Industry Perspective From Matthew Kahn:
The Impact and Business of Climate Change

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Matthew E. Kahn, economics professor at USC, explores the near- and long-term impacts of climate change on businesses, the insurance industry, and global markets, followed by a Q&A with Robert Muir-Wood, chief research officer at RMS®. *Adapted from a keynote speech at RMS Exceedance® 2021.*

I recently published a piece in the *Harvard Business Review* that discussed how the insurance industry would play a key role in helping the world adapt to climate change. Today, I want to offer a series of microeconomic ideas about my ongoing optimism that despite the challenges posed by climate change, the insurance industry will continue to play a crucial role in helping the world adapt. When we face a crisis, opportunities are created for those firms that are forward-looking and think about how they will adapt to increase profits during this time of ongoing challenges. The insurance industry is a key actor in my recently published book, *Adapting to Climate Change*.

My young son is 20 years old, and I'm deeply concerned about his future. I very much hope the United States, China, India, and other developing countries sharply reduce their greenhouse gas emissions. But as an economist, I'm well aware that the developing world needs to consume energy for its growing urban middle class. And I am concerned that global greenhouse gas emissions will continue to rise.

I have devoted my research and consulting to helping companies adapt to the challenges we are all going to face. There are profit opportunities for those entities that figure this out, and I will mention some pathways. But the starting point in discussing the insurance industry is my excitement about the rise of big data. In addition, I will examine incentives and the microeconomics of pushing our economy to become more resilient as Mother Nature throws harder punches at us all.

Using Big Data to Reduce Risk Behavior

As all actuaries know, different entities face different risks; young drivers are riskier than older drivers. We need risk pricing such that riskier activities should be charged more for insurance. A very exciting part of the big data revolution is pinpoint geography of the challenges of different parcels of land – whether in southern Miami, London, or Holland – and the spatial risks that properties and assets face because of sea level rise, fires, and other natural disasters. As actuarial risk rises, insurers need to charge more for those risks to send signals to consumers about where is "higher ground."

The first point to think about is the crucial role that the insurance industry plays as a type of Paul Revere, sounding the alarm. As the insurance industry works with companies like RMS to identify where the relatively safer areas are, then the industry will charge lower insurance premiums there. This actually nudges economic activity to higher ground, into safer places. There is this synergy – much of Los Angeles is zoned for single-family homes, and more middle-class people will be able to adapt to climate change if the insurance industry charges higher prices for insurance in risky places, and we "upzone" because of this in safer parts of the city. Although I recognize that many of us will continue to live in risky places, such as coastal areas exposed to sea level rise or communities in fire zones.

The insurance industry can play a key role in helping those who choose to live in increasingly risky places to take precautions to better protect their families. For example, if homes in areas facing sea level rise are put on stilts; if homes in fire zones have vegetation that's less likely to burn. These self-protective steps increase climate resilience. As Mother Nature throws harder punches, then those punches cause less damage if the insurance industry has created incentives for those who seek insurance to take precautions. I am very excited about the potential of the insurance industry to nudge individuals to invest in greater precautions against risk.

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Big Data Can Reduce Information Asymmetry

The insurance industry can also play an important role in leveling the playing field. In economics, there is a famous story about lemons and used cars. George Akerlof won the Nobel Prize in part for his work on this story, which is as follows: When you buy a used car, why is the seller willing to sell it? Does he have more information about the car? When people purchase a used car, the buyer knows less than the seller and may be suspicious that the car is a lemon.

Economists are interested in whether the same issue will occur in the case of climate change affecting real estate. When a family sells a home, whether in Phoenix or in Paris, how much of that decision is just that they are ready to sell and to downsize? Or is it the case that the home faces risks that the seller is aware of, and they want to sell this "climate lemon" to an unsuspecting, unsophisticated buyer?

