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Climate Change Adaptation Will Offer a Sharp Test of the Claims of Behavioral Economics

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Abstract: Concepts from behavioral economics can be used to make predictions concerning how climate change will impact the economy. Six new predictions from behavioral economics are compared to their rational expectations counterparts.

Keywords: behavioral economics; climate change adaptation; rational expectations.

In May 2015, Professor Richard Thaler published his new book titled; *Misbehaving: The Making of Behavioral Economics*. Thaler is one of the world's leading behavioral economists. His worldview poses a challenge for economists like me. For better or worse, I am a proud "traditional" University of Chicago economist. When I started graduate school at Chicago in the fall of 1988, rational expectations macro was in full bloom. We studied models in which if government runs a deficit today, then forward looking agents increase their savings now because they anticipate that future taxes will increase to balance the future budget. Such offsetting behavior meant that Keynesian stimulus (while well intended) would be unlikely to achieve the short run goal of increasing aggregate demand. In my micro econometric classes, we were taught structural discrete choice models in which forward looking agents made the best choices for themselves while contemplating the likely consequences of their actions. For example, a teenager considering whether to graduate from high school would recognize that by finishing high school that she has the option of going on to college. If the returns to attending college increase, then this forward looking teen would be more likely to finish high school.

The decision makers in the models I was taught were quite smart, logical, forward looking and calm as they sought to do the best they could given their goals and the constraints that they faced. In contrast, behavioral economists model people as mistake prone, myopic, procrastinators who seek immediate gratification.

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An active research agenda continues to seek out settings to test for whether the behavioral economics worldview explains and predicts behavior. In one excellent case study, Choi, Laibson, and Madrian (2011) document that 36 percent of older employees at a set of companies choose to forgo a "free lunch" of $500 a year in choosing their retirement plans. They conclude that this subset of employees are procrastinators. An exciting feature of this research is the explicit recognition that the population is a mixture of two types; the "rational types" and the "behavioral types" and figures out an econometric strategy to measure their proportions in the population. This research then seeks to actually try to understand why the sub-optimizing subset exist and whether there are information treatments that would nudge them to make better choices. An implicit optimism prevails in their work that the people exhibiting behavioral tendencies can be educated to make better choices.

Many tests of behavioral economics have focused on asset pricing puzzles, lab experiments testing endowment effects and retirement savings choices. An unexplored area for testing behavioral economics is climate change adaptation. While many environmental economists focus on public policies such as introducing a carbon tax to mitigate climate change, a growing number of environmental economists are now studying how the climate change that we have collectively unleashed (through cumulative global greenhouse emissions) will impact our economy (Kahn 2010). The behavioral viewpoint would posit that looming climate change will pose much greater threats to our economy than would be predicted by rational expectations economics. I now sketch out five different predictions that standard behavioral economics would make concerning the impact of climate change.

1 Predictive Test #1: The Death Toll from Natural Disasters

If the world is increasingly at risk to suffer from sea level rise, flooding, and hurricanes exacerbated by climate change, then will more people die from natural disasters? Rappaport and Sachs (2003) document that Americans are increasingly living in coastal areas due to the high amenities of such areas. Both the Tsunami in 2004 and Hurricane Katrina in 2005 highlight the damage that natural disasters can cause in such areas. If coastal residents do not update their assessments of emerging risks then the death toll from natural disasters will rise over time. Rational expectations economists would predict it will fall as improvements in real time alerts and broad diffusion of information technology (smart phones) allow households to respond to new news.

2 Predictive Test #2 Coastal Property Owner Self Protection Investment and Increased Storm Risk

As demonstrated by Hurricane Sandy's impact on the Northeast shore in October 2012, coastal areas face the joint risk of both sea level rise and increased storm severity and frequency. While there is considerable uncertainty about the severity and the geography of this risk, a rational prediction is that the medium term historical record sharply understates the coastal challenges that property owners will face over the next 50 years. A behavioral economist would predict that coastal property owners will procrastinate and form myopic backwards looking forecasts of emerging risks. Such owners would under-invest in basic self-protection such as raising their property (stilts), and their communities would invest less in natural infrastructure such as dunes and reefs. The net effect of such under-investment in self-protection would mean increased capital losses from storms in the future. Insurance claims data can be used to test this hypothesis.

