Title: Taking Climate Risk Seriously in Economic Policy

Outlet: 4th annual NBER conference/publication on Environmental and Energy Policy and the Economy (May 19 2022, Washington DC)

Deadline: 2-3 page abstract submitted by Oct 22.

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Abstract:

Taking climate change seriously within economic policy requires robust measurement. This involves not just the timely and accurate measurement of emissions (although that's important), but also integrating climate and environmental risks into the bedrock data used in economic analysis. This integration will involve externality- and risk-adjusted versions of productivity growth, potential output, creditworthiness, and returns to investments in broad assets. Such data will enable government and business strategies to be stress-tested against climate scenarios and associated simulations of rapid environmental, technical, behavioural, and policy change.

Economic measurement is already undergoing a revolution. There is global movement to go 'Beyond GDP, the System of National Accounts itself is being revised, the UN Statistics Commission adopted new standards for ecosystem accounting in 2021, governments around the world are compiling wellbeing statistics, the World Bank's Changing Wealth of Nations began to measure social capital for the first time in 2021, and there are initiatives to improve measurement of the digital economy and extend human capital metrics to incorporate human health. But beyond compiling more comprehensive accounts, the next step for economists is to embed the information they contain into mainstream economic indicators relating to risk, growth, and productivity.

Extended Abstract

Climate change has been described as "the greatest market failure the world has ever seen" (Stern 2007). In fact, it is a compilation of multiple market failures with implications for every field of economics, including labour, health, finance, fiscal and monetary stability, and productivity. Yet the statistical canon that economists might use to model and assess the consequences of climate change are largely ignorant of the climatological and ecological fundamentals. If GDP forecasts ignore emissions, trade statistics ignore the erosion of natural capital, asset pricing models ignore climate risks, and productivity policy ignores the role of air pollution and temperature volatility, how can we claim to be taking climate risk seriously in economics? If the data are wrong and if the models are wrong, the economics is unlikely to be economics right.

Environmental risk is no longer the sole domain of environment ministries. Both the Stern Review on the Economics of Climate Change (Stern 2007) and Dasgupta Review on the Economics of Biodiversity were commissioned by the UK Treasury, and challenged economists to embed ethics and natural science into their analyses. The Network for Greening the Financial System and Coalition of Finance Ministers now include the central banks and treasuries representing most of the world's major economies, and are working to mandate climate disclosure, conduct climate stress tests and map climate risks onto fiscal policy. Their shared objective is to secure long-term productivity growth, tax revenue resilience and fiscal sustainability. In this paper, we outline several potential

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avenues through which economists can incorporate insights from climate and environmental economics, including Inclusive Wealth accounting, into mainstream economic statistics.

I: Environment- and Risk-adjusted economic statistics

More than a decade of anaemic productivity growth across the developed world – the so-called 'productivity puzzle' – has become a central concern in economic policy. A common explanation is mismeasurement: economic statistics mismeasure key inputs, output or prices. Free digital goods are an obvious example, with services from YouTube and WhatsApp that provide value without leaving a statistical fingerprint. But using data from the UK, where since 1990 emissions have fallen 50% whilst GDP has grown by 80%, we propose another source of productivity mismeasurement: the omission of environmental degradation in productivity statistics. We show how accounting for the externality value of carbon emissions might adjust reported productivity growth.

In addition to internalizing carbon externalities, we argue that a risk adjusted framework for measuring productivity, enabled by incorporating a forward-looking wealth perspective, has broader applicability. Investment involves inherent uncertainties - about technological pathways for example, as well as environmental events - and correlations among different types of capital assets. The consequence of ignoring these correlations has been demonstrated by the supply chain shocks emerging after the pandemic, when capital and labour services bottlenecks have occurred in unexpected ways, amplifying an initial shock in one part of the system. Similarly, climate change-induced weather events and ecosystem changes will have the potential to introduce output and productivity shocks across the economic system.

Finally, we show how climate and environmental economic models can be incorporated into leading financial risk metrics to construct climate- and biodiversity-adjusted sovereign credit ratings. The results can be used to assess environmental- (and policy-) driven changes in creditworthiness, default probability, and the cost of sovereign and corporate debt.