The insurance industry can level the information playing field and help buyers to be less naive. Buying a home, or buying any asset, is expensive. If you know that you *don't* know the risks you face, the prudent person would want to consult with a knowledgeable entity. Insurers have big data from past claims information to process with pinpoint accuracy the risks that properties face, and they can team up with entities like RMS to model likely future risk.

A potential future revenue stream for the insurance industry is educating potential home buyers about the risks they face when buying a house. If homes have a beautiful view but the threat of sea level rise is increasing, let caveat emptor (let the buyer beware) inform buyers about the risks they face – and then they will bid differently for those assets. The insurance industry can use big data to achieve great things by educating consumers.

How "Nudges" Incentivize Good Behavior

Richard Thaler won the Nobel Prize in Economics in 2017 for his prominent work in behavioral economics, which I believe offers several ideas that could be profitable for the insurance industry in the face of climate change. Thaler wrote a well-known book (cowritten with Cass Sunstein) called *Nudge: Improving Decisions About Health, Wealth, and Happiness.* A nudge is a small piece of information that can have a large effect on people's behavior.

For example, there's a billion-dollar company called Opower, which became very rich by teaming with electric utilities. They sent a letter to households tracking electricity consumption over the prior 12 months and presented the information as a graph. And then, in a genius piece of big data analysis, they also included on the same graph the hundred closest neighbors' average energy consumption and the 20 most energy-efficient neighbors. And so, on this graph, households could see how they compared to their neighbors.

This is a classic "keeping up with the Joneses" effect, and Opower got rich by making it easy for households to benchmark their electricity consumption relative to their neighbors. When a random subset of people received these reports, they reduced their electricity consumption by 2 percent. In fact, Dora L. Costa and I documented that progressives were even more likely to reduce their electricity consumption when they received these reports.

This type of nudge is relevant for the insurance industry. After natural disasters, the industry could send out letters to both real estate owners and companies about precautions they can take. These resilience investments would reduce losses from future natural disasters. If the insurance industry were to borrow the "nudge" methodology, it could be a low-cost way to see if salient information about disasters could lead to greater resilience investment by real estate owners.

This is an exciting example of how academics like me can partner with the insurance industry to help increase profits. If insurers sell more policies, and if there are fewer claimants in the face of climate change, then fewer people suffer when the next hurricane/hailstorm/sea level rise/fire occurs – and the insurer's profits go up. There's a dovetailing between the incentives of the insurance industry and the incentives of society to make us more resilient.

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The Role of Behavioral Economics in Insurance

Another insight from behavioral economics is related to salient events. Horrible things in our world happen every day – the terrorist attacks of 9/11 or the Texas freeze in February 2021 – and they affect many of us. A silver lining of such salient shocks is that they get into our brains. After 9/11, I was afraid to fly for a year, even though my economics training taught me that it was a fluke event and that because of Homeland Security the airports were increasingly safe.

After a salient event, such as Hurricane Sandy affecting Texas in 2017 or the 2021 Texas freeze, that is the right time for insurers to step in and aggressively market policies to people. If, after a natural disaster, people are "in the mood" for greater insurance because they're more worried about the risk to their families, then this is the right time to market policies. In the future, I would enjoy working with insurers on whether this salience hypothesis is right.

Hillary Clinton, when she was secretary of state, said, "Never waste a good crisis." In a similar sense, a silver lining for the insurance industry is to not waste a crisis when shocks occur. Yes, there will be payouts to those who lose in the disaster, but there will be new revenue streams. By incentivizing the new policyholders to take precautions, Mother Nature's future shocks will cause less damage.

