Roger Cook and Carolyn Kousky make some intriguing points in an article in the Summer issue of Resources. They discuss three problems confronting insurance companies, all of them probably exacerbated by climate change: fat tails, tail dependence, and micro-correlations. Although the names may not be self-explanatory, these are phenomena with great significance for society's management of risks. One lesson is that it's not enough to worry about the most likely scenarios for future harm. We also need to worry that some huge risk will materialize, or two different kinds of major harm will "just happen" to take place at the same time, or that a plague of smaller risks will all hit together.

"Fat tails" means that the tail of the distribution tapers off slowly, so that extreme events are more likely than we would normally expect. (The term "normally" in the last sentence can be read with both its general meeting or as referring to the Gaussian normal distribution.) An example is Hurricane Katrina, which was very far indeed from the average harmful weather event.

The second problem is called "tail dependence" — really bad things are more likely to be connected than less extreme versions of the same thing. Normally, the chance that a fire will occur somewhere has no relation to the chance that an earthquake will occur there. But extremely strong earthquakes often come with major fires — the San Francisco earthquake of 1908 is the classic example. For an insurance company that writes insurance for two kinds of events, this is a scary possibility.

The third — and I thought this was where things really became interesting — is called "microcorrelation." These are very small correlations between events that can cumulatively become very important. The example they give involves flood events. If you randomly pick two U.S. counties, the correlation between flood events is just about zero. But if you aggregate 500 copies, you start seeing the correlations. The reason is that large scale weather phenomena can link weather events at great distances — floods in California and fires in Australia can both reflect El Nino conditions.

Fat tails, tail dependency, and micro-correlations pose real threats to insurance markets — and therefore to ordinary people who would like to have some protection against large-scale risks. Risk diversification through the security markets also has limitations, as we've all seen recently. Figuring out how to create mechanisms for overcoming these barriers to risk management isn't easy.