

Addressing the Relationship between Economics and Climate Change: A Discussion of Principles

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Abstract

The majority of US colleges and universities have a degree requirement related to the principles of economics. As a result, nearly all college students have some exposure to economics during their undergraduate program. However, the practical applicability of economics to present observable outcomes is not often addressed in standard textbooks. This exclusion limits the opportunity to foster needed and urgent changes in human behavior and further, limits the questioning of the relationship between economics and sustainability. This article reviews the most widely used macroeconomics textbook, Principles of Economics by N. Gregory Mankiw, specific to the discussion of climate change. The article authors argue for the explicit inclusion of climate change in macroeconomics textbooks and conclude with survey outcomes resulting from exposure to an integrated approach of economics and sustainability at the introductory economics level.

Keywords: climate change; economics; Mankiw; principles of economics; sustainability

Introduction

Globally, economies are measured and assessed in relative terms with respect to a single economic indicator—the gross domestic product (GDP). GDP, which was created to measure output, has become a synonym for standard of living, in direct opposition to the caution put forward by its creator: “The welfare of a nation can scarcely be inferred from a measurement of national income” (Kuznets, 1934). In the decades that followed the universal deployment of GDP in the 1940s, the aggressive inclusion of mathematics has successfully facilitated the perception of economics as a science, distancing the discipline from its moral philosophical roots. Instead

of economics providing evaluation and policy based on an explicit normative framework seeking to attain societally optimal outcomes related to the value of all life and the responsibility to steward our global commons for the present and future, economics has been molded by mathematics to project an objective observational stance where the impact of pollution and environmental degradation is weighed against production benefits. The latter, however, is arguably an implicit normative judgment that is embedded in the discount rate used to assess present value relative to future value. Indeed, the practice of economics has promoted business without inter-temporal or even intra-temporal responsibility.

The outcome of this business as usual (BAU) approach includes both the profit-maximizing and immediate gratification consumption benefits to some, but externalities, characterized as market failures in the form of pollution, environmental degradation, and labor exploitation, to others. The teaching of economics has endogenized marketing and profit making by legitimizing that individuals are insatiable and driven by greed. That these assumptions, which are referenced as theory, are now observable social norms borne into existence through social construction are not addressed.

Over the past 70 years the teaching of economics has become standardized,

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being dominated by the texts of Alfred Marshall, Paul Samuelson, and N. Gregory Mankiw in succession (Reisman, 1991; Samuelson et al., 1999; Samuelson, 2019; Skousen, 1997; Weinstein, 2009). Arguably, with the standardizing of how the economy works, there has been an endogenizing of theory into reality (i.e., social construction) and through intergenerational teaching of the same theories, subsequent reinforcement of the same. Individualism is a social norm in the United States and demand for goods is facilitated through marketing self-gratification; companies are expected to make a profit and sustainability is typically pursued only when a monetization (i.e., brand value) is accessible. Arguably, this reality provides an opportunity for the discipline to acknowledge its relevance with respect to issues affecting global environmental health. Evidence strongly suggests that it is the production-driven model along with an exclusion of stewardship responsibility that has, if not created, significantly contributed to the social and environmental justice issues, including the present speed of climate change.

This article addresses the relationship between economics and climate change, discussing first the relationship between our present economic system, from the perspective of energy generation, and climate change. The section that follows reviews the omission of climate change in the teaching of economics, specifically addressing the responsibility of instruction with a critical assessment of N. Gregory Mankiw’s text *Principles of Economics*. The article concludes with a perspective related to the opportunity presently available to integrate sustainability into the teaching of introductory economics.

Economic Growth and Climate Change

GDP is a measure of production capacity within a nation’s domestic borders and essentially captures the total value of goods and services sold at a specific point in time (see Table 1). In the United States, in recent decades consumption expenditures have accounted for between 67 to 69 percent of GDP (Federal Reserve Economic Data [FRED], 2020). Because prices change routinely, the value of GDP is found in its growth rate period to period and in comparison, at a point in time, to another country’s GDP value.

This comparative evaluation has become a proxy for the economic strength of a country. As an aggregate measure, it does not capture the

changes in quality of life or standard of living or even income distribution. These are significant limitations that were noted by developers of the indicator. However, since the 1940s in spite of its known limitations, GDP has been the international metric for economic progress. Given the significance of consumption in the US calculation of GDP as well as the focus on GDP as an indication of economic strength, consumption is a significant driver of economic growth and as a result, a focal point of monetary and fiscal policy. Thus, a perversion exists with a GDP measure, as provided in an analogy by Anielski (2002):

An economic hero is a terminal cancer patient going through an expensive divorce, whose car is totaled in a twenty-car pile-up.

