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Climate Risk and the Fed: Preparing for an Uncertain Certainty

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While the severity and scope of a changing climate remains unclear, the consensus is that it poses a significant risk to the global economy and financial system. As monetary policymakers, the Fed's job is to navigate this uncertainty by anticipating the potential changes and understanding their implications. The following is adapted from remarks by the president of the Federal Reserve Bank of San Francisco to the Peterson Institute for International Economics on June 22.

Economies are, in many ways, perpetually evolving, adapting to new conditions and moving from one steady state to another. As these transitions occur, the path forward is often hazy. We can see the world shifting around us, but we're not completely sure where we'll end up. All we know for certain is that change is on the horizon.

Society has faced many of these uncertain certainties: industrialization, globalization, the digital revolution. It's increasingly clear that climate change is another one. While the severity and scope remain unclear, the consensus is that a changing climate poses a significant risk to the global economy and financial system (see, for example, USGCRP 2018, Auffhammer 2018, Hsiang and Kopp 2018, Hsiang et al. 2017, Brunetti et al. 2021, Rudebusch 2021; see also Brainard 2021 for related discussion). And we know from experience that ignoring these risks or failing to prepare for them will make the transformation more turbulent and the destination less hospitable.

As monetary policymakers, our job is to navigate this uncertainty. We need to anticipate the changes before us and understand their implications. Today, I will talk about how the Federal Reserve Bank of San Francisco and the Federal Reserve more broadly think about climate risk and its implications for the economy.

Preparing for uncertainty

Now, at this point, most people understand that their future, and the futures of their children and grandchildren, will be affected by climate change. Defined as the current and projected trend toward higher average temperatures and the environmental shifts that result, such as melting ice caps, rising sea levels, more frequent severe storms, and changes in the pattern and predictability of rainfall (IPCC 2020, USGCRP 2018). Indeed, in a 2019 Pew Research survey, 62% of Americans said that climate change is having at least some effect on their local communities (Funk and Hefferon 2019).

But the future is a far-off place. And as humans, it can be tempting to discount or simply ignore it. Unfortunately, that makes the path to change more treacherous. The better we understand the challenges and opportunities of climate change, the better we'll be able to manage them.

For many people, that future is already here. Drought and wildfires in California and the Pacific Northwest, ice storms in Texas, floods in the Midwest, and hurricanes in the South have already cost lives, destroyed property, and displaced communities, sometimes permanently (for research on extreme events and their economic effects, see Aylward and Oliveira 2020, Bakkensen and Barrage 2020, Gallagher 2014, Tran and Wilson 2020, Deryugina 2017, and Fried 2021). Assessing climate risk means understanding the likely frequency and severity of these kinds of physical disruptions.

But physical risks are only part of the story. A complete picture has to recognize the preparations—precautionary or proactive—that individuals, businesses, and governments are making to manage the expected risks. These are especially uncertain since they depend on the awareness and reactions of individuals, communities, and societies.

Early data tell us that adjustments are already under way. As the frequency of climate-related events has increased, insurers and financial institutions have taken notice. They're much less likely to shake off storms, fires, and floods as occasional or "freak" occurrences. Instead, they're recognizing them as indicative of a more recurrent pattern that demands higher compensation or different treatment.

The economic impact is tangible. It's already harder and more expensive to insure real estate in risk-prone areas like Florida, Louisiana, Texas, and California (see, for example, Flavelle 2019, Grimaldi et al. 2020, and Sheehan 2020.) Individuals and businesses in those areas are increasingly on the hook for property damage. This limits their ability to get loans or attract investors, curtails production, and affects decisions about the location of current and future operations. It also leaves property owners and the banks that hold their mortgages with stranded assets: real estate investments that can no longer deliver their projected rate of return.

These dynamics aren't limited to businesses and households in areas prone to destructive weather events. We're seeing them in parts of the country facing less conspicuous climate effects, like prolonged extreme temperatures and unpredictable rainfall. The outcomes may seem less acute than fires or hurricanes, but they affect business operations in equally crucial ways—for example, by influencing which crops can be grown or how many months of the year people can work outside. These kinds of shifts are already being factored into businesses' and insurers' assessments of risk (Brunetti et al. 2021).

