CONFERENCE: PRICING CLIMATE RISK:

Refocusing the Climate Policy Debate

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It is widely recognized that the failure to place a price on greenhouse gas emissions in many countries – notably the US and China – is a crucial obstacle to effectively controlling those emissions and avoiding the harmful consequences of global climate change. The conference's objective is to develop a deeper and more nuanced consideration of the pricing of climate risk as a practical proposition in the US and other developed economies.

Much of the existing economic literature views the notion of pricing carbon from a simplified perspective. The focus of that literature is on mitigation, and the pricing of global GHG emissions in the light of aggregate global damages. While it is true that aggregate total of global GHG emissions determines changes in future climate, the fact is that climate varies greatly both spatially and temporally. Therefore, prospective changes in climate, and the resulting damages, also vary spatially and temporally. The same change in global average annual temperature will generate very different physical impacts, and very different economic damages, in different countries – indeed, in different areas within the same country – and at different times of the year. The existing literature tends *not* to treat the impacts of climate change as a set of spatially heterogeneous local events, albeit linked to the accumulated global stock of emissions.

The spatial and temporal differences are often finessed in the economic literature through the artifact of assuming a single, infinitely-lived actor. In that context, issues of compensation hardly arise: the same actor bears both the costs and benefits of mitigation, and by saving or consuming can transfer wealth seamlessly across generations and nations. The real world of climate policy, however, involves many separate actors and many distinct generations. Different actors face different costs of mitigation, different impacts, and different opportunities and costs of adaptation.

It has been recognized that timely and efficient adaptation reduces the damages from climate change, but little attention has been given to the price signals that would be needed to promote timely and efficient local adaptation. There is a myriad of mappings from changes in local climate to physical, social and economic impacts on a variety of dimensions. In an economic model with a single commodity ("output"), the pricing of the externality is a simple manner. In the real world with a multitude of commodities affected by climate change, whether as complements or substitutes for climate by virtue of location or other characteristics, the pricing of climate risks is a far more complicated matter.

Opinions regarding the damages from climate change vary quite widely, ranging from a present value of about $5 per ton of carbon dioxide at the low end to over $100 per ton. In the US, the general consensus lies so far at the low end of this range. The U.S. government recently recommended a value of $22 per ton as a central estimate for cost-benefit analysis of federal regulations, based on a 3% discount rate and the central tendency of the climate sensitivity distribution. Whether this is adequate and will promote the effective pricing of climate risk is a question to be considered at the conference.

The discount rate has been identified as an influential factor in this calculation because of the long time span over which damages are expected to occur. However, while the choice of discount rate has been the object of a highly visible debate, rather less consideration has been given to the magnitude of the damages themselves. There seems to be a perception among many economists that, when the time arrives, future generations may be able to deal with the average impacts of climate change relatively uneventfully. This contributes to moderate price signal being recommended for carbon emissions.

If there is a perception of the relative uneventfulness of future damages, it arises from several causes, including a focus on aggregate global damages (induced, in turn, by a focus on the change in global average temperature as a sufficient statistic); the anticipated secular growth in per capita income; the limited attention being given to extreme events; and the limited allowance for risk aversion in the assessment of damages.

In the standard economic analyses, the harmful impact of climate change is represented as a reduction in per capita income (GDP). To the extent that the normal process of economic growth generates a secular increase in real per capita income, this partially offsets the effects of climate change. But, two factors complicate the relationship between economic growth and the valuation of future damages from climate change. For some climate impacts such as sea level rise and coastal flooding, economic growth increases the vulnerability to climate change as people migrate to coastal areas and the stock of economic assets becomes more concentrated in those areas. Secondly, many effects of climate change are non-market impacts; in those cases, it is not clear that exogenous growth in the accumulation of material assets and the rise per capita income will necessarily reduce the valuation of those impacts – it may increase the valuation if the unspoiled natural environment becomes a scarcer commodity and/or has a large positive income elasticity of willingness to pay (Krutilla, 1967).

While there is recognition of the potential importance of extreme climate events, this tends to be equated with catastrophic *global-scale* climate events. Moreover, there remains disagreement about the implication for the pricing of catastrophic climate risks. These are long-run risks, and they are low probability risks. However, they are imperfectly diversifiable and they are likely to attract a degree of global risk aversion. How large that risk premium should be has been disputed.

Setting catastrophic global climate risks aside and turning to local climate impacts, it seems clear most of the damage associated with local climate risks is likely to be incurred in connection with extreme weather events – heat waves, droughts, floods, etc – rather than with changes in average climate. By way of example, about 60% of the projected economic damage to US agriculture at the end of the century under the high-emission A1Fi scenario is estimated to be associated with the increase in extreme heat events (degree days over 34C) rather than with the change over the normal weather range (degree days within the range 8-32C) and the change in precipitation. The proportion is even larger -- 80-90% of the damage to US agriculture -- earlier in the century (2020-2049) and/or with lower emission scenarios (Schlenker et al., 2006). These extreme weather events are not considered in many of the existing damage estimates for agriculture or other sectors. Whether a $22/ton social cost of CO2 adequately prices the risk of extreme local weather events and, if not, what else is needed, are topics for discussion.

Existing economic analyses of climate impact uncertainty have focused largely on uncertainty about the global climate sensitivity parameter or the risk of catastrophic reduction in global GDP. However, there is pervasive uncertainty associated with the multitudinous local impacts. The uncertainty cascades as one maps from global climate sensitivity to changes in local climate, to physical changes such as local stream-flow, to events such local flooding and local flood damages. These risks play out on a local scale, but the local population that is vulnerable to them may be risk averse and may be willing to pay a premium to avoid them. These local risk premia may add up to a significant amount in aggregate, but they are not factored into any of the existing estimates of climate change damages. The extent to which those local risks can be diversified through financial markets is a topic for discussion.

The conference is intended to bring together some leading economic experts to consider these issues and identify implications for the more effective pricing of climate risk in developed economies. Following a brief introduction, the conference will be organized in six panels, as outlined in the agenda below. Each panel will be introduced by a pair of speakers and then opened to a round table discussion by the full group.