Table 1. GDP Calculation

By definition, GDP measures the market value of all (gross) final goods and services (product) produced within a country (domestic) at a specific point in time. From this perspective, GDP provides an aggregate value but no detail with respect to the distribution of goods and services, quality, or standard of living of a country’s inhabitants. However, given the relationship between employment, disposable income, and consumption, there is an implied connection between employment growth and GDP. As a result, employment is a significant predictor for GDP growth and to the extent that increased GDP growth is a target metric for countries relative to their measurement of progress, employment growth and quality are also routinely evaluated.
GDP can be calculated by assessing total income generated in an economy or total expenditures made within an economy at a specific point in time. The components of the expenditure calculation of GDP include consumption (C), investment (I), government (G), and net exports, the formula for which is exports minus imports (X – M),
$GDP = C + I + G + (X - M)$
C: Consumption spending is spending by households on goods and services, with the exception of new housing. Included in household expenditures are durable and nondurable goods as well as medical care and education.
I: Investment spending consists of the purchase of goods and services that will be used in the production of future goods and services. The expenditures include production facilities, inventory, and new housing.
G: Government spending includes spending on goods and services by local and state and the national government, but it does not include transfer payments. Transfer payments do not reflect a direct purchase of a good or service; rather they reflect a reallocation of tax dollars. The expenditures of transfer recipients are already included in consumption spending, justifying their omission from G in the calculation of GDP.
(X – M): Net exports reflect the net amount of purchases by foreigners of domestically produced goods (X) relative to the amount of foreign goods purchased in the domestic market (M). Net exports provide the status of the balance of trade between countries and are influenced by and also a result of relative demand between trading parties; they influence foreign exchange rates. Foreign exchange rates reflect the demand of one currency relative to another.

... The economic villain, according to the GDP, is the healthy person in a solid marriage who cooks at home, walks to work and doesn't smoke or gamble.

Research conducted on the relationship between GDP and energy use exposes the positive relationship between a nation's development and energy use (Ferguson et al., 2000; Chontanawat et al., 2008). Wealthy countries, however, typically have the highest consumption of energy. In a study of energy consumption and economic growth specific to G7 countries, Bildirici (2012) concluded that "an increase in energy consumption directly affects economic growth and that economic growth also stimulates energy consumption in that country."

Peterson (1963) calculated average country income by per capita GDP and noted that "the greater a nation's output of goods, the greater is its consumption of energy. Thus, energy policy should focus on the consumer." More recently Satterthwaite (2009, p.2) stated:

Responsibility for greenhouse gas emissions should be allocated to individuals and households, not nations. It should be based on the greenhouse gas implications of their consumption. The wealthiest fifth of the world's population is likely to account for more than 80 percent of all human-induced greenhouse gas emissions and an even higher proportion of historic contributions—past emissions that are in the atmosphere and are driving climate change.

Figure 1 depicts the externalities related to energy use as proxied by global carbon dioxide (CO₂) and Figure 2 details the trajectory of global GDP growth. In looking at these two graphs, their similar shape is notable.

