A Community Capitals Framework For Social-Equity Based Resilience Assessment in Rural Communities

J.W. Wells[1], Brooklynn G. Bennett[2], Jason S Bergtold[3]

1) Undergraduate Student Agricultural Economics, Kansas State University; 2) Undergraduate Student Agricultural Economics, Kansas State University;
3) Professor Agricultural Economics, Kansas State University.

Introduction

Resilience metrics that are social equity-based and provide a holistic view of communities for rural communities in Kansas is crucial for resilience planning and efforts in these communities to natural disasters and significant disruptive events. The purpose of this poster is to present a preliminary holistic community capitals framework for assessing resilience that is social-equity-based for rural communities. The research framework and initial assessments focus on a rural community in western Kansas. The poster provides an initial look at the community capitals framework, data collection efforts, and a more detailed look at financial and natural capitals and resilience for a western Kansas rural community.

Community Capitals Framework & Social Equity

The Community Capitals Framework is a holistic approach to examine seven categories of interconnected characteristics of a community. The seven categories are Natural, Political, Social, Cultural, Financial, Built, and Human. Natural capital examines the natural resources that can be utilized by residents of a community (ex: rivers, lakes, wildlife, natural features, etc). Political capital measures the ability of its residents to influence governance and law enforcement. Social capital measures the social connectivity of individuals and households to their larger community. Cultural capital examines the values, languages, races and ethnicities, and other demographic characteristics that comprise culture. Financial capital demonstrates the financial resources that are available to a community. Built capital examines the man-made infrastructure that supports a community (ex: telecommunications, water treatment, waste management, roads, etc). Human capital measures the ability of residents in a community to lead as well as resident's education level and capacity for learning.

For this project, we examine equity from the purview of being "consistent and systematic fair, just, and impartial treatment of all individuals, including individuals who belong to underserved communities that have been denied such treatment, such as Black, Latino, and Indigenous and Native American persons, Asian Americans and Pacific Islanders and other persons of color; members of religious minorities; lesbian, gay, bisexual, transgender, and queer (LGBTQ+) persons; persons with disabilities; persons who live in rural areas; and persons otherwise adversely affected by persistent poverty or inequality.

Description of Study Area

Garden City is located in Finney County in the southwest part of the state and has a population of 28,000. It is a primarily agricultural community, with its major crops being wheat, milo and corn grown using water pumped from the Ogallala aquifer. Garden City is commonly classified as a boomtown because of its history of rapid population growth due to the feed grain and livestock industries attracting meatpackers to the area, causing a sharp increase in labor demand. This economic situation has caused Garden City to become one of Kansas' most diverse communities, with high populations of Latin American and Southeast Asian immigrants.

Natural Capital

Natural capital is defined as "those assets that abide in a particular location, including weather, geographic isolation, natural resources, amenities, and natural beauty" (Emery & Flora 2006). Natural capital is the most basic community capital on which the rest of the capitals build. In disaster resilience studies, an assessment of a community's natural capital often also includes its risk of natural hazards. This includes the natural disasters that might affect the area, any environmental hazards caused by pollution, and the impact of climate change on the area's natural resources.

Social equity in natural capital can be affected by many different factors, and disparities between groups can take two general forms: a lack of access to natural capital and an imbalance in impact of natural disasters (including climate change) and environmental hazards.

Financial Capital

Broadly speaking, financial capital is the financial resources available to invest in community capacity business development, support civic and social entrepreneurship, and accumulate wealth for future community development. Looking at this capital from a spiraling-up approach, financial capital is near the top. Many of the lower capitals build upon each other, which culminates in the need or application of financial capital. The most straightforward application of financial capital is towards enhancing built capital.

Social equity can be measured within financial capital as 'have' and 'have not', such as access to employment, homeownership, income, credit accessibility. This section attempts to measure the social equitability of disaster-resilience metrics.