While I am very optimistic about the positive role that the private insurance industry can play in helping us to adapt to climate change, I want to tell you about what may be a surprising "villain." In the United States, and perhaps in many other nations, the U.S. government is actively involved in subsidizing insurance for risks such as flood insurance;
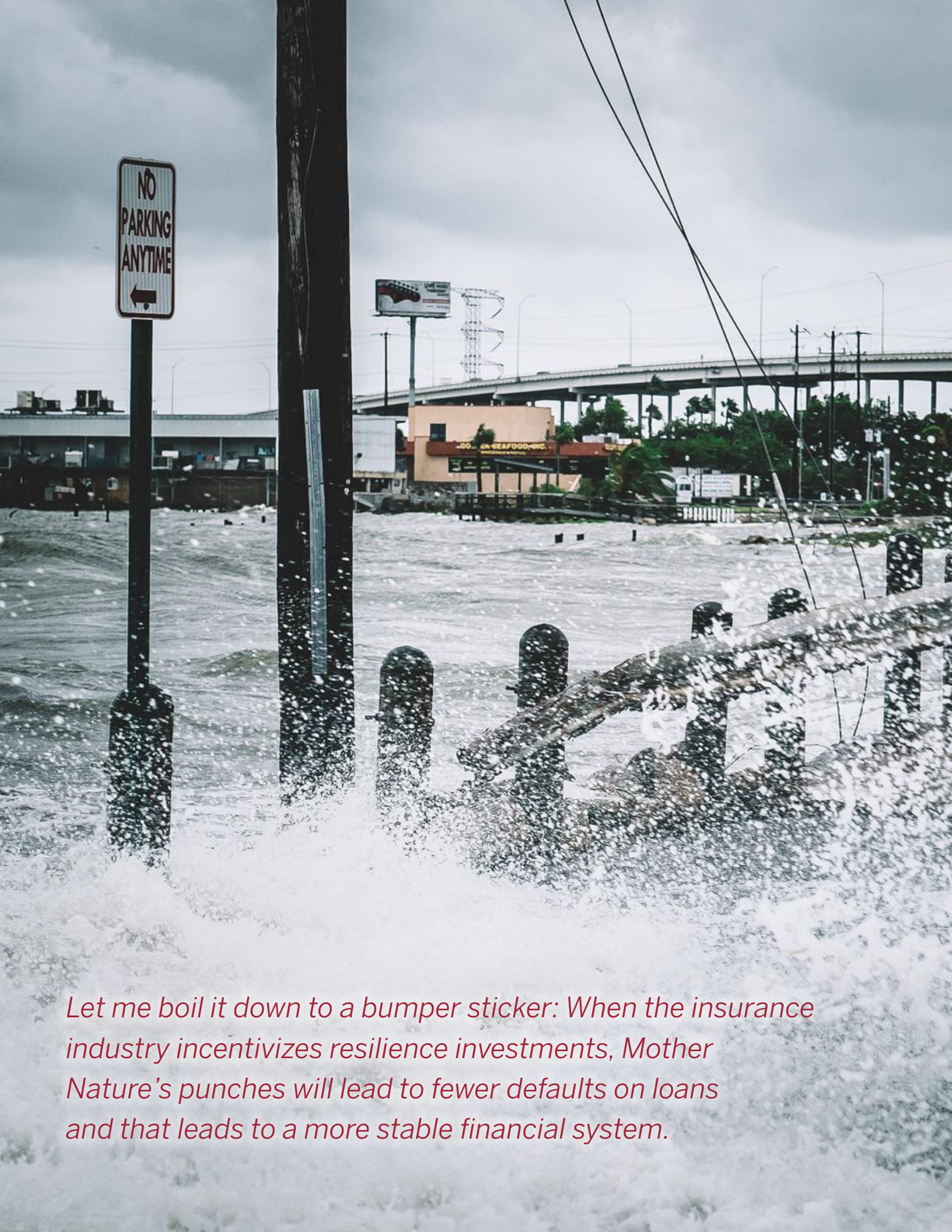
Let me boil it down to a bumper sticker: When the insurance industry incentivizes resilience investments, Mother Nature's punches will lead to fewer defaults on loans and that leads to a more stable financial system.

and in California and other states, the government provides free firefighting. The government is actively subsidizing risk-taking in the United States. Libertarian economists are discussing that an unintended consequence of this well-meaning subsidized insurance for people who live in flood zones is that it destroys the incentive for private insurers to do basic research, data collection and analysis, and create insurance products – because there isn't a market for them.