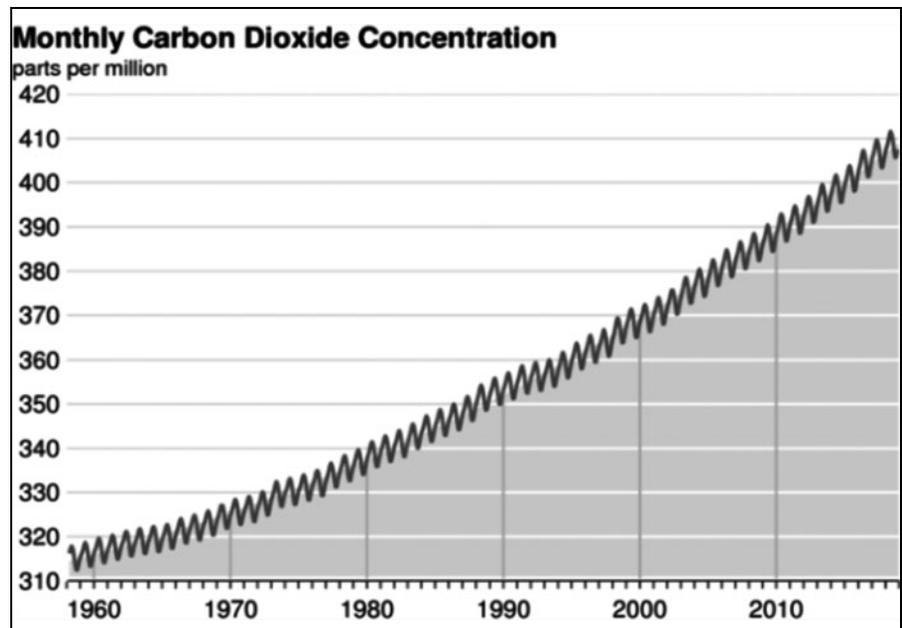


Figure 1. Atmospheric carbon dioxide concentration: 1960-2018

Keeping in mind that carbon-based fuels have been the dominant source of global energy production, the focus on a consumption-driven measure of economic growth where pollution is assessed only as an externality without factoring in related holistic and intertemporal costs can be viewed as a significant driver of human-made climate change.

From a country perspective, India and China were among the top 10 global

emitters of greenhouse gases in 2017 and for nearly a decade preceding; this is consistent with their economic growth rate. However, as presented in Figure 3, the cumulative impact of the United States from the period of industrialization to 2011 exceeds the greenhouse gas emission contribution from any other individual country.

Scientific evaluation has attributed the increase in carbon dioxide emissions to human-made causes.

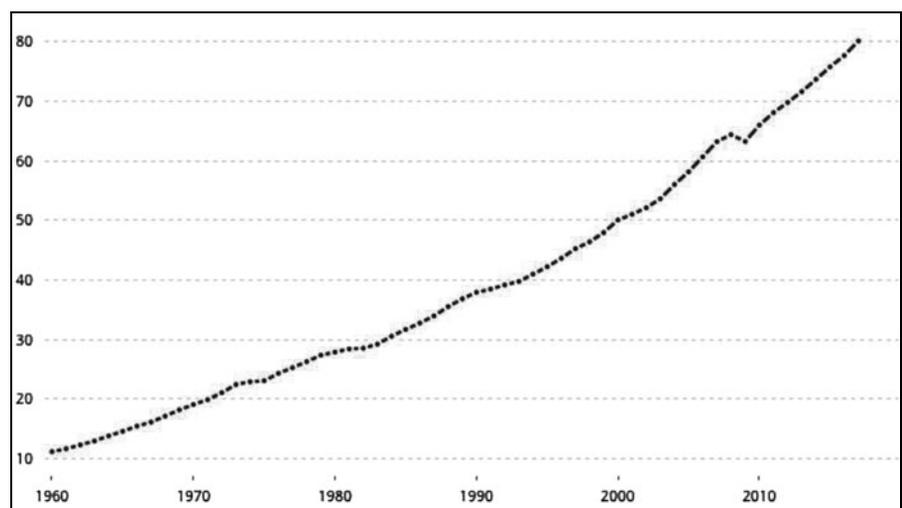


Figure 2. Global GDP (constant 2010 US dollars)

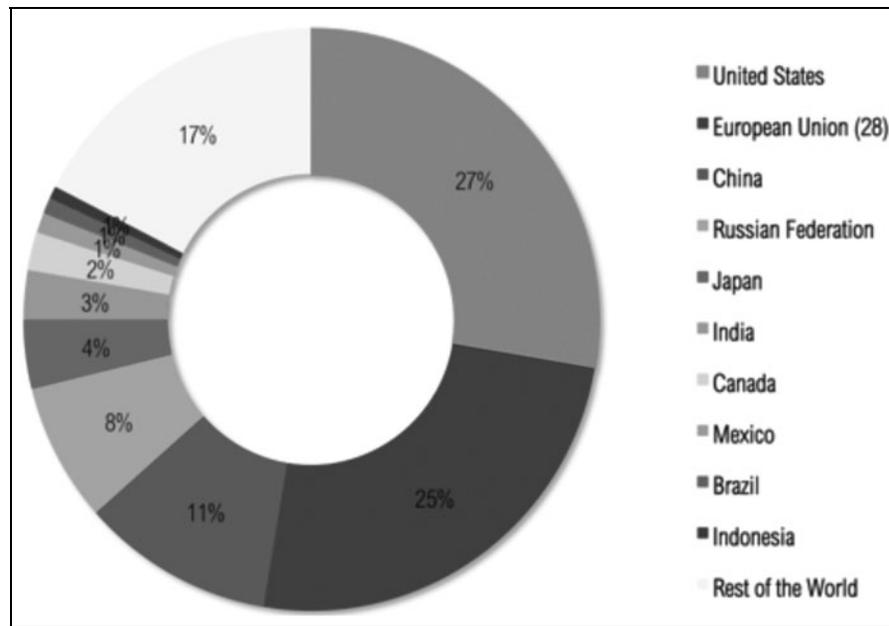


Figure 3. Cumulative CO₂ emissions 1850-2011 (% of World Total)

The concentration of CO₂ in the atmosphere has risen from close to 280 parts per million (ppm) in 1800, at first slowly and then progressively faster to a value of 367 ppm in 1999, echoing the increasing pace of global agricultural and industrial development. This is known from numerous, well-replicated measurements of the composition of air bubbles trapped in Antarctic ice. Atmospheric CO₂ concentrations have been measured directly with high precision since 1957; these measurements agree with ice-core measurements, and show a continuation of the increasing trend up to the present (Intergovernmental Panel on Climate Change [IPCC], 2018).

