Smallholder Participation in Contract Farming and Food Security

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Introduction

With rising incomes and falling trades barriers, consumers in the industrialized world have come to value greater food diversity and availability over the last 60 years.

For example, the average US supermarket offers several varieties of tomatoes at any given time, and it sells strawberries in winter.

With rising incomes in the developing world, supermarkets are playing an increasingly important role in providing consumers with a stable supply of a greater number of commodities.

Introduction

Instead of relying on farm-gate sales (Fafchamps and Hill, 2005) and spot markets (Bellemare and Barrett, 2006), supermarkets rely on complex supply chains in which commodities are produced under contract, often in the context of long-term relationships (Reardon and Berdegué, 2002; Reardon et al., 2003).

Thus, contract farming – wherein a processing firm contracts its production of agricultural commodities out to growers in exchange for a predetermined price – is playing an increasingly important role in developing countries.

Introduction

Most quantitative studies of the welfare impacts of contract farming focus on a narrow set of welfare measures. In Bellemare (2012), I looked at income, as most other studies of the welfare effects of contract farming have done (Warning and Key, 2002; Miyata et al., 2007; Minten et al., 2009; Michelson, 2013; Narayanan, 2014). One notable exception is Simmons et al. (2005), who look at returns to capital.

But income is a rather narrow definition of welfare. It works well as a welfare measure in theory – higher incomes allow relaxing the budget constraint and attaining higher indifference curves – but in practice, it is not clear that higher incomes necessarily translate into improvements in nonwelfarist measures of welfare, i.e., nutrition, health, access to clean water, etc.

Introduction

In this paper, we look at the effect of participation in agricultural value chains on food security.

Specifically, using a 1,200-household data set covering six regions of Madagascar, we look at *whether participating in contract farming translates into shorter hungry seasons* for smallholders.

Half of those households participate in contract farming agreements covering over 10 crops; half of them do not.

Introduction

Because the hungry season occurs several months after people get paid around harvest time, it is not obvious that the households involved in contract farming can or will save the extra income. Formal means of saving money are not always available (Dupas and Robinson, 2013), and self-control problems are not uncommon among the poor (Banerjee and Mullainathan, 2010).
This matters for a few reasons:

1. There is value in knowing whether income gains translate into other types of gains.
2. Women and children are often the ones who bear the burden of longer hungry seasons given unequal intrahousehold allocations of food, calories, and nutrients. Longer hungry seasons can cause wasting, stunting, and a number of other health problems.

Introduction

As in Bellemare (2012), we exploit the results of a contingent valuation experiment aimed at eliciting respondent willingness to pay (WTP) to participate in a hypothetical contract farming agreement – regardless of whether they actually do so – to control for grower self-selection into participating in contract farming.

There's a twist, however: Since the publication of my 2012 article, I've come to change my mind about how WTP should be used to identify the likely causal impact of participation in contract farming. Here, WTP is used as a control for selection on observables instead of as an IV.

Introduction

Our empirical results indicate that

- Households who participate in contract farming experience a hungry season that is on average 10 days shorter than households who do not participate in contract farming
- In a given month during the hungry season, households who participate in contract farming are on average 20 percent more likely to see their hungry season end than households who do not participate in contract farming.

Outline

Data

The data come from a 1,200-household survey conducted in six regions of Madagascar. Half the respondents participate in contract farming, half do not. Sampling weights are used throughout to bring the sample as close as possible to a random sample.

Because if its breadth, this data set offers a good deal of external validity–most studies of contract farming cover only a few villages in a given region, or only one crop. This one covers six very different regions of Madagascar, and over 10 different crops.

Identification Strategy

As always in this kind of work, the difficulty lies in teasing out a potential causal relationship flowing from participation in contract farming to the duration of the hungry season from the correlation between the two. Here, we use the results of a contingent valuation (CV) experiment to elicit a proxy for respondents' WTP to participate in contract farming.

Each respondent was presented with a hypothetical question asking whether he would participate in a contract farming agreement that would increase his household income by 10 percent for sure. In order to do so, they would have to bear a (random) cost of participation that varied from $12.75 to $75.

Identification Strategy

Respondents' yes or no answers to the contingent valuation question allow estimating a measure of willingness to pay (WTP) to participate in contract farming, which we then use as a proxy for the marginal utility each respondent derives (or would derive) from participating in contract farming.

This allows controlling for a number of factors that are usually unobserved – entrepreneurial ability, preferences, risk aversion, technical ability, etc. – and which compromise the identification of a causal relationship.

