EconoFact Chats: Understanding Uncertainty

Nicholas Bloom, Stanford University

Published on 19th February 2023

Michael Klein:

I am Michael Klein, executive editor of EconoFact, a nonpartisan web-based publication of the Fletcher School at Tufts University. At EconoFact we bring key facts and incisive analysis to the national debate on economic and social policies, publishing work from leading economists across the country. You can learn more about us and see our work at www.econofact.org.

In a February, 2002 news briefing in response to a question about the supply of weapons by Iraq to terrorist groups, then defense secretary Donald Rumsfeld famously said, "There are known knowns. Things we know we know. There are known unknowns. Some things we do not know. But there are also unknown unknowns. The ones we don't know, we don't know." Uncertainty, known unknowns, and unknown unknowns are clearly important in military conflicts. Uncertainty is also important in economics. It affects people's decisions on how much and what to buy, companies' decisions on when and what to invest and whether or not to hire, and the government's choices about spending and tax policies. But how can we measure uncertainty? And with these measures, can we show an effect of uncertainty on economic outcomes? Kristalina Georgieva, the Managing Director of the International Monetary Fund, said in January, 2020, "if I had to identify a theme at the outset of the new decade, it would be increasing uncertainty." One of the economists who has worked on measuring uncertainty and seen its economic effects is my guest today, professor Nicholas Bloom of Stanford University. Nick, welcome back to EconoFact Chats.

Nicholas Bloom:

Thanks very much for having me. It's great to be back.

Michael Klein:

Oh, it's wonderful to have you back, Nick. Nick, what led you to try to measure uncertainty, and determine its economic effects?

Nicholas Bloom:

Oh, it's a kind of bit of a random path. So when I was doing, I did a master's in Oxford University in '94 to '96, a very long time ago. I remember when I did that, there was a book by Dixit and Pindyck, called Investment Under Uncertainty, which oddly enough is quite technical, but it was kind of in airports as when I got interested in reading that. But it was mainly theoretical. There's no data, and it just happened that my girlfriend at the time and now wife was working at the Bank of England and was looking at financial options markets and that had data, that had all this data on implied volatility, uncertainty, and so I was like, "wow," put one and one together and thought this would be an interesting thing to do my PhD on.

Michael Klein:

So is that book by Dixit and Pindyck the only airport book ever with Itô's lemma in it?

Nicholas Bloom:

Yes. I mean, it's amazing. I've actually spoken to publishers about potentially doing a book on uncertainty, work from home, management, some stuff I work on, and I said, "i'd love to be as successful as that book." And they're like, "a) forget it. It's just like, that's a superstar book and b), it's full of maths, so even we don't know what makes it so popular in airport bookstores."

Michael Klein:

Yeah, I think a lot of people, once they settled into their seats, were a little surprised to see stochastic calculus. It kind of helped them sleep on a long flight, I suppose. So before going into the results about the empirical analysis of uncertainty, let's frame our discussion by talking about what economic theory has to say about uncertainty. First, what have economists said about the nature of uncertainty?

Nicholas Bloom:

Well, your initial quote was perfect for setting this up. So Frank Knight back in 1921 said, look, there are two types of things you can think about. There is known uncertainty, which he called risk, which to be honest nowadays is just basically called uncertainty, which is when you know the distribution of something. So good example, if you're flipping a coin, if it's fair, we know it's 50% heads, 50% tails. Then he called something back then uncertainty, which is now generally called 'Knightian uncertainty,' is when you don't know the distribution of something. So an example might be if I asked you to say, "how many coins have ever been minted in the history of human civilization?" And you're going to be like, "how on earth do I know, that's like everything from Romans to..." It's just impossible to figure it out. And that's now called Knightian uncertainty, and that is kind of, I know there's unknown unknowns or known unknowns, but it's something that we can't put a probability distribution on. It's also being called ambiguity as well sometimes in the literature.