Teaching Economics

In most colleges and universities, students are required to take introductory economics. This is usually comprised of a two-semester sequence of what is generally referred

to as Principles of Macroeconomics and Principles of Microeconomics. Though there are standard elements in all principles courses (e.g., supply/demand, elasticity, externalities), the manner in which these subjects are discussed and the practical connection that is constructed between the classroom experience and the real economy are at the discretion of the instructor, as is, to a significant extent, the choice of textbook required for the course. The textbook is the primary learning vehicle.

Even though economics is a behavioral science, the subject has been taught as an optimization discipline in which incentives like utility and profit maximization are immutable drivers of human behavior. Students are typically presented with a single perspective of how the economy works and why. However, the teaching also bounds the rationality of the student to the extent that there is no critical assessment of the prevailing economic system and no discussion of responsibility or purpose for growth other than accumulation.

As early as 1938 Beach noted:

It has been the policy of many teachers of economics that beginners in economic theory should be taught only one theoretical explanation of each phenomenon. These teachers feel that the acquaintance of the student with other explanations can be postponed until the student has become more familiar with economics in general and therefore has a better sense of judgment. . . . The effectiveness of this policy might be questioned. . . . Elementary students look for definite answers to their problems, and, lacking the power of discernment, will accept the one theoretical explanation as sufficient. If the students do not continue in this subject, this one explanation will always be the explanation. If the students continue, they will tend to have a bias in respect to this one explanation. (p. 515)

Though nearly 80 years later, Mankiw (2019, p. 4), whose *Principles* text is in standard use (Samuelson, 2019), has maintained and continues to promote the policy that Beach criticized:

This perspective of instructor as ambassador raises the question of what instructors should do if they hold views far from the mainstream of the economics profession. If you are an Austrian or Marxist economist, for example, what should you do if asked to teach an introductory course? In my view, there are only two responsible courses of action. One is to sublimate your own views and spend most of the course teaching what the mainstream believes, even if you disagree with it. Because many introductory students will take only one or two courses in economics throughout their

educations, it would be pedagogical malpractice, in my judgment, to focus on an idiosyncratic minority viewpoint. The other responsible course of action is to avoid teaching introductory (and even intermediate) courses entirely.

What he labels as niche or idiosyncratic includes: symmetric information, political economy, and behavioral economics (Mankiw, 2019, p. 4).

Interestingly, Mankiw also notes that the curriculum in economics has a responsibility to evolve:

One reason textbooks evolve is that knowledge advances. For example, one of the most important developments in economics over my lifetime has been the rise of behavioral economics, the subfield that combines economics and psychology to challenge economists' conventional assumption of rational decision making. Behavioral economics did not exist when I was a student, and it was not mentioned in the first edition of my principles text. But as the subfield has become established, I would have failed in my role as the profession's ambassador if I did not add a discussion of it. (Mankiw, 2019, p. 10)

He continues with:

Although changing world events will always require courses and textbooks to evolve, my goal when writing my books is to provide students with a set of tools robust enough to be applied to new and unexpected challenges. (Mankiw, 2019, p. 11)

These comments alongside his stated view on promoting "mainstream economics" are based on a subjective view—his—and therefore are biased

in favor of his beliefs of how the economic system works inclusive of the normative evaluation of its purpose. Unfortunately, this may not be transparent to students or even be assessed by instructors; the subjectivity of the text is often obscured by the legitimacy given to textbooks.

The present edition of Mankiw's *Principles of Economics* text includes four mentions of climate change across 789 pages, excluding the index. Mankiw leaves himself open to criticism regarding his stance on the urgency of climate change mitigation and adaptation. Though he comments on the need for economics to evolve with knowledge, he excludes climate change in the discussion of externalities and economic growth and includes climate change denial as a credible perspective (Mankiw, 2020, p. 120) along with the following statement: "Moreover, the burning of fossil fuels such as gasoline is widely believed to be the primary cause of global climate change" (p. 196).