All of this highlights an important reality. The risks from climate change aren't an isolated problem relevant only to a few sectors or parts of the country. Large swaths of the nation and a wide range of industries are vulnerable to disruption. These industries include the agricultural and resource sectors, leisure activities, various manufacturing industries, and the financial institutions that support their operation (USGCRP 2018).

Of course, nowhere are these risks more acute than in the sectors of the economy that produce and use carbon-based energy. The global and increasingly domestic momentum to "go green" is prompting consumers and businesses to decarbonize and shift to more environmentally neutral forms of energy (Fried, Novan, and Peterman 2021). These changes can lead to mispriced assets or misallocated capital, especially for entities operating globally. We're already seeing corporations take notice. A growing number of them are including climate risk assessments in their daily business planning and financial disclosures. In many cases, this is happening in the absence of regulatory requirements or government mandates (see the work by the Task Force on Climate-Related Financial Disclosures, https://www.fsb-tcfd.org/, and CDP, https://www.cdp.net/en/climate).

Many sectors are feeling the strain, including energy, automobiles, and construction. Firms in these carbon-heavy sectors could see declines in asset prices, income, and profitability (Rudebusch 2021, Brunetti et al. 2021). Understandably, communities and businesses that rely on these industries are worried; they're thinking about falling production, stranded assets, and, ultimately, stranded people.

Their fears aren't unfounded. We don't have to go back very far in our history to see the devastating impact economic shifts can have on whole segments of society. Think back to the 1980s wave of globalization. The view of most economists, including me, was that freer trade would be an unqualified win for the aggregate economy, raising output, driving growth, lowering inflation, and ultimately delivering higher GDP per capita (Alston, Kearl, and Vaughan 1992). And globalization has led to many good things—just not across the board (see, for example, Broda and Weinstein 2006, Ebenstein et al. 2014, Caliendo and Parro 2015, and Hummels, Munch, and Xiang 2018).

Industries that had once been at the heart of the U.S. economy became less profitable and less viable. Workers displaced from downsized and closing businesses found it hard to transition to alternative employment with similar pay. Some remained idle for the rest of their working lives. While new jobs and industries emerged, they often went to other people, in other places, far from the communities hardest hit by globalization. Thirty years later, many of these communities still bear the scars, having never fully recovered from the effects of the transition. Regarding persistent trade impacts on U.S. employment, see, for example, Autor, Dorn, and Hanson (2013) and Autor et al. (2014).

Climate change could bring similar economic upheaval, boosting innovation, output, and jobs in green sectors, while reducing them in carbon-intensive ones. While the evolution of these patterns is uncertain, it is clear that where we end up will be different than where we've been. And the lesson from past experience is that how we manage these shifts will shape not just the climate, but also the trajectory of the economy and the individuals, families, and communities that make it up.

Climate risk and the Fed

So, what does all of this mean for the Fed? Well, like all other risks to the economy, it's incumbent on the Federal Reserve to understand the likely path of climate change and the transitions that could be part of this evolution. At this juncture, when both the path of change and the eventual new equilibrium are so uncertain, our role is to listen, study, and adjust to whatever comes our way.

And we've already needed to do this. Over the past several years, severe weather and wildfires have frequently distorted headline employment and growth numbers, making it more challenging to decipher the true state of the economy. This has prompted us and others throughout the Federal Reserve System to look at weather as a regular explanatory factor in economic performance—a necessary response to the increased frequency and impact of climate events (Wilson 2019, Boldin and Wright 2015). This is different than simple seasonal adjustment, which assumes the local and national patterns of weather are broadly similar from year to year.

But the Fed and all central banks also need to be forward looking, responding to the risks we see today, while anticipating those that have yet to unfold. This need has prompted many central banks to formally consider climate risk in the regulation and supervision of financial institutions. For example, this month the Bank of England (2021) launched an "experimental" climate risk stress test of major U.K. banks and insurers. The European Central Bank (2020) includes climate risk in its supervisory guidance to financial institutions.

The Federal Reserve is thinking about these risks, too. Earlier this year, we created a new Supervision Climate Committee to ensure the resilience of financial firms under our supervision. The Federal Reserve Board is also establishing a Financial Stability Climate Committee to identify, assess, and address climate-related risks to financial stability. The Federal Reserve's *Supervision and Regulation Report* (Board of Governors 2020a) and *Financial Stability Report* (Board of Governors 2020b) discuss these issues from microprudential and macroprudential perspectives, respectively (see Brainard 2021 for additional discussion).