Identification Strategy

Looking at responses to the contingent valuation question, we get the following:

Bid	Proportion "Yes"	(Std. Err.)
$12.50	0.131	(0.011)
$25.00	0.180	(0.013)
$37.50	0.157	(0.012)
$50.00	0.133	(0.011)
$62.50	0.068	(0.009)
$75.00	0.066	(0.008)

Identification Strategy

We use the responses to the contingent valuation question in two ways in our regression of duration of the hungry season:

1. Each bid as its own category, i.e., six dummy variables. For each dummy, a "Yes" means the respondent would be willing to pay *at least the bid* to participate in the hypothetical contract farming arrangement, and a "No" means that the would not be willing to pay that much.
2. One variable that assigns to each respondent the value of their bid if they say "Yes" and a value of zero otherwise.

Controlling for WTP in either one of those two ways implies that we attempt to identify a causal effect via *selection on observables* (Angrist and Pischke, 2009).

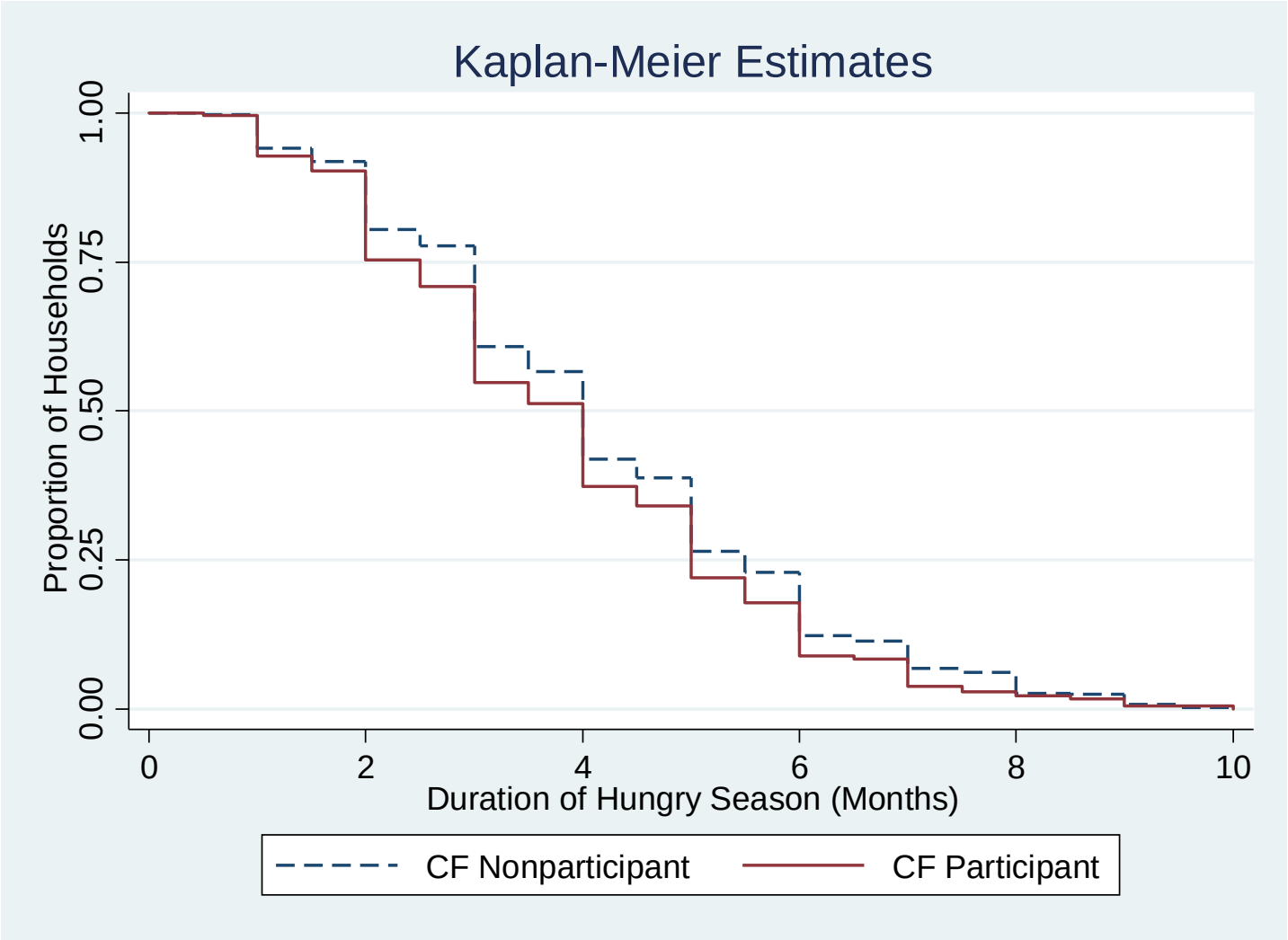
Identification Strategy

We then estimate three specifications of our core equation, which regresses the duration of the hungry season experienced by the household on (i) whether the household participates in contract farming, (ii) household-level controls, (iii) district fixed effects, and (iv) WTP:

1. A linear regression,
2. A Cox proportional hazards model, and
3. A survival model.

The first specification is standard. The latter two are to reflect the fact that we are dealing with duration data for our dependent variable (Lancaster, 1992).

Estimation Results



Estimation Results

So it definitely looks as though participation in contract farming is *correlated* with shorter hungry seasons: on average, households who participate in contract farming experience a hungry season that lasts 3.3 months, versus 3.7 months for households who do not participate in contract farming–a prima facie difference of about 12 days.

But does participation in contract farming appear to *cause* shorter hungry season? Let's see some results.

Estimation Results: Linear Regression

Variable	Coefficient	(Std. Err.)
CF Participant	-0.277*	(0.145)

Note: Controls for household characteristics, village fixed effects, and WTP for contract farming included. The symbols ***, **, and * denote statistical significance at the 99, 95, and 90 percent levels, respectively.

Estimation Results: Cox Proportional Hazards Model

Variable	**Coefficient**	**(Std. Err.)**
CF Participant	1.181***	(0.074)

Note: Controls for household characteristics, village fixed effects, and WTP for contract farming included.

Estimation Results: Parametric Survival Model (Weibull)

Variable	Coefficient	(Std. Err.)
CF Participant	1.207***	(0.086)

Note: Controls for household characteristics, village fixed effects, and WTP for contract farming included.

Estimation Results: Linear Regression

Variable	**Coefficient**	**(Std. Err.)**
CF Participant	0.210	(0.253)
CF Participant*Kids	-0.191**	(0.082)

Note: Controls for household characteristics, village fixed effects, and WTP for contract farming included.

Estimation Results: Linear Regression

Variable	Coefficient	(Std. Err.)
CF Participant	0.206	(0.254)
CF Participant*Girls	-0.215*	(0.120)
CF Participant*Boys	-0.163	(0.120)

Note: Controls for household characteristics, village fixed effects, and WTP for contract farming included.

Estimation Results: Cox Proportional Hazards Model

Variable	**Coefficient**	**(Std. Err.)**
CF Participant	1.009	(0.110)
CF Participant*Kids	1.062*	(0.037)

Note: Controls for household characteristics, village fixed effects, and WTP for contract farming included.

Estimation Results: Cox Proportional Hazards Model

Variable	Coefficient	(Std. Err.)
CF Participant	0.995	(0.109)
CF Participant*Girls	1.125**	(0.061)
CF Participant*Boys	1.015	(0.049)

Note: Controls for household characteristics, village fixed effects, and WTP for contract farming included.

Estimation Results: Parametric Survival Model (Weibull)

Variable	**Coefficient**	**(Std. Err.)**
CF Participant	1.004	(0.126)
CF Participant*Kids	1.072*	(0.042)

Note: Controls for household characteristics, village fixed effects, and WTP for contract farming included.

Estimation Results: Parametric Survival Model (Weibull)

Variable	Coefficient	(Std. Err.)
CF Participant	0.987	(0.124)
CF Participant*Girls	1.147**	(0.070)
CF Participant*Boys	1.018	(0.055)

Note: Controls for household characteristics, village fixed effects, and WTP for contract farming included.

Conclusion

In this paper, we have looked at the (presumably) causal relationship flowing from participation in agricultural value chains to the food security of smallholders in Madagascar.

Using a selection on observables identification strategy for internal validity and a data set covering six regions of and over ten crops in Madagascar for external validity, we find that participation in contract farming decreases the length of the hungry season by 10 days for the average household in the data.

Conclusion

Moreover, we find that households that do participate in contract farming are, in any given hungry season month, almost 20 percent more likely to exit that condition relative to households that do not participate in contract farming.

Lastly, we find that the benefits of participation in contract farming are more pronounced the more kids there are in a household, and the more girls there are in a household – a humble manifestation of the oft-touted "girl effect."