Michael Klein:

I think that term ambiguity is good. So why does ambiguity or uncertainty matter for economic outcomes?

Nicholas Bloom:

It matters when you've got to decide about something in the future, and it's costly if you make a mistake. So probably the best examples are firstly firms thinking about investing or hiring people. So if you're a company, you want to go out and set up a new factory, or you'll say Walmart and open a new store, you make a mistake, and put it in the wrong place, it's very costly to unwind now. Think about hiring new employees. So when you're forward looking, for firms hiring and investing. For all of us, for consumers, the classic decisions might be buying durables, so like buying a house, or a car, or a washing machine. These again are decisions, if you buy the wrong car, it's expensive to unwind it. And so uncertainty tends to make us cautious. Less likely to act. And if you're doing something like buying a cup of coffee from Starbucks, it's only whatever, it used to be $3, it's probably now $5. It's something that's small fry and it doesn't really matter. But for major decisions, investing, hiring, buying durables, it turns out to be potentially quite damaging to those decisions.

Michael Klein:

Hopefully when you buy the coffee from Starbucks, you're not that uncertain about the quality, but you might be more uncertain about people you hire, whether they actually work out or not, right?

Nicholas Bloom:

Yes, that is another factor. So if I'm a firm, think of I'm Walmart, I'm deciding whether to open a new superstore. That cost, let's say $10 billion, I figure out if I make a mistake and scrap it, I'm only going to get $2 billion back. I'll get the land back. But all the buildings are pretty useless. There's enormous uncertainty for them about general retail trends. Is it online, offline? Who's going to live there? As you say, how good the construction of the store will be, the workers? So for Walmart, they're going to say, "look, here's my mean estimated profit, but I need a buffer. I need what's often been called 'real options.' I need to get not only above that, I need to price in some uncertainty."

Michael Klein:

So given this framing, Nick, we'd like to know whether the effects of uncertainty on economic outcomes, are big or small, but to do this, we need to measure uncertainty. How have you done that in your research?

Nicholas Bloom:

So I would say for me and others, there are probably three broad groups of measures. So one is the one I first started working with, and it's maybe the oldest, which is from financial markets. So for example, if you look at the S&P 500, if it's bouncing up and down every day, you tend to think things are uncertain. I mean, in some ways it's kind of a measure of the value of at least publicly traded firms, and if it's going up and down, there's a lot of uncertainty. A slightly more sophisticated version of that is what's called implied volatility. So we take options prices and invert them out through Black-Scholes, you can get a market estimate. So that's group one, is financial markets, either stock market vol or implied vol.

Group two is survey data, and survey data, you go out and survey tens of thousands of firms or individuals. It's harder, there's these surveys they ask you, "How uncertain are you right now? Low, medium, high, very high?" It's less clear how quantitative that is. I've been doing some stuff in the UK and the US we've asked firms to forecast sales in different bins and put subjective probabilities about that...around that. That's another good option. The problem with survey data is it's expensive to collect and it's hard to go back in time.

The third group comes from text of which probably the most well-known would be newspapers. So what you can do is go back and just search or scrape basically newspapers to find the frequency of the word uncertainty. You may think that this is, that's a bit simplistic, so maybe it say let's say uncertainty within 10 words of the word...business or economics or growth or some policy word. But people have been searching, scraping Twitter, for example. But its this text to data methods.

Michael Klein:

So these are all measures for the US or the UK, but you've also developed measures for a wider range of countries as well, right?

Nicholas Bloom:

Yeah. So the newspaper stuff can be used across countries, but you can't compare levels. So you can go and scrape French newspapers, and German ones, and British ones, but we can't really compare levels because the newspaper structure's different. In a project I've been doing, in fact, with the IMF, so your quote earlier was perfect, we take The Economist and these have these monthly country reports. So [inaudible] in the Economist Intelligence Unit puts out a report for about 140 countries once a month, and it's about 30 pages long, and they have a very standardized structure, and we search for the frequency of uncertainty in those reports. Turns out that's actually does seems to do a pretty good job.

