



# Developing agricultural markets in sub-Saharan Africa

~ organic cocoa in rural Uganda ~

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# Outline

- (1) Cocoa and organic market background
- (2) ESCO scheme overview
- (3) Empirical strategy
- (4) Main results
- (5) Conclusion: is it replicable?



# (1) MARKET BACKGROUND



# Agriculture is important

“Throughout history, agriculture-led development strategies ... have been essential to achieving rapid economy-wide growth, poverty reduction, and structural transformation”

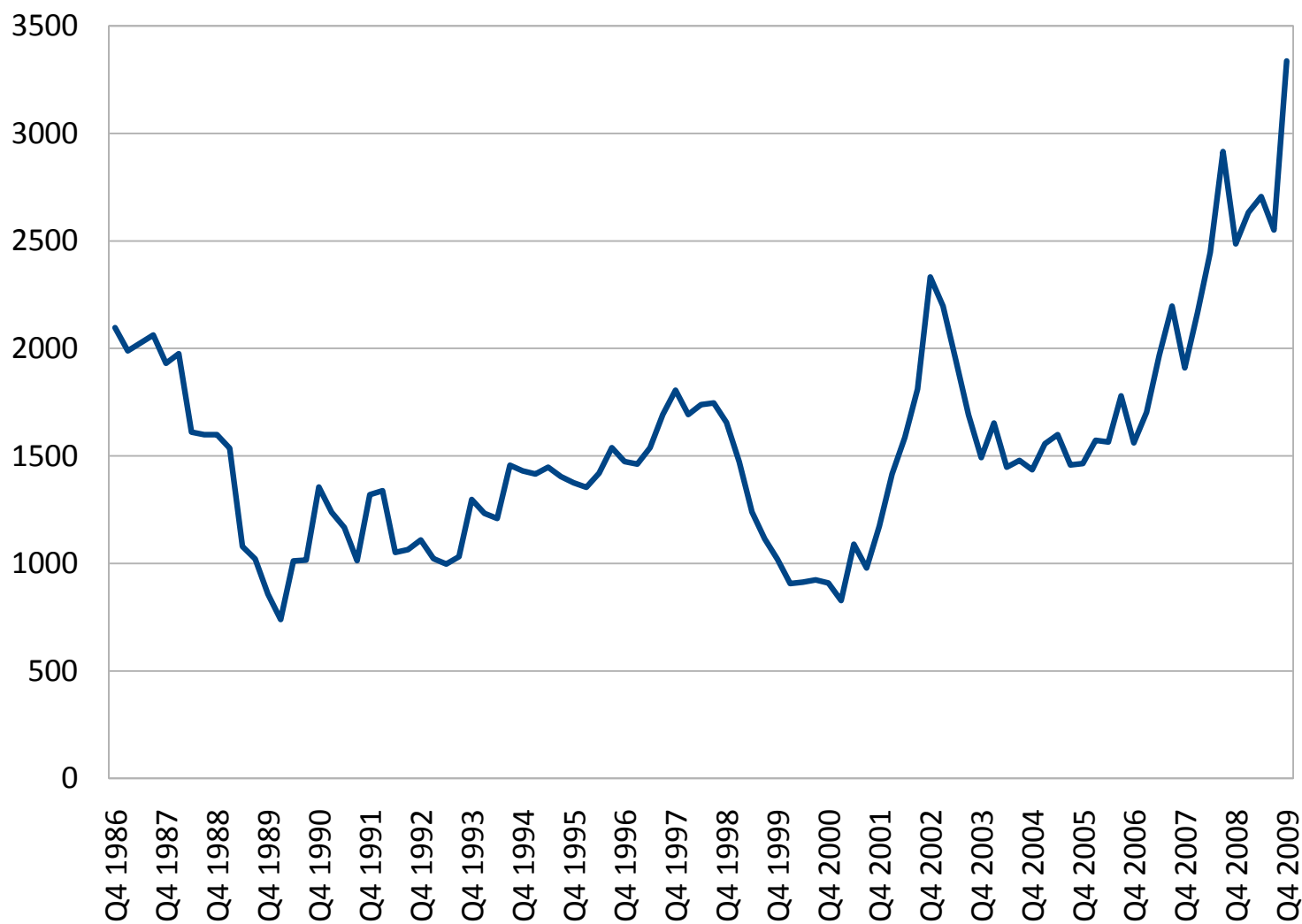
(Bezemer & Heady, 2008)