When I teach my undergraduates, I crack the following joke. I say, "Folks, I'm a bald man." And they agree. And I say, "If I were the only bald man in the world, there would be no Rogaine, but because there are so many of us it becomes profitable to do the research and to market and sell Rogaine." The same story holds here. When the federal government subsidizes flood insurance that reduces the aggregate demand for private-sector insurance, it's the equivalent of not having Rogaine. As a bald man who wants us to adapt to climate change, that does not make me happy.

A point from Econ 101. We face balanced budget constraints at the government level. If the government is subsidizing risk-taking and if climate change is exacerbating those risks, meaning that federal subsidies have to get even larger, the rest of the taxpayers will pay higher taxes for those subsidies. This is both unfair and, from economic logic, it is just kind of crazy.

If we can figure out a system for phasing out some of these subsidies for insurance, there's a double win. The insurance industry will have new profit opportunities to step up its game, to work with firms like RMS, and to use its spatial big data generated by satellites and drones.

We live at a time when it is getting cheaper and cheaper, due to Google Earth and other satellite technology, to do the basic research that allows insurers to determine pinpoint pricing, pushing us to higher ground. For those who insist on taking risks, I would say they need to pay the market price for the risks they are taking. An unintended consequence of government subsidies in this space is to discourage the private sector. And I think that needs to stop.

I now want to pivot to macroeconomics. Macroeconomics was never my strongest subject. A Nobel laureate whom I once told one of my ideas in macroeconomics turned to me and said, "That is a stupid idea." And that was the beginning of my being a *micro*economist. That is it. I am a brave man. I want to tell you a macro idea.

What Macroeconomics Can Teach Us About Systemic Risk

There is a deep worry that climate change could cause a domino effect, creating a financial crisis. I want to highlight how the insurance industry can play a key role in helping us to adapt such that there is no financial crisis. Here's the nightmare that Secretary of the Treasury Janet Yellen and her team of economists talk about. There is an incentive to default on a loan if the value of an asset is less than what you owe on the asset. For example, suppose that I owe $700,000 on a Los Angeles home, but because of climate shocks it is now a $400,000 house. Take $400,000 and subtract $700,000, and I am underwater. I have negative equity of minus $300,000. And I have an incentive to engage in ruthless default.

If the insurance industry can incentivize asset owners to take precautions, then when natural disasters occur they cause less damage.

If, after a natural disaster, homeowners make that same calculation and have negative equity on their asset – and this holds for firms also, not just for households – they may default on these assets and that can set off a domino effect, putting great stress on the banks who are holding those loans. This can create a financial crisis. That scares me. But let's celebrate the potential role for the insurance industry. If the insurance industry can incentivize asset owners to take precautions, then when natural disasters occur they cause less damage. And in that case, the asset retains its value. The asset owners, even if they still have a mortgage, are more likely to have positive equity. In that case, they won't default and we don't get the domino effect.

Let me boil it down to a bumper sticker: When the insurance industry incentivizes resilience investments, Mother Nature's punches will lead to fewer defaults on loans and that leads to a more stable financial system. That is the link between microeconomics and macroeconomics and the crucial role that the insurance industry plays, helping us brick-by-brick to protect capitalism and to protect our children's future.

The Role of Insurance in the Developing World

I would like to discuss the developing world, such as Uganda and India, where development economists study families.

In the developing world, people get sick, injured, or lose their jobs, but many of these individuals don't purchase insurance. Instead, in their large families, they borrow money from a family member. There is a huge opportunity for the insurance industry to sell insurance in the developing world on terms even more favorable, perhaps, than borrowing from a family member.

I believe that climate change will only increase the demand for market insurance in the developing world and middle-income countries like Mexico, and there are tremendous opportunities. Let me give a couple of examples. In the developing world, millions of people are moving to cities, seeking out their own good life there. When they live in cities, they face risks when taking transportation to their homes or in their lives. These individuals will seek out insurance, and this creates opportunities for insurers who think about how to write smart policies tailored to them.