So in the US for example, if you correlate that with stock vol, or surveys, it lines up. What you tend to see is in developing countries uncertainty's highest. So if you go to let's say the reports for Africa, central

America, some of the poorer parts of Asia, it talks a lot about uncertainty. When you read it, it's talking about policy, domestic policy, political situation, wars. Sometimes the effect of overseas policy. Middle income countries is medium and developed countries here in the US and Europe actually has the lowest count. So in some ways it's ironic to me that much of the literature on the measurement and effective uncertainties focused on the US, which actually is relatively stable on a global context.

Michael Klein:

So when we have multiple indicators of a similar thing, we like to check to make sure that there's a rough agreement amongst them. Is that the case with these different measures of uncertainty, or do they move separately from one another and give you different pictures of what's going on?

Nicholas Bloom:

Yes, rough is a good term there. So I would say the correlation is about 0.5 and depends what you think. That's a glass half full or a glass half empty. Yeah, I mean, this [inaudible] says they definitely move together. So let's just show you a graph of a newspaper mentions stock market volatility, and firm surveys, they move together, but the magnitudes are very different. So just as an example, in fact, I think newspapers spiked by 4-500% with COVID. Stock market vol went up by about 2-300% and firm subjective uncertainty doubled. So you can see there's big differences. Another era there is interesting differences with Donald Trump. So after the election of Donald Trump, there wasn't particularly higher measures in financial markets or in surveys, but in newspapers it surged. So Trump was certainly all over the news. Newspapers talked a lot about uncertainty. We didn't see it so much picked up in other areas.

Michael Klein:

So going back to what we talked about earlier, Nick, do you think these indicators as reflecting ambiguity or uncertainty, going back to the Knightian idea of ambiguity, and what you call the distribution of coin flip idea of uncertainty.

Nicholas Bloom:

I think they mostly predict uncertainty, apart from huge spikes where they predict like ambiguity or Knightian uncertainty. So most of the time if you look at what's going up and down, it's some government decided to make a policy announcement, or the price of oil or OPEC has done this, or there's some companies announced new results, the big spikes on the other hand...so I think of 9/11, global financial crisis when it just broke out, COVID the beginning of the pandemic...there, it does feel like there's elements of Knightian uncertainty or ambiguity because I mean, for example, take 9/11, for the early days of 9/11, the first two, three days, no one actually stepped forward to say who's responsible. Bin Laden didn't initially take responsibility for it. And so there's the anthrax attacks, no one knew what was going on. With the pandemic, it was very hard early on even to get ideas of whether it was spread by touch or by the air, the mortality rates, et cetera. So I think these big spikes are big surges of Knightian uncertainty, but the smaller fluctuations are more measures of measurable uncertainty.

Michael Klein:

And that would make sense I suppose, because these are kind of once in a generation or even once in a lifetime events, and so you don't have other things to compare it with. So it makes sense that if you have COVID or 9/11 or the Lehman crisis, people don't have a frame of reference for it. So that seems consistent with this definition that you've made between uncertainty and ambiguity.

Nicholas Bloom:

Yes, I mean, definitely. It matches very much the business cycle. So I think it was Bob Hall, one of my colleagues at Stanford talked about what's called the Anna Karenina theory of recessions. So if you look at growth periods, they're all kind of similar, but like the book where it says, "happy families are all alike, unhappy families are all different," recessions in the US and globally seem to be different. So if you look at US recessions, it's the pandemic, there was 9/11, there's the financial crisis, there's OPEC. So downturns seem to be driven by unexpected events, and those events also as you say, are different. We've never seen anything like them before or rarely, and so they generate big surges of uncertainty. So I think it kind of goes together in a picture that in normal growth periods uncertainty is lower, things are predictable. It's kind of uncertainty in recession, certainly at the beginning, there's some huge event often that causes it, uncertainty picks up and it's much more a ambiguity or Knightian uncertainty in that initial early phase.