Results and Conclusions

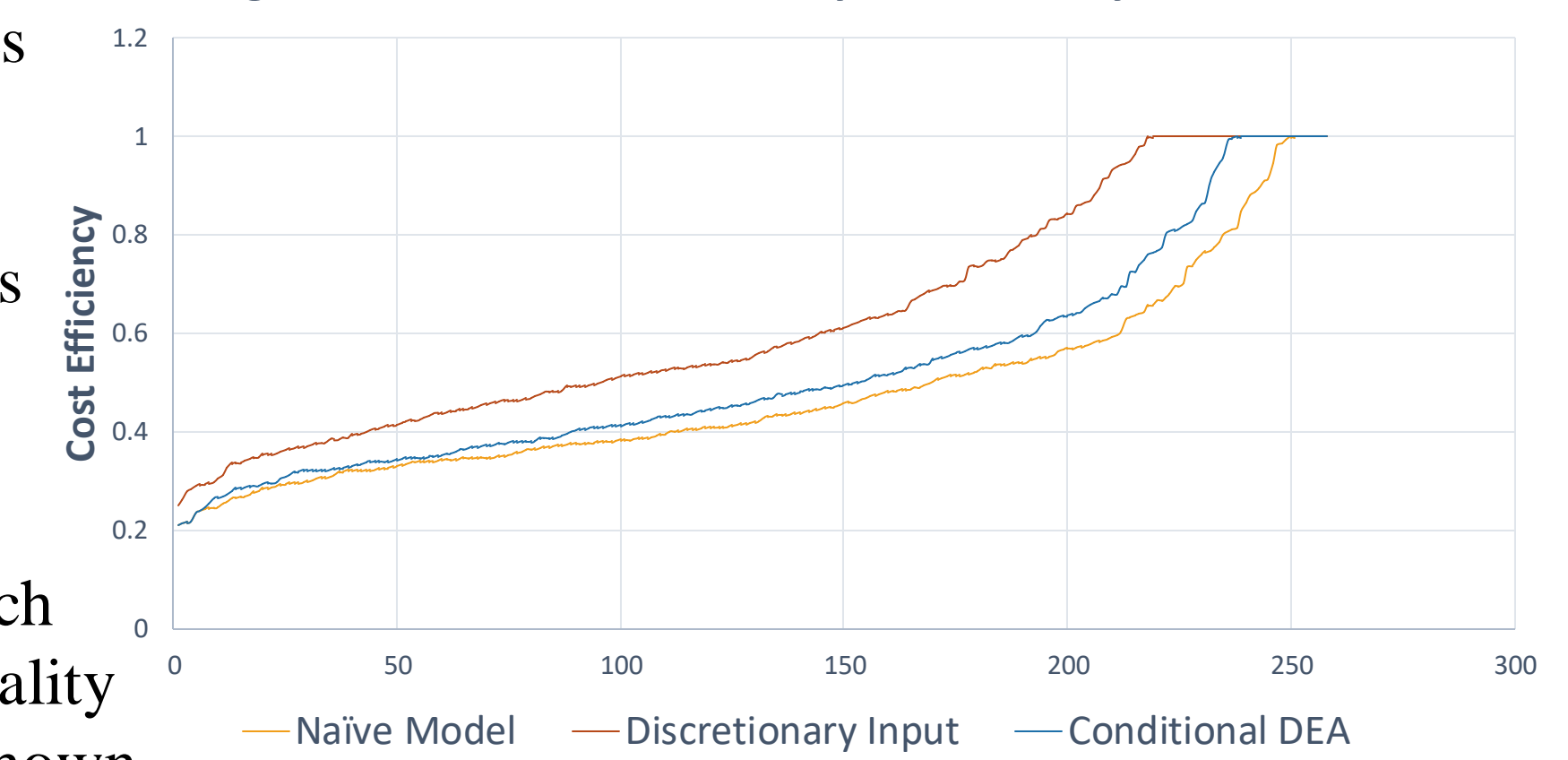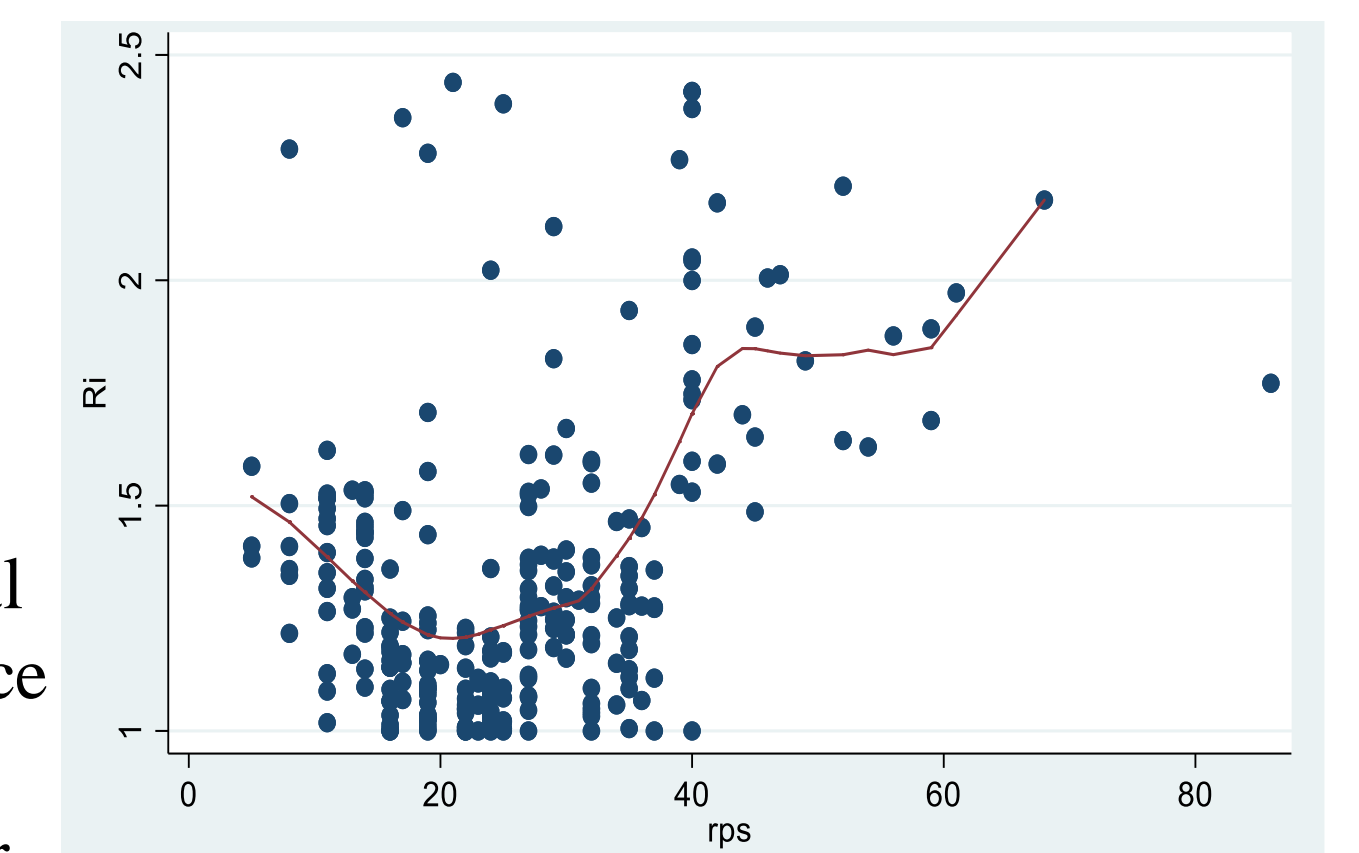Figure 1: Sorted Cost Efficiency Estimates by Risk Model