There is no discussion of climate change as human-made or as an outcome of the production process. In addressing global warming, he only notes:

More recently, climatologists have debated whether the earth is experiencing global warming and, if so, why. Science is an ongoing search to understand the world around us. It is not surprising that as the search continues, scientists sometimes disagree about the direction in which truth lies. (p. Mankiw, 2020, p. 29)

Further, the Paris Agreement, which is tied to country-specific fossil fuel emissions and GDP, is not mentioned once. Given the US impact on global greenhouse gas emissions and the significance of consumption as a

driver for domestic GDP, in conjunction with US GDP strength (World Bank, n.d.), Mankiw's omission can be identified as pedagogical malpractice based on the very definition he provides, as there is no doubt among legitimate global entities that climate change is a real threat (IPCC, 2019) and US economic behavior is a significant component of the human-made cause (Gillis and Popovich, 2017). Further, given the urgency for behavioral change as advocated by global agencies, it would appear that economics texts should include the relationship between economic practice and externalities that threaten human life.

Though Mankiw addresses externalities, his explanation maintains the standard characterization—a market failure:

Market power and externalities are examples of a general phenomenon called market failure—the inability of some unregulated markets to allocate resources efficiently. When markets fail, public policy can potentially remedy the problem and increase economic efficiency. (Mankiw, 2020, p. 148)

The presumption that policy alone is a solution, ignores that policy is based on understanding, education, symmetry of information flow, and a common commitment to social welfare, all of which can break down or become nonexistent if the general population does not understand the issue and, as a result, places pressure on policy action. Arguably, policy is reflective of prevailing societal understanding of an issue (Amit & Rapport, 2002; Basu, 2018).

Mankiw's text has a strong following among instructors, but this may be more reflective of their comfort in

teaching what they learned, which is the same conservative approach mimicked by Mankiw. Further, enabled by the cycle of sales to development of collateral material (i.e., PPTs, test banks, lecture supplements), Mankiw's text has a competitive advantage in the market, which facilitates its adoption, and again, as in a cycle, continues to foster an advantage. The comfort with omission asserts a complicity on the part of instructors of economics and perhaps even an alignment with the perspective of Mankiw, who has stated both right-wing political bias and identifies as a libertarian (Nordlinger, 2020; Scurfield, 2019; Smith, 2019).

Opportunity: Economics and Sustainability

Of the top five economics texts, only two reference sustainability; the topic is not part of mainstream economics discourse. As a result, the relationship between sustainability and economics is likely not obvious to students from a course text. In standard introductory economics courses (i.e. principles), students are taught a very rigid perspective of the economy, with little room for questioning or divergent thinking. In fact, much of what they are taught aligns with the present functioning of the economy and supports the perception that self-gratifying consumption and accumulation-centered growth are goals, arguably, indoctrinating students into a limited perception of their actions and purpose, normalizing the same.

Economics as a discipline loses an opportunity to expand its appeal by not addressing the relationship between the prevailing and standardized framework and contemporary environmental and social issues. In a course exit survey given to students

in an introductory level Economics of Sustainability course, which has no Principles of Economics prerequisites but does introduce students to the relationship between economics and social and environmental outcomes, one student noted: "There are many takeaways that I can discuss in detail, but I believe one of the most important was how economic growth metrics do not account for pressing issues we face today." Another student emphasized this point: "... my biggest takeaway is the flawed nature of our desire for GDP-based growth. This course has encouraged me to consider other factors that are more tightly correlated to a higher quality of life and sustainability." This idea was reinforced by another student who stated: "Our current economic system needs re-evaluation as to how it measures economic growth. Our education system should also re-evaluate how economics is taught to students. More schools of thought should be taught in the curriculum, and the economics of sustainability should be emphasized."

The exit survey of yet another student reinforced the comments of Beach (1938): "In general, I never tend to question principles that I have been taught in school. But this course was eye opening in that not everything they teach you is necessarily 'right' or the best." Economics is not absolute; rather it is a discipline based in context (Earle et al., 2017). These comments reinforce the need for providing context for the outcomes we see, and responsible engagement is required to equip students in highlighting the relationship between their behavior and the world they would like to create and be a part of.

In the present period, researchers have noted that the teaching of economics has not evolved much over

the past 50 years, pointing out that the discipline has lagged with respect to alignment of content with contemporary issues (Bowles & Carlin, 2020). This is both a lost opportunity and a problem. More broadly, a few courses in undergraduate economics, in some cases perhaps only one introductory course, are often the only interaction that the college graduates of tomorrow will have with the concepts of economics. Because they are the only opportunities that academic economists will have to educate the citizens and voters of tomorrow, they deserve our best efforts (Becker, 2000, p. 117).

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