Max Huppertz

Research statement

My research focuses on global development, combining rigorous reduced form identification with structural methods to understand implications for the whole economy. The main topic I study is the impact of climate change on firms and trade; my job market paper quantifies how firms in poor countries react to extreme weather events and shows the implications for climate change focused policy. Another paper of mine uses almost 200 years of weather and trade data to show that climate change increases trade costs. The second strand of my research studies the effects of information frictions along value chains, with projects on the antimalarials market in Kano, Nigeria and the impact of firm information about trade policy on firms' exports and imports.

Climate change, firms and trade

In my job market paper, "**Sacking the sales staff: Firm reactions to extreme weather and implications for policy design**," I study how firm reactions to extreme weather should inform policy aimed at reducing the negative impacts of climate change. Climate change and extreme weather events are a global problem but especially affect poor countries. To understand how non-agricultural firms in poor countries react to weather shocks, I combine firm-level data from sub-Saharan Africa and South Asia with high-resolution weather data. Using random year-to-year weather variation, I show that weather shocks reduce firm productivity. I then show that firms react to these shocks by scaling back complementary expenditures on *productive capability* – hiring less machinery, less office space and fewer non-production workers. This makes firms even less productive. To quantify the aggregate implications of productive capability reactions for climate change policy, I develop a simple international trade model that includes this mechanism. I combine the model with machine learning estimates of the impact of climate change to discipline counterfactual analyses. Counterfactuals show that productive capability reactions make (i) policies aimed at larger firms and (ii) policies allowing firms to adapt to climate change especially effective at countering the negative impacts of climate change, compared to a model that ignores these reactions.

In another paper in the same strand of work, "**Climate change increases bilateral trade cost**," I explore an as-yet unstudied channel through which climate change impacts trade flows and economic activity. It is well established that climate change affects economic production, but its effects on trade networks, especially trade costs, have not been studied. I use international trade and weather data covering almost 200 years to show that climate change increases trade costs. Estimating a simple gravity framework, I find that rising temperatures at the origin or destination country increase bilateral trade cost. I use a standard trade model to quantify the welfare impact of increased trade cost, finding that the impact of climate change on trade cost since the 1910s reduced welfare in the 2010s by 0.81 percent. Looking at the distribution of gains, almost all countries are harmed by trade cost increases due to climate change but poor countries especially so. My methodology can easily be embedded in studies of the impact of climate change using models of international trade.

My **future research agenda** in this literature will hone in on how firms in poor countries think about extreme weather events and climate change, and how we can help them to cope with those. This

includes, first, in-depth original data collection on how managers of firms of different sizes think about this question, figuring out what existing adaptation strategies are, how firms learn about these, and what may be keeping firms from using them. To design truly efficient policy that will help poor countries cope with climate change, we need to understand how firms are currently responding and how effective those responses are. We can then focus on expanding those measures to more firms, by removing key obstacles to adoption and leveraging the ways firms learn about climate proofing in practice. My job market paper is a first step towards this larger research agenda, which I hope to pursue over the coming years.

Information frictions in value chains

Turning to my research on information frictions in value chains, "**Information frictions, demand for quality, and welfare in the market for antimalarials**," with Russell Morton, assesses whether low adoption rates of gold-standard antimalarial medicines (ACTs) in a global malaria hotspot are driven by consumer uncertainty about pharmaceutical quality. We study whether the risk of buying a substandard medicine – a pill that is either counterfeit or degraded – matters for consumers' purchasing decisions. We employ novel and cost-effective scanner technology to test pills obtained via mystery shopping, which gives us the likelihood of purchasing substandard medicines at various vendors. We then elicit households' beliefs about quality at these vendors and randomly inform households about quality at vendors around them. We also randomly select markets in which we provide a pill testing stall consumers can use to assess the quality of pills they have purchased.

We use the RCT to estimate the impact of better information on purchasing decisions. To quantify the longer-run impacts once antimalarial vendors take consumers' improved information into account, we estimate a structural model of the market for antimalarials. We use the RCT results to validate the model and estimate price changes and resulting long-run adoption rates. This improves on WHO estimates of the welfare cost of substandard drugs and allows us to show that commonly employed policies to increase ACT adoption vary widely in their efficacy depending on consumer information. We have raised about USD 80,000 in grant funding for this project, which we used to implement two pilots, one in a urban and another in a peri-urban area, and are writing a working paper based on the pilot results.

Another project in this area is "**Information frictions and firm behavior: Evidence from the African Continental Free Trade Area (AfCFTA)**," with Yewande Olapade and Socrates Majune; a write-up of pilot results is available online. AfCFTA lowers tariffs, harmonizes standards and decreases red tape, aiming to increase intra-African trade. We find, however, that a substantial fraction of Kenyan firms is unaware of the agreement. This is true even among larger firms and firms already engaged in international trade. We ask whether increasing awareness of the agreement and giving firms actionable information on changes relevant to their sector can increase engagement in international trade, especially for firms that are already directly exporting or importing. We use a randomized intervention providing actionable information on AfCFTA, including the ability for firms to ask questions relevant to their operations. We combine our survey results with Kenyan customs data to track firms' international transactions following the intervention. We embed our RCT results in a

model of international trade featuring misinformation about trade cost, estimating the welfare costs of the information friction we highlight, and the benefit of policies aimed at removing it. We have raised about USD 110,000 in grant funding and are currently implementing a pilot, which includes designing the firm training intervention.

My **future research agenda** in this literature intersects with my interests in the economics of climate change. As I mentioned above, understanding how firms learn about adaptation strategies will be crucial for improving adoption of those strategies, and it is a core question about information flows along value chains. Beyond that, I am interested in expanding my work with Russell Morton on pharmaceutical markets in poor countries. We noticed that branding, including the names of generic drugs, seems to explain a lot of variation in prices within and across pharmaceutical vendors, and are interested in assessing whether this makes entry easier for pharmaceutical sellers. They do not need to build a brand reputation if they can latch onto consumer impressions of drug brands they sell.