In this age of big data, if you see in your database a car owner who has been in no accidents and has had a clean record for the last couple of years, then I would posit that this is a good predictor of the risks he or she will face in other facets of their life. Those who are good drivers also do not smoke in bed and live a consistent life across each sector. This has information for the insurance industry about how to make profits by learning from your big data.

So again, the key point in this segment is that climate change risk is very serious and could pose great risks to people in the developing world. If the insurers working with climate science firms educate the public about these risks, the public will be more willing to purchase insurance contracts to make sure that, on a rainy day, they have access to the funds they crucially need. In that way, the insurance industry plays a crucial role in helping those who have suffered a calamity get back on their feet. Last year was a horrible year. A silver lining of what we have gone through in the last 14 months is we've learned that the unexpected can suddenly happen.

Conclusion

Climate change, unfortunately, is going to throw even harder punches at us. In my book, I talk about the role that markets play – the insurance market but many other markets – in helping us as individuals to continue to live the best lives we can, even when Mother Nature throws harder punches at us.

My mother always tells me to avoid wishful thinking, and I don't believe in magic, but what I do believe is when enough of us face a challenge then that creates a huge market for those firms with the foresight and wisdom to use their big data and team up with specialized firms, such as the emerging climate science industry, to do their homework and market the products we're going to need given the climate challenges we now face.

Q&A: Robert Muir-Wood and Matthew Kahn

ROBERT MUIR-WOOD: I have a couple of questions for you about how we can bring your insights on microeconomics and risk into some of the areas that we focus on around insurance. My first question is around one key component. One key moment in the history of the development of any risk is when the building first gets built, and the district planning decisions about how it's built. The insurer tends not to be present at that moment even though it is going to be expected to insure that property for a lifetime. How do we change that?

MATTHEW KAHN: This is a great question. As urban planners plan out a new community, developers will be building that housing. I would love to see the developer meeting with the insurance industry and getting a price quote of the property for future purchasers. What will their insurance premium prices be, given the building materials used, given the geographic risks the property faces? I would think that would be crucial information informing the developer's resiliency choices. I would also want the urban planners to allow the insurers to have a seat at the table so that they understand whether middle-class people will be able to afford insurance in the communities they are planning, which as you said will last for decades and face ever-harder punches from Mother Nature.

RMW: Do you think insurers should be providing a kind of quote about the future price of risk for those properties over the building's lifetime? Do you think something like that would be helpful?

MK: I do support that. In Europe, my coauthors in Holland have documented that more energy-efficient homes, when certified by experts, sell for a price premium. I would love to see something analogous. For a home that gets an "A" rating, in terms of its RMS expected risk over the next 30 years, that the urban planners know that the insurance will be relatively cheap because experts predict that the risk is lower going forward. I think we are much more likely to get better decisions featuring less regret with this forward-looking expectation investment.

RMW: One challenge we have with climate change is the risk over the lifetime of a building; it is going to change. In many situations along the coast, along the floodplains, it is going to increase through time, and we need to communicate that somehow. Currently, FEMA produces a line on a map and says, "If you are on one side of the line, you are going to be flooded more often than a 1 percent chance in a given year." But what we really want to know is where is that line going to be in 30 or 50 years' time? Because then you can see your building may not be in the flood zone today, but it will be there tomorrow. Do you think that would be useful?

I am a fan of competition between insurers. Because of competition between insurers, we can see customers paying a fair price for insurance because there's competition to win the right to sell that policy.

MK: I think that's terrific. A key role that I foresee for the insurance industry is expanding people's imagination. In 2019, if you had told me that my family was going to be in lockdown for all of 2020, I do not think I would have believed that. And I view myself as a prudent person. These "known unknowns" and the insurance industry's role of giving us a heads-up and expanding our imagination in a world where we face new risks is crucial. So, it is this partnership between the insurers and with the climate science firms that help to provide this Paul Revere effect, helping us to make better long-run plans.