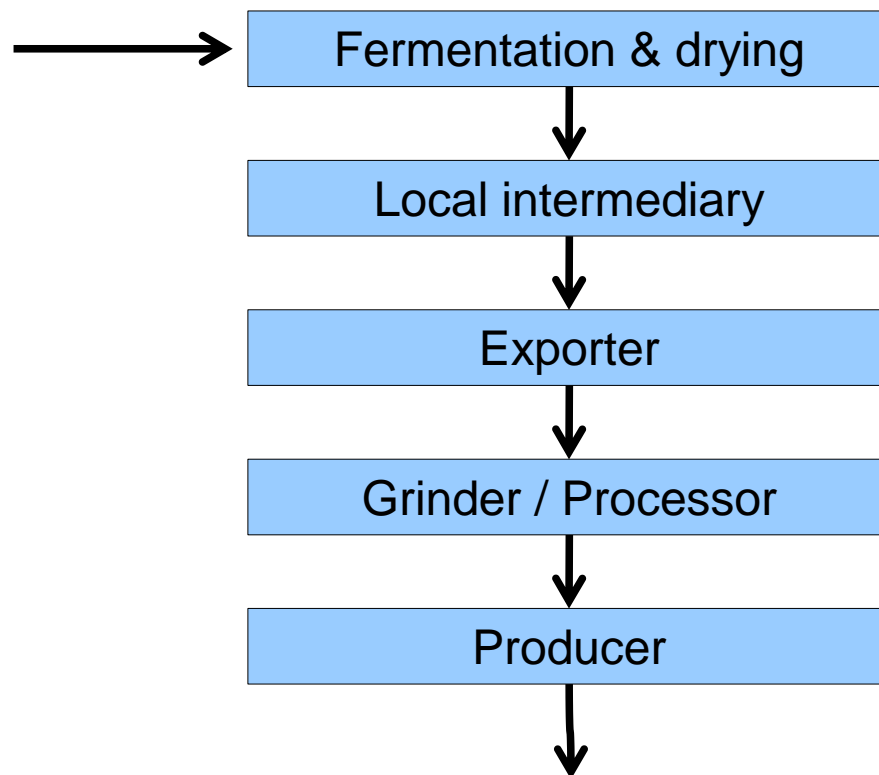
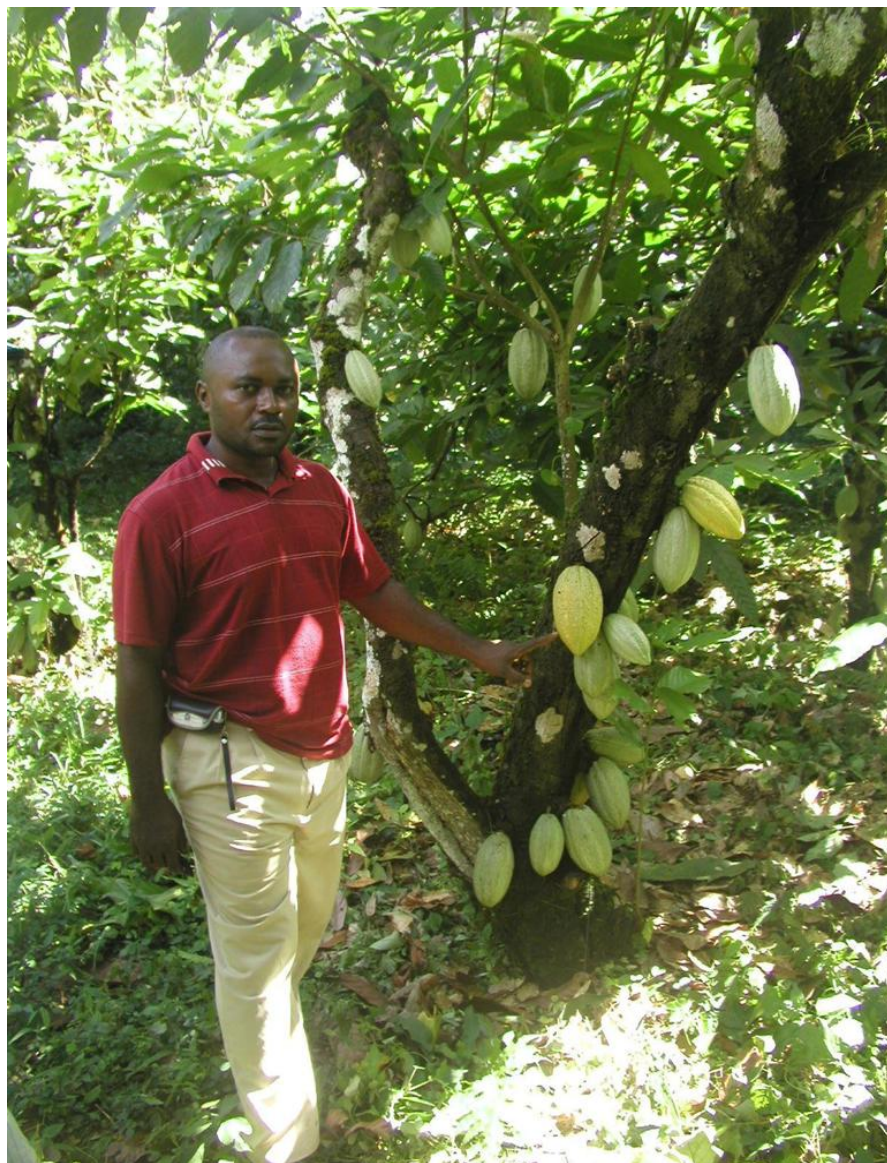
# A buoyant cocoa market