Of course, there are also risks to the economy that we don't yet fully understand—the known but unknown risks. One of those is the response of businesses and households to living in a more unpredictable world. As uncertainty rises, so does the desire for precautionary savings that can be used to offset or hedge against possible future losses. While such behavior is a prudent response to greater risk, a change in saving behavior of a large number of individuals, both here and abroad, would contribute to a lower neutral rate of interest, or r-star (Dietrich, Muller, and Schoenle 2021).

A similar downward force on r-star may arise from a reduction in labor productivity, as rising temperatures impede outdoor work or skill demand outstrips skill supply, limiting growth. This would only add to the structural factors currently depressing the neutral rate of interest and further curtail the Fed's ability to cut rates to combat economic downturns (for examinations of the structural factors depressing r-star see Carvalho, Ferrero, and Nechio 2016, Holston, Laubach, and Williams 2017, Jordà and Taylor 2019). Of course, there could also be offsetting pressure on r-star from increased investments to move to a more sustainable economy. In other words, there's a lot of uncertainty.

Another known but unknown risk is how much and how rapidly the structure of the economy will change. If the journey occurs abruptly, the transition could put considerable pressure on both employment and prices. For example, an abrupt shift from older, less green technologies to greener ones could leave workers in declining sectors unprepared, lacking the skills to smoothly transition. We could also see prices jump in emerging sectors and fall in declining ones, as supply responds to changes in demand. Without advance

preparation to help industries transform and the workforce adapt, the transition costs could be large and long-lasting. As monetary policymakers, we will need to watch these developments closely and prepare for any and all scenarios.

So how do we do this? How do we watch for developments and assess risks when so many have yet to fully develop? At the San Francisco Fed we have taken a very direct approach. We are working intentionally and deliberately with our communities, other public institutions, and the private sector to catalog the risks and how they are playing out in the 12th District, the nation, and across the globe. These data collection efforts are multifaceted and include formal surveys, listening sessions, and targeted meetings with CEOs to better understand how climate risk affects decisionmaking and resiliency planning.

We are also convening the best academic thinking on these topics, hosting conferences (see https://www.frbsf.org/our-district/about/climate-risk/), and sponsoring a virtual seminar series on climate economics that features a range of research on the issues we are facing. In addition, our Community Development group is hosting a climate conference, https://www.frbsfevents.org/event/2c68afa2-7d0f-465c-b386-8770185ff28f/summary, on July 21.

Finally, consistent with our history, we have assembled a team to study how these issues are likely to impact the Federal Reserve's mandates in the future. This team allows us to leverage our strength as students of the economy to prepare for the challenges and uncertainties that lie ahead. Our new Sustainable Growth group continues the San Francisco Fed's long tradition of doing focused research on issues that affect the economy (for example, previous groups have focused on the IT revolution, emerging Pacific Basin economies, and quantitative assessment of financial vulnerability).

The transition we choose

Future occurrences, especially when uncertain, are easy to push off. But doing so leaves a mark.

I saw this myself. As a teenager growing up in Missouri, I witnessed factory after factory move away, or simply shutter. Each one of them left people behind. Some of those people—too many to count—never recovered. I saw the same thing in Syracuse, where I got my PhD. Carrier air conditioning closed, and the community struggled. Drive anywhere in America and you can see vestiges of a similar story.

Now, it's tempting to blame globalization. And so many do. But the real miss was a lack of acknowledgment. Acknowledgment that, while the economy would be better off in the end, the end is a long way off and the transition would not benefit everyone equally. In fact, there could be collateral damage.

So, what do we learn from this? The key lesson is that transitions matter. And how they play out is our choice. On the cusp of an economic transformation that will likely be even more far-reaching, we have an opportunity to do things differently.

Our future is uncertain: no one really knows the severity and scale of climate change, where and who will be most affected, or the nature, extent, and duration of our response to the risks. But one thing is certain—the

economic ground is shifting. And we have a window of opportunity to prepare, to choose the degree of hardship we will endure.

Economic transitions are inevitable, but the degree of pain they inflict is not. In the end, preparation gives us agency. It is our duty to use it.

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