A recent literature demonstrates that uncertainty shocks can explain business cycles, financial crises and asset price fluctuations with great success. But the way uncertainty shocks are measured and modeled varies from paper to paper. In some papers, an uncertainty shock means that an aggregate variable, such as TFP, becomes less predictable. We refer to this as “macro uncertainty.” In other papers, an uncertainty shock describes an increase in the cross-sectional difference in firm outcomes. We refer to this as “micro uncertainty.” Yet others use the disagreement between forecasts of aggregate variables, “forecast dispersion,” as a measure of uncertainty. One reason that these various phenomena are conflated is that they covary. At first glance, this paints a consistent picture of many uncertainty measures pointing to the same conclusion. But aggregate and idiosyncratic shocks typically constitute an orthogonal decomposition of variance. Similarly, when idiosyncratic information is more precise, forecasts can be more dispersed and yet the forecasters may be less uncertain. It is far from obvious that these various measures should covary. This raises the question: What is the mechanism that links micro uncertainty, macro uncertainty and forecast dispersion? By uncovering this mechanism, we gain a deeper understanding of what the nature of uncertainty shocks is, where they come from and how they can be related to disaster risk.

One possible explanation for the covariance between micro and macro uncertainty is that both are driven by business cycle fluctuations. We show that, even after controlling for various measures of the business cycle, micro uncertainty and forecast dispersion are both related to macro uncertainty in a significant way. Another possible explanation has to do with binding constraints. When aggregate uncertainty rises, constraints are tighter, constrained firms have significantly different outcomes than unconstrained firms, and dispersion in outcomes rises. This may well be true. But the same dispersion that shows up in firm earnings also shows up in macro forecasts. In other words, in times when professional forecasters disagree greatly about macroeconomic outcomes, firms also have idiosyncratic outcomes that differ greatly. An economic constraint creates different outcomes, but does not typically create differences in beliefs.

Our explanation for these three uncertainty related phenomena is that they are an outcome of a Bayesian belief formation process with private information. Firms observe
aggregate economic outcomes that are public, but they also observe private signals about future productivity. These private signals could arise from different interpretations of public data or a rational inattention phenomenon. Either way, heterogeneous information is essential to explain any forecast dispersion. Because firms’ beliefs about productivity differ, they choose different labor inputs and have different earnings. Clearly, heterogeneous signals can create dispersion in forecasts and in earnings, which is micro uncertainty. But how do forecast dispersion and micro uncertainty react to changes in macro uncertainty?

We explore this connection with two different mechanisms. For the first mechanism, we follow a very standard approach by estimating macro uncertainty as the conditional variance in an estimated GARCH process. In this model private signals and public priors about TFP growth are normally-distributed; agents update beliefs by forming a linear combination of priors and signals, each weighted by their relative precision. When macro uncertainty rises, past public information offers a less precise prediction of TFP growth. Therefore, the firm weights the past public information less and the heterogeneous signal more, resulting in more heterogeneous beliefs. When firms have different beliefs about TFP they make different forecasts and choose different amounts of labor, causing earnings to become more dispersed. While this simple story is logical, the calibrated model accounts for less than half of the observed fluctuations in forecast dispersion and only about 80 percent of the fluctuations in earnings dispersion. Furthermore these uncertainty measures have counterfactually low correlations with GDP growth.

What explains the remainder of fluctuations in forecast and earnings dispersion? We show that nonlinearities in the economy amplify micro uncertainty and forecast dispersion shocks, and that they generate correlations between our three uncertainty measures and GDP growth that are close to those in the data. The nonlinearity is important because it captures the fact that macro shocks are not normally distributed. In particular, the degree of non-linearity regulates the left tail of the distribution and thus the probability of rare negative events, i.e. disasters. The nonlinearity also generates time-varying disaster risk. Our model shows why times with high disaster risk exhibit high macro uncertainty, but also lots of belief dispersion and therefore micro risk. Our conclusion is that disaster risk is a mechanism that can explain the link between forecast dispersion, and micro and macro uncertainty shocks.

More broadly, by developing a model that is consistent with many features of the professional forecast data, we learn about how agents form beliefs about future economic outcomes. A better understanding of the belief formation process gives us a better understanding of how and why uncertainty (risk) can fluctuate. Changes in risk matter for almost every decision, price and quantity in the macroeconomy.

\[1\] This finding is preliminary. We still need to work on aspects of the calibration.