Michael Klein:

So you were saying that you have this information across different countries, and do you see in this information any patterns across countries that speak to whether there are higher or lower levels of uncertainty? Can we say in countries that have this characteristic or that characteristic, uncertainty or ambiguity seems to be higher?

Nicholas Bloom:

One thing that's interesting, I mean, we're kind of pulling it out is if you look at the level of democracy, it looks like democracies tend to have lower on average. As you get less and less democratic, and more autocratic, it tends to go up. But there's a reduction, till you get to very autocratic, it goes up again. I think what's going on is democracies are kind of predictable chaos. We know particularly anyone that's been to Italy, but the UK's been through a fair amount of turmoil. Governments come and go, there's churn, but you kind of know what you're getting. As you go to more autocratic regimes you have things that seem to be stable for a while, and then there's a revolution or a coup, or the leader dies and you get absolute and unpredicted chaos.

So one thing is the political structure, democracy in that sense are slightly more predictable. They avoid the left tail outcomes. The level of development's, another thing we talked about earlier, it seems to be in developed, well-functioning countries, Northern Europe, the US, Japan, Australia, New Zealand, et cetera, uncertainty's low on average. The types of events that are extreme outliers tend to be rarer. I think one of the drivers there is policy, however much unhappy, I certainly wouldn't say that US or European policy has been perfect by any means, but it's more predictable, more reasonable than some of the policies, particularly in autocratic developing countries whereby you see terrible things that are happening. Or in fact, if you look at Europe and the US, if you go back in history, if you look at how these countries were run 500 or a 1000 years ago, I imagine if you could have measured it, uncertainty would be far higher back then, where some despotic leader would make some terrible decision. So governments, government and governance is hugely important for this.

Michael Klein:

So one of the advantages of all the measures of uncertainty that you're talking about is that they're pretty contemporaneous. So what about now, are we living in particularly uncertain times?

Nicholas Bloom:

Yeah, again, I thought the quote from the IMF earlier was great. We are kind of like a 7 out of 10. So to put it in perspective, the nineties looking back and it turned out to be a period of relatively low uncertainty and calm. I mean, it seems anyone, and I was born in '73, so I can remember that as an adult.

But in most of our data it looks kind of low. It's been picking up, rising. 2008 was a big spike up, dropdown. Obviously 2020 was an enormous surge. It does look like uncertainty is slowly trending up, albeit with kind of punches and jumps. I think one reason is politics certainly in Europe and the US has become more polarized and more aggressive, and more combatorial in the last 10 years. Maybe globalization. But yeah, our measures, I would say, have a weak upward trend. It's slightly hard to tell between bad luck, and a trend, but certainly if you run a regression, it's significantly rising up and you kind of see it visually with '08 and 2020 in particular.

Michael Klein:

So you have these measures, Nick, and when you want to see whether and how they affect economies, what results do you get?

Nicholas Bloom:

So you can do it at the firm, by firm level, or you can do it at individual consumers, or at the national level. You generally get the same results, which is when uncertainty goes up, you see a big drop in business investment. So investment, buying, plant equipment, computers, et cetera, drops the most. That's maybe not surprising. It's a very expensive decision to reverse. You see a drop in hiring. So firms pause, they're cautious, they say, "Do I really need to hire that extra person? Maybe I just wait until the conditions are clear." And then on the consumer side, you see a big drop in spending, particularly in consumer durables. In fact, Christina Romer has a famous paper showing in the Great Depression, going back about 100 years, there was a huge drop in durable expenditure, so people stopped buying. I mean, durables back then was cars, I guess, but household equipment, and they'd still buy food, they'd still buy clothing. So generally investment is down, durable expenditures down, hiring is down a bit, and that generally overall causes a recession.