Figure 1 compares some baseline results from the three DEA models considered. DEA cost efficiency estimates for the naïve model, which assume risk neutrality (or no risk), are shown with the yellow curve. Results from treating risk as a discretionary input (the red curve) shows that the naïve model likely provides biased efficiency estimates. The estimates for the second model are only unbiased and consistent, if risk preferences are freely disposable and are scalable. Risk preferences not likely freely disposable as they represent preference relations that are often assumed to be static. In addition, the meaning of the scalability of risk preferences is unclear.

The results in Figure 1 for the conditional DEA model (iii) are misleading, as the results are not comparable across different risk preference intervals used to estimate conditional DEA scores. In this situation, for comparability we can use nonparametric regression to assess if the level of risk tolerance biases the DEA estimated by comparing the ratio of the conditional DEA score for (iii) to the naive DEA score for (i). A graph of the marginal impact on the level of risk aversion on this ratio is provided in Figure 2 below.

Figure 2: Marginal effect of risk aversion on ratio of conditional to unconditional DEA scores

Figure 2 shows that the level of risk aversion does impact cost efficiency estimates and results in a downward bias in efficiency scores from 25 to 125% depending on the level of risk aversion. Furthermore, the results from the conditional DEA confirm that risk tolerance not only alters the distribution of firms under the cost frontier but can shift the cost frontier, as well. The marginal effect in Figure 2 is significant at a 5% level of significance. Following Daraio and Simar (2014), model (i) and model (ii) are biased due to the fact that risk aversion can shift the cost frontier and risk preferences are not freely disposable. Thus, when incorporating risk into efficiency analyses using DEA, modelers must be aware of the impact risk will have on firm decision-making.

References

Coelli, T.J., D.S. Prasada Rao, C.J. O'Donnell, and G.E. Battese. 2005. *An Introduction to Efficiency and Productivity Analysis*. 2nd edn. Springer, New York.

Daraio, C. and L. Simar. 2007. "Conditional nonparametric frontier models for convex and nonconvex technologies: a unifying approach." *Journal of Productivity Analysis* 28: 13 – 32.

Daraio, C. and L. Simar. 2014. "Directional distances and their robust versions: computational and testing issues." *European Journal of Operational Research* 237: 358 – 369.

Mester, L.J. 1996. "A study of bank efficiency taking into account risk-preferences." *Journal of Banking & Finance* 20: 1025-1045.

Moschini, G and D. Hennessy. 2001. "Uncertainty, Risk Aversion and Risk Management for Agricultural Producers." *Handbook of Agricultural Economics* 1: 87 - 153.

Pope, K.F. 2009. *Cow-calf Risk Management Among Kansas Producers*. Thesis, Kansas State University.

Pope, R.D. and J.P. Chavas. 1994. "Cost Functions under Production Uncertainty." *American Journal of Agricultural Economics* 76(2): 196 – 204.

USDA. 2008. "Agricultural Prices." National Agricultural Statistics Service. Various issues.