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Title: Hedging credit risk of smallholder farmers with remotely-sensed Vegetation Health Indices



Farmers' vulnerability to adverse weather events, which are likely to increase in frequency and magnitude due to climate change, is a main impediment to a sufficient credit supply. Smallholder farmers' access to credit is, among other factors, crucial for productivity and output growth. Weather index insurance could help lenders to compensate for lacking installment payments in years with severe weather conditions and, thus, are considered to accelerate agricultural lending. Using a unique borrower dataset provided by a microfinance institute in Madagascar, we analyze the relationship between remotely-sensed vegetation indices and the credit risk of smallholder farmers. In our analysis, we consider the Vegetation Condition Index, Temperature Condition Index and the Vegetation Health Index at the individual branch and the aggregated bank level. These indices are available globally and can potentially enhance the effectiveness of weather index insurance by reducing basis risk as a major drawback of index insurance. Credit risk indicators, which are derived from portfolio at risk measures, serve as dependent variables in a sequential logit model. The three vegetation indices as well as socio-demographic variables of the lenders are included as independent variables. Our results show that the credit risk of smallholder farmers is explained, to a large extent, by the vegetation indices. The Vegetation Health Index, as the weighted average of the other vegetation indices, shows the highest influence on credit risk. The conditional chance that at least one instalment payment is one day overdue can be reduced by up to 78 % per index point. For instalment payments that are overdue more than 14 days, we found a reduction of the conditional chance of up to 75 % per index point. The conditional chance that an instalment payment is overdue by at least 30 days is reduced by up to 53 % per index point. Thus, remotely-sensed vegetation indices can be utilized for index insurance to hedge agricultural credit risk. A smaller risk exposure of the lenders could result in reduced interest rates for agricultural borrowers. Remotely-sensed index insurance could therefore enhance access to credit, contributing to a sustainable development in the study region.