3 Predictive Test #3 Air Conditioning Investment in Areas Featuring Rising Summer Temperatures

In Phoenix, it is routinely over 100 degrees during summer but very few deaths in such heat waves are reported. The people of Phoenix anticipate that summers are hot and they have prepared by purchasing air conditioners. In contrast, in the summer of 2010 Moscow suffered from a heat wave and thousands died. Very few people in the typically cool city of Moscow had air conditioning. As discussed by Martin Weitzman and other economists, climate change poses "fat tail" risk. Extreme events that used to have a zero probability of taking place (such as an extremely hot Moscow summer day) will in the future be more likely to take place due to climate. Models based upon behavioral economics predict that people living in these affected places will be continually shocked by these events and will suffer greatly. Myopic forecasts do not incorporate the emerging (but ambiguous) information being generated by climate science. In contrast, a rational expectations model of investment under uncertainty would posit that residents of Northern cities such as Moscow know that they do not know the future likelihood of extreme heat. Fearing the impact of extreme heat days, such cities will have contingency cooling plans (such as cooling centers) and residents will increasingly invest in air conditioning as a type of insurance policy against extreme tem-

perature. Of course, air conditioners are not free and the poor will be the least likely to purchase such products. But, the durables demand of the middle class in such northern cities offers a direct of behavioral economics theories. The timing of such purchases could be informative. Matthew Rabin's law of small numbers (see Rabin 2000) would posit that air conditioner demand would soar just after such a shock rather than in anticipation of an emerging increasing likelihood of such heat waves. Do salient shocks prod people to update their assessment of extreme heat?

4 Predictive Test #4; Future Agricultural Output Volatility

Many environmental economists study how agricultural production will be affected by climate change (see Robert Mendelsohn of Yale's research, Lobell, Schlenker, and Costa-Roberts 2011). Different regions will face different combinations of drought and heat waves and this will affect the output of many different agricultural products. Behavioral economics theory would predict that farmers will not adapt to these changing weather conditions. Such "behavioral farmers" will assume that their low output is simply the result of idiosyncratic bad luck rather than reflecting a structural break in climate conditions. The neo-classical farmer would recognize that in the face of climate change that she "knows that she does not know" what future climate conditions will do to her production. Such a farmer would invest in growing crops that are more robust in the face of climate change and would engage in holding inventories and hedging risk through formal futures markets. Participation in new markets for smoothing weather shocks provides a direct test of how different farmers cope with emerging risks (see Mobarak and Rosenzweig 2012). A business as usual model of farmers would posit that agricultural output will become much more volatile in the face of climate change while rational expectations farmers would make investments in both their human capital and physical capital so that climate shocks have a smaller effect on their production and profits.

5 Predictive Test #5: Global Supply Chain Breaks

In our globalized economy, many firms such as Apple are producing their products far from final consumers. Such global supply chains take advantage of

each region's comparative advantage but the spatial separation of such activities creates logistics risk such that storms and interruption of key transportation infrastructure could mean that such firms lose sales opportunities in the face of disruptive events. An alternative hypothesis is that such firms will anticipate that they face increased logistics risks and they will build redundancies in their supply chains to hedge against these new risks. Alternatively, such companies could hold inventories to reduce risks. The net effect of these new investments will be a global economy that is less sensitive to exogenous climate shocks.

6 Predictive Test #6 Voting on Adaptation Friendly Local Public Goods Investment

All of the examples I have listed above focus on private solutions to emerging climate change challenges. There are many examples such as building sea walls, dykes or investing in coastal wetlands where government is needed to collect tax revenue to finance publicly provided public goods. A study of San Francisco's lowlands can be very informative (see Polek, Cragg, and Polasky [2012]). A behavioral economics view of voters would posit that they are myopic and impatient and thus will oppose higher taxes now for investments to protect local areas. A rational expectations model would posit that home owners will tradeoff the costs of higher taxes now versus the expected present discounted value of benefits from reducing the future risk of disaster because it will be capitalized into their property values. If affected areas held direct binding voter referendum then this would offer a direct test of the rational expectations optimism.

7 Conclusion

Implicit in much of the "doom and gloom" worldview expressed by environmentalists is an embrace of behavioral economics. In contrast, neo-classical economists fosters a more optimistic view of our individual and collective ability to cope with emerging and even ambiguous risks. The "behavioral" man "doesn't know that he doesn't know." A person who knows that he doesn't know and is risk averse will invest in a series of options and strategies to cope with new risks. A silver lining of climate change is that we will have a new laboratory to test key ideas currently being debated in academic economics.

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