

Was Sandmo Right? Experimental Evidence on Attitudes to Price Uncertainty*

➔ Yu Na LEE, PhD Student, University of Minnesota.
leex5244@umn.edu

➔ Marc F. BELLEMARE, Associate Professor and Director, Center for International Food and Agricultural Policy, University of Minnesota.
mbellema@umn.edu

➔ David R. JUST, Professor, Cornell University, Ithaca.
drj3@cornell.edu

Food price stabilization policies to decrease food price volatility¹ have been an important policy instrument in a number of developing countries after the global food crisis of 2007-08 and the sharp increase of food prices in 2010. Price stabilization measures are often implemented by governments under political pressure (Poulton et al., 2006), without careful justification for the high cost of implementation of such policies (Gouel, 2013).



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1. We use the terms "volatility," "fluctuation," "risk," and "uncertainty" interchangeably for variability of prices over time. Also, we focus mainly on staple food prices.

•••/••• Recent empirical work finds mixed results on the impact of commodity price risk on household welfare: Bellemare et al. (2013) find that there would be a net welfare gain for rural households from price stabilization; Bellemare (2015) finds that increases in food prices cause food riots, but finds no significant effect for food price volatility, suggesting that policy makers need to focus on lowering food price levels rather than food price volatility.

To complicate matters, households in developing countries are often consumers and producers of food, which makes it difficult to disentangle the impact of price volatility on the welfare of rural households when using observational data. In order to empirically estimate the welfare impacts of commodity price risk using observational data, high-quality micro-level data is required on each household's marketable surplus and income, as well as on the price of each commodity, and those data are not always available. In addition, the available data do not provide the required plausibly exogenous variation needed to cleanly estimate price risk preferences.

► Data and Methods

Given the important policy implication of the welfare impacts of price risk as well as the difficulty of accurately identifying them with observational data, we conducted a series of lab experiments to identify individual price risk preferences. To do so, we focused on the simple case where a hypothetical producer makes production decisions regarding a single output, and we ask the following research questions:

- (i) Do producers hedge against price risk by underproducing, as Sandmo (1971) famously predicted?
- (ii) How do results differ if the distribution of prices is unknown and producers deal with price ambiguity instead of price risk?

We conducted two types of experiments at Cornell's LEEDR lab with 48 students as our subjects. In the first type, we use a two-stage randomized design to first determine whether subjects face a certain or an uncertain output price and, conditional on facing an uncertain price, which of four different distributions the output price will be drawn from, with all four distributions holding the mean output price constant but offering different variances. This first experiment allows identifying the causal effects on output of (i) price risk relative to price certainty and (ii) increases in price risk.

In the second experiment, we follow the same setup as in the first experiment, with the difference being that we do not tell subjects which distribution we draw from when they face an uncertain price—we only tell them about the range of possible prices. This second experiment allows identifying the causal effect of price ambiguity on output decisions.

In conjunction with the price risk experiments just described, we also elicited our subjects' income risk preferences using the method developed by Holt and Laury (2002). This allows controlling for income risk preferences throughout and make sure that our results are truly driven by price instead of income risk preferences.

► Findings

Our results are striking. First, we find that in stark contrast to Sandmo's (1971) prediction, the move from a certain to an uncertain known price (i.e., price risk) leads to an increase in output. Second, conditional on facing an uncertain price, an increase in price risk reduces output. Third, the move from a certain to an uncertain, unknown price (i.e., price ambiguity) either leads to a decrease or an increase in output, depending on whether our subjects' income risk preferences were elicited after or before their price risk preferences were elicited. Our findings are robust to a number of empirical specifications including controlling for random effects, income risk pref-

ferences using the Holt and Laury (2002) game, learning effects, outcome in the previous period, and so on.

► Implications for Policy

Our findings could have important implications for food security: On the one hand, if the concept of risk is the true representation of the uncertainty faced by producers in developing countries, then a little uncertainty may be good for food security (since it leads to increases in production), but too much of it is bad for food security (since it leads to decreases in production below the certainty level). If, on the other hand, ambiguity is true representation of the uncertainty faced by producers in developing countries, then uncertainty is all bad news, because it leads to unambiguous decreases in production.



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 **Contact**

www.ferdi.fr

contact@ferdi.fr

+33 (0)4 73 17 75 30

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