

### Authors reply to comment #3

Thank you for your comments! We, the authors, are very glad to respond and discuss those questions in comments in details.

Q: There are some simplifications in the methodology that should be changed. Be careful when comparing with and without scenarios and assuming that all the negative impact is due to the existence of the natural disaster. Economy is a complex aggregate, and many factors may influence on the negative result. Consider ranges or confident intervals where some other factors may be included (such as price variation within a normal range). Make clear you are not assuming all the negative impact is due to drought. The consideration of an internal time trend is a good approach, but not sufficient.

A: Actually, the variation of price may be influenced by many factors. In those factors, besides the supply, the importation and exportation are also included. China is a big sugar consuming country for her large population and sugar is always in slightly short supply. Therefore, sugar rarely exports from China. For the aspect of importation, the amount of sugar imported is always under strict control because China is running a TRQ (Tariff Rate Quota) system for importing many agricultural products including sugar. In 2009, the quota of sugar imported is 1.945 million tons<sup>[1]</sup> and the actual amount of sugar imported is only 1.064 million tons<sup>[2]</sup>. In contrast, China produces about 11 million tons of sugar domestically in season 2009/2010<sup>[3]</sup>. Therefore, as the sugar imported accounts for less than 9% of sugar products in China, the importation of sugar can hardly have great influences on domestic sugar price.

In the sugar market of China, state sugar reserves play a special role. The central government buys sugar when market price is low and sells sugar when price is high, which intends to stabilize the sugar price. Between April 2009 and April 2010, the central government had four auctions of state sugar reserves<sup>[4]</sup>. However, the effect of stabilizing sugar price is not that significant. Every time when state sugar reserves released, the trend of sugar price is not influenced. Unexpectedly, it seems that on the contrary, the release of state sugar reserves encourage the rise of sugar price because the action of release is a signal that sugar market is in short supply.

All in all, during the period of 2009 drought, other factors have little influences on the variation of sugar price, except changes in supply caused by drought. Therefore, we set this drought to be the dominant reason of price variation and study the effect of disaster severity on sugar price.

Q: The determination of drought and non-drought scenarios may include more data from the time series. Is there any other period with water shortages? Was this period affected by drought? There were no previous water shortages affecting sugarcane prices? The consideration of just one drought period is a very severe assumption. It would be better if they test whether if the time series has any relation with sugarcane prices and water availability.

In relation to the previous comment, the link between yield loss and price loss is quite fuzzy. It is correct to assume a linear relation between yield loss and price change, but to calculate the coefficient you need more information about previous drought events.

A: We agree that to include longer time series will be better and to take water availability into considerations will be more precise. These comments are good advises to improve our paper.

Inspired by the local phenomenon we found when we investigated in this region (like severe

yield loss and monetary loss, fixed sugarcane purchasing price), the starting point of this research is to study the phenomenon of economic inequality between economic bodies in contract farming with the background of this catastrophic droughts. Hence, we study this topic from an economic perspective and our focus is just on the 2009 severe drought. Because we did not investigate data (like planting costs, water shortages) of other droughts in field works, we are not able to do such analysis proposed in comments. We will take all advised above into considerations and apply them in our further research.

Q: It would be useful if the water availability were mentioned. How severe was the drought? Data about the natural disaster is missed.

A: When we introduce the 2009 drought, we mainly focus on its impacts on local sugar industry to illustrate the negative effect of natural disaster. We agree that some physical description like water shortage should be added briefly to this paper and that may help readers have better understanding of this drought.

Q: The evolution of prices and the time trend was at least considered by Gil et al. (2013) so please make it clear when mentioned such publications in the introduction.

A: We agree that the paper of Gil et al. (2013) has good connections with our research and we will make it more explicit in new version of manuscript.

Q: They reach to the conclusion that option contracts are a good instrument to share drought risk. Many other authors have mention that, so it would be helpful if they include some financial risk analysis and more bibliography on option contracts for raw materials and drought.

A: We agree with this comment. More research about option contracts will be put into our new version of this paper.

Q: At the beginning of 3.4, it refers to the period from April 2009 till September 2010. It is not clear if they are talking about all the period or just the drought period. What are the rest of the condition that remain similar?

A: The time series we use that covers the drought period is from April 2009 to September 2010 because it includes the growing season and marketing season. Within the time series above, we use the data from April 2009 to October 2009 as pre-disaster series to predict sugar price in non-disaster scenario. The rest, i.e. from November 2009 to September 2010 is regarded as disaster effected series during which sugar price series in non-disaster scenario and disaster-hit scenario are compared.

Q: The CPI used to fix the time series appears to be confusing. April 2009 or April 2006? Correct the differences

A: The using of CPI applies twice in this paper and they have different purposes.

The first time of using CPI is when researching the internal trend of sugar price. We use a long time series of sugar price from December 1999 to December 2013 to investigate the endogenous trend in sugar price. Because the CPI of China has significant increase since 2007 and the official data of CPI is documented since December 2006, we simplify that the sugar price before 2007 is not significantly influenced by inflation. So we use CPI data since December 2006 to process the

sugar price series since 2007 to ensure that the sugar price does not affect by macro-economy condition like inflation.

The second time of using CPI is when researching the 2009 drought. We know that this drought lasts such a long time and it is quite necessary to remove macro-economy information from sugar price in order to ensure that changes in price are almost caused by drought only. So we use CPI to process time series of sugar price from April 2009 to September 2010 which covers the whole period of growing season and marketing season.

#### References:

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- [2] Yunnan Sugar Network. China imports more than 1 million tons of sugar in 2009. For brief version in English which is translated by the authors of this paper, please check file named *Ref #2* in supplement. For complete version in Chinese, please visit:  
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