II. New models for shaping the transition and its costs

Historically, economic assessments of the cost and deployment of decarbonisation technologies have been highly pessimistic relative to real-world experience. The gap between projected costs and reality suggests that the models being used are simply not fit for purpose. By ignoring path dependencies in innovation, the cumulative and replicating nature of innovation processes, learning-by-doing, and the role of government in crowding-in private investment, they failed to predict the rapid cost reductions witnessed in renewables generation and battery technologies. Such analysis overstate the cost of climate action, leading to policy delay (Penasco et al. 2021; Grubb et al. 2021). Indeed, this delay can itself increase overall decarbonisation costs, meaning high cost estimates can become self-fulfilling.

Instead, climate policy needs models that explicitly incorporate policy-induced innovation, network formation, technology adoption, and expectations formation (Ekins & Zenghelis, 2020). Research shows that climate and environmental policies can benefit every stage of the innovation process, with positive outcomes reflected in data on patents, cost-reductions, and deployment of clean technologies. If abatement costs are shaped by innovation (Aghion et al 2016), then once a globally scaled and integrated technology becomes sufficiently competitive, it undercuts incumbents and alters the entire environment in which it operates. These effects, plus the cost savings as new networks and institutions are established, explain why Acemoglu et al. (2012) make a powerful theoretical case to suggest that policy to support clean innovation can be temporary, because once

the “clean innovation machine” has been “switched on and is running,” it can be more innovative and productive than the conventional alternative, with a positive impact on GDP levels and growth.

III. Climate policies, emissions impacts, and inequality

Because climate change is the result of multiple interconnected market failures, including the carbon externality, technological lock-in, imperfect and asymmetric information, network effects, and perverse incentives, the ‘simple’ economic response of instituting a carbon tax is an insufficient policy response. This section considers the range of policy options for addressing multiple market failures, and comments on what previous experience can teach us about the political-economy realities of climate policy.

A common critique of net zero policies is that they may reduce competitiveness, raise prices, and exacerbate inequalities. But the evidence suggests that unabated climate change already is and will continue to exacerbate existing inequalities within and between countries, and will create new ones. Understanding the effect of climate policies on innovation, competitiveness, distributional, and environmental outcomes is crucial to securing a just transition.

Systematically reviewing over 700 decarbonisation policy instruments, Penasco et al. (2021) find strong evidence of positive effects on environmental, technological, and innovation outcomes, but that there are often short-term negative impacts on competitiveness and distributional outcomes. We explore how policies can be designed to minimize these negative impacts, and call for climate policy evaluation to incorporate a wider set of environmental and social co-benefits, such as air or water quality, biodiversity loss, or ocean acidification (Bastien-Olvera and Moore 2020; Agarwala and Coyle 2020).

Role of environmental economics policy

The necessary investment for net zero is massive - $90 trillion by 2030 according to some estimates (Global Commission on the Economy and Climate, 2016). That’s roughly equal to the total outstanding stock of public debt by end 2021 (IIF 2021). These sums make it clear: there is no path to net zero without the wholescale transformation of private finance. We argue that this actually increases the role of public finance, which must leverage scaled-up private investment to provide the enabling physical, human and knowledge infrastructure. This spending should afford great opportunities for investment in new clean, resource-efficient sectors in energy, transport, agriculture, manufacturing and construction. But it also presents a growing risk of disruption and devaluation in existing carbon- and resource-intensive sectors and activities.

The role for public investment in crowding-in private finance is even bigger for net zero than it was for jumpstarting solar PV and wind energy. With the right inducements, solar/wind, private investors could (and do) set up their own energy farms and sell energy. But for net zero, there is a need for integrated systems transformation which the private sector will struggle to coordinate unaided. Upgrading and digitising the entire electricity grid is a much bigger project than changing the inputs at one end of it. Switching costs and legacy and lock-in effects are much deeper for networks.

Policy must aim to clearly and credibly ‘steer’ the economy through an uncertain and changing environment by generating self-reinforcing expectation feedbacks which facilitate deployment of new technologies and secure new learnings, and economies of scale in production and discovery. This requires replacing cost benefit analysis with analysis of risk and opportunity; a process which has already influenced asset pricing and allocation decisions in financial markets. Policy action to decarbonise activity and boost productivity must focus on dynamic market shaping rather than static market failures. In line with the theory of endogenous technical change, governments seeking to

sustainably boost productivity must strategically design and steer, rather than passively forecast, the future.

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