RMW: We have this challenge that people do not want to hear news about rising levels of risks. They do not want to hear that the risk is more than they thought it was. And so we have this resistance. Even when we think this is the best science-based information, we have this resistance – we have it at the insurance regulator level, we have it at the consumer level. What can we do? How can we educate this society to want to hear the reality of risk?

MK: When I teach undergraduate economics, I talk about insurance. There is price discrimination, and that is a good thing. Women pay less for car insurance than men. Older people pay more for life insurance than younger people. We all face different risks. So, in some settings, we're very used to the idea that if you want to be insured against a risk, you pay more. If there's a higher probability that you will file a claim, then that logic also needs to apply here. Just because if, in the past, there has not been a fire, then because of climate change an area may now be in a fire zone.

I am a fan of competition between insurers. Because of competition between insurers, we can see customers paying a fair price for insurance because there's competition to win the right to sell that policy. I think a very important point here for the industry is how to take the optimism that they can charge different prices for life insurance or for car insurance. And I would say that the same logic applies in the case of climate risk insurance. What do you think?

RMW: I am inspired by your perspective. It makes me wonder why everybody is not as informed about risk as you are. And why don't we try and teach everyone? Why don't we try and get into schools, commit to the curriculum. Give a basic understanding of risk and how one goes about trying to measure it and respond to it. Is that something you would support?

MK: I would support getting rid of trigonometry in high school and adding an introduction to actuarial science. An aside – in 2019, if you had told me that a worldwide contagion would lead everyone to shut down the economy, I would have been shocked. While I view myself as a prudent man with some sense of base theorem and an ability to calculate probabilities, I keep learning about the "known unknowns" and even the "unknown unknowns" that we face. Part of my work is about humility, that we need the insurance industry to educate us about new risks. Because if you had tried to sell me contagion insurance in 2019, I would have shrugged at you. And boy, was I wrong about the new shocks that we face in our ever-changing economy.

RMW: Yes, we need more around how people respond to risk-positive stories. I think your optimism and positivity brings out this search for examples, which can help people make effective decisions. One story I have for you is about some buildings in the Bahamas, which had the same hurricane risk as in Florida, but the Bahamas has a free market for insurance, so it's a bit of a Wild West for insurance. The government doesn't intervene and set prices. There was one estate, Queen's Cove on Grand Bahama, that was flooded by hurricanes four times within 10 years. And as a result, they could no longer get insurance or mortgages, and the houses started to be abandoned. Then someone realized if you rebuilt these houses on stilts, they would come back into being insurable again and you could get a mortgage. And it was like a kind of natural selection was happening. People found a solution, and they found a solution that would not have been available to them without this idea of risk information. So, is there more out there you think we can learn from?

MK: I love your example because it highlights the big data that insurers are sitting on, great data. They know what types of claims they are writing for what types of homes in what types of areas. Through sort of an "amoeba learning process" they can figure out what are the low risks that are worth writing policies on and are profitable.

You alluded to a key issue. When government steps into insurance, even with good intentions, what are the intended and unintended consequences? I would love to see in this age of climate science, greater investments in satellites and sharing of such data with climate modelers, so that insurers have the best information available to see the emerging risks we face. Then, insurers will have the capacity to write contracts and protect people against some of the scary scenarios we face. And, as you said, to incentivize investments in resilience, as in the Bahamas, putting homes on stilts, which protects against Mother Nature's next punches.

RMW: Thank you. My one request for you, because I think getting you to talk at this conference has been an opportunity for you to understand a bit more about our world, is about risk modeling and about insurance. We really want you to stay connected to the insurance sector going forward because I think your insights and your perspective is exactly what is needed. Thank you again for talking to us today and keep in touch with us.

MK: Robert, thank you. I have increased my LinkedIn presence because I want to be part of more of these discussions to learn from insurers and to learn from the insurance industry about the opportunities and challenges posed by climate change.

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