BanRep Blog: Expected effect of climate change on economic activity

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There is a broad consensus in the scientific community regarding the risks associated with climate change on the economic activity of most countries in the world. Such risks may be physical or transitional. Physical risks are related to the gradual increase in temperatures around the globe and the increased frequency of extreme events such as droughts, floods, and hurricanes. Transition risks are related to the costs and economic effects of climate change mitigation policies, the adoption of new technologies, and changes in consumption patterns. Physical and transition risks are inversely related, since minimizing the physical ones requires effective mitigation policies at the global level, which raises the transition ones.

Mitigation policies that may have greater economic effects include the introduction of carbon taxes and other regulations aimed at discouraging the use of fossil fuels. Similarly, high economic costs are expected for investments in sustainable infrastructure that support climate adaptation and energy efficiency.

A document of the journal Ensayos sobre Política Económica (ESPE) published by *Banco de la República* (the Central Bank of Colombia), and coordinated by researchers Joaquín Bernal and Jair Ojeda, reviews recent work on these economic risks. In this context, an exercise is proposed to project the levels of economic activity of Colombia under alternative scenarios of climate change for the remainder of the century.

Academic papers that analyze the macroeconomic impact of climate change usually simulate a set of possible scenarios of what could happen in the future. This strategy allows focusing on the transmission mechanisms of climate change in the economy, under specific assumptions, without speculating on the high or low probability of its occurrence. The United Nations, through its Intergovernmental Panel on Climate Change (IPCC), has standardized these scenarios to facilitate their use, and defines them according to the average magnitude of global warming for the rest of this century with respect to the pre-industrial period. Thus, the most optimistic scenario corresponds to full compliance with the Paris Agreements, which anticipates an average warming of 1.5°C in 2100. Meanwhile, the most pessimistic scenario foresees high fossil fuel consumption accompanied by higher climate risks that would lead to an average warming of 3.7°C by 2100.

The specialized literature proposes different methodological approaches to calculate the potential effects of climate risks on economic growth, which are detailed in the ESPE document. Among the cited literature there are works that estimate a worldwide loss of GDP in the year 2100 ranging from 7.2% to 23.0%, with respect to the level of economic activity without climate change.

One of the types of models used are the so-called integrated assessment models. These analyze not only economic phenomena but also climatic and natural phenomena, such as the water and carbon cycle. This allows physical and transition risks to be incorporated simultaneously, making it possible to estimate the costs of climate transition policies relative to the benefits of lower emissions and thus lower physical risks. The Network of Central Banks and Supervisors for Greening the Financial System (NGFS) has developed integrated assessment models for climate research. Information from these models was used in the ESPE document to make specific estimates for the Colombian case.

The scenarios developed by the NGFS can be divided into three categories. First, the orderly scenarios, which assume that global climate change mitigation policies are introduced in such a way that warming by 2100 does

not exceed 2°C compared to the pre-industrial era. Second, the disorderly scenarios, which assume that warming by 2100 is less than 2°C, but this is achieved with late and heterogeneous mitigation policies in different regions of the world, resulting in high transition risks. Finally, the global warming scenarios, which assume that total global efforts are insufficient to mitigate climate change and, therefore, the total warming by 2100 is greater than 2.5°C. While the latter scenario contains the greatest physical risks, the greatest transition risks are found in the delayed transition scenarios.

Table 1 shows the percentage losses of Gross Domestic Product (GDP) for Colombia by 2100 with respect to a scenario without climate change. The global warming scenario presents an average loss of 7.8%, which may reach 13.3%, at the limit of a probability confidence interval of 95.0%. It is also observed that, in the two mitigation scenarios, the average losses, as well as the width of the confidence intervals, are lower due to a lower degree of uncertainty. In an orderly scenario, which implies zero emissions by 2050, the average loss of GDP in 2100 is 2.0%, while in a disorderly scenario with late mitigation policies, it is 2.6%.

Table 1 - Impact of climate change-related risks on Colombia's GDP by 2100

ScenarioAverage Impact95.0 % Confidence IntervalGlobal Warming: Current Policies-7,8%[-13,3%, -4,3%]Dosorderly Mitigation: Delayed Transition-2,6%[-5,0%, -0,8%]Orderly Mitigation: Zero emissions by 2050-2,0%[-4,3%, -0,5%]

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