Michael Klein:

Do you find that these effects of uncertainty and economic outcomes differ in any systematic way across countries, or across different kinds of businesses?

Nicholas Bloom:

Certainly across countries. We found this is kind of the double hit to developing countries. Not only is the level of uncertainty higher, they appear to react more strongly to it. And one reason you think is they're financially not as robust. They're economically not as robust. So if you're a country, a company in a developing country, you probably don't have nearly as much financial buffer, as much cash flow, so this affects you more. In terms of firms, the ones that appear to be impacted most are the ones with the longest horizon, and doing the most irreversible activity, which is basically R&D. So you think of research and development, if you're doing a five year R&D project, three years in something goes wrong, you really can't sell the half-finished research. So it's totally irreversible and you're very sensitive to market conditions. So it's one of the reasons why stability tends to drive growth, because it promotes investment, it promotes R&D, and on the individual side, it also promotes investment in education. So yes, it appears, long run, long focused, research, development, investment is the most sensitive.

Michael Klein:

So do you have any practical advice for companies or for individuals how they can insulate themselves from the effects of uncertainty?

Nicholas Bloom:

Yeah, so yes, I link back to your question earlier about rising uncertainty. Actually because of that, put something out in the Harvard Business Review in their blog piece and we said, "look, there are three steps you can take." One is paying attention to politics. I hate to say it, but politics has become more important. That famous quote about the business of business is business, that's true. But politics is, think of Brexit in the UK or Trump in the US, politics is really affecting business. So one is pay more attention to politics to have a better idea of what's coming down the pipe. The second is pay for flexibility. And by that I mean if you're buying property, you might want to think of signing shorter leases, or lease rather than buy. It's more expensive per year, but it means you can get out of it. Lease, contract staff rather than hire them permanently. Lease equipment rather [in audible].

Basically, there's often decisions you can say, do I buy the season ticket or the individual ticket per game? One is more expensive per game and the other, but the other loses flexibility. I'd suggest more with uncertainty, pay for flexibility. And then the third is scenario planning. So it turns out, think about the pandemic or think about 2008. There was a big premium for firms that reacted quickly. And one of the best ways to be able to react quickly is to do scenario planning. So you have a emergency drills, emergency tests. If you look back at the pandemic, typically the firms that had that, they never got exactly the pandemic scenario right. They got something that was a bit like it, and the companies say, look, we're going to go to our major fire plan. It's not the same, but at least we have some rough idea of what to do.

Michael Klein:

What about governments? What can governments do in the face of uncertainty or ambiguity to make their work better?

Nicholas Bloom:

I mean, governments can basically stand back and be stable. I mean, the main things that governments can do is try and reduce generating uncertainty. So I have a paper with Steve Davis and Scott Baker, whereby we've looked at measuring uncertainty and we find that governments generate about 30 to 40% of it. And you can imagine why. It's like, well, will the government have a trade war with China? Yes or no? Will it introduce a minimum wage? Is it going to [inaudible] in the unions? Is it going to allow this pipeline, et cetera? Is it going to ratify NAFTA? And that generates tremendous uncertainty.

There's also, at the local level, I mean, where I live, there's endless debate about whether or not you're can have planning constraints, and tax laws, et cetera. So I think at the aggregate level, some things that obviously they've done that have been great, which is like central bank independence, to try to have some more stable fiscal positions, but more so also, at the micro level, avoid what I call tinkering. So the governments, the best thing is basically stable policy, rules, guidance, particularly avoid changes at the last minute.

Michael Klein:

So Nick, your research has made us a little less uncertain about uncertainty. Thanks for joining me today and discussing this important work.

Nicholas Bloom:

Thanks very much. Great to be on.

Michael Klein:

Wonderful to have you. This has been EconoFact Chats. To learn more about EconoFact and to see the work on our site, you can log into www.econofact.org. EconoFact is a publication of the Fletcher School at Tufts University. Thanks for listening.