of income distribution into strategies for environmental conservation; though implicit possibilities seem to exist for intergenerational equity via the conservation of environmental resources. Poorer countries are less prone to embrace the practical arguments for sustainability because of the desperate circumstances of poorer people. Yet, the argument can be made that the US (a wealthy country in per capita terms) is equally prone to serious environmental challenges. The common challenges of environmental sustainability—directly associated with human actions—debunk the Kuznets' environmental hypothesis.

Notably, this paper has pointedly addressed the reasons for technological innovation not only to improve output in the economic sphere but to improve the production functions of the natural sphere. The data reveal that the profits of the industries that are most responsible for environmental pollution in the US are relatively miniscule in comparison to baseline pecuniary costs of environmental damages; even when the costs to subsequent generations are discounted. Invariably, not all costs can be computed or estimated with pinpoint precision, which, given the baseline information, elevates the argument for smarter technologies that can conserve environmental resources while expanding economic output concomitantly.

Significantly, issues of equity within generations cannot be cleanly or directly endogenized within contemporary models. Therefore, as a policy matter, nations must find meaningful ways to integrate concepts of sustainable development into matters of income distribution or equity; failing which, poorer residents will continuously abuse environmental resources for subsistence and human survival regardless of the level of economic development. Invariably, one of the surest ways to minimize the disparity between cost and profit (benefits) remains the reduction of pollutants via investments in innovation and diversification of economic activity.

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