**US\$ cocoa prices, nominal, 1986-2009 (Q4)**

source: Datastream



# A long value chain



# Market access depends on cocoa quality



- Cocoa is **NOT** a homogeneous product
  - Exporters bulk to a specified quality standard
  - Demand for high quality cocoa is increasing
  - Price premium for quality
- High quality cocoa depends on:
  - “On farm” post-harvest fermentation and drying
  - Technology to measure quality (observation costs)
  - Institutions that can uphold quality standards
  - External (& local intermediary) demand
- Reputation has public good characteristics:
  - **Ghana**: maintained high quality reputation, in part through government export board
  - **Cameroon**: liberalization associated with a rapid decline in cocoa quality



# Organic produce in SSA

- Organic produce, a specific quality standard:
  - Non-use of synthetic inputs
  - Reliance on local inputs + new methods to maintain soil fertility and protect vs pests
  - Globally growing market
- In advanced countries, certification as organic demands major changes to farm practices
- In SSA many smallholders are “organic by default”
  - Minimal use of artificial inputs
  - Conversion costs generally small
  - Under-researched



## **(2) SCHEME OVERVIEW**



# Research focus

- Organic cocoa contract farming scheme
  - Scheme set up to purchase organically certified cocoa, which is sold to overseas buyers
  - Certification run by scheme manager
  - Organised by an export intermediary (Esco)
  - Initial set-up supported with donor funds (Sida)
  - Located in remote Western Uganda (Bundibugyo district, near DRC)
  - A 'young' cocoa growing region



## Esco scheme

- “Modern” form of contract farming
  - Farmers are registered & certified as “organic”
  - Esco commits to purchase all cocoa of a specified (high) quality from participants
  - Farmers commit to selling cocoa to Esco, but this is a loose contract
  - Participants benefit from a **quality premium** (variable, can be up to 80%) and an **organic premium** (16-18%)
  - Non-participants can also sell to Esco, but only on a spot basis and without the organic premium
  - Started 2002 and expanded 2005-2009 (from approx 1,700 to >5,000 farmers)



# Potential impact channels

- Farmers sell more cocoa to Esco
  - Thereby benefitting from a higher price (only)
- Farmers process more cocoa to a higher quality standard
  - Via adoption of post-harvest technologies
- Farmers adopt recommended organic practices
  - Potential improvement in (long-run) yields
- Spill-over effects
  - Social learning, e.g., non-members may see benefits of processing
  - General stimulation of local economy



# Potential pitfalls

- **Local market structure**
  - How to maintain quality standards?
  - Danger of free-riding on quality reputation
  - Potentially acute with free entry into the intermediary market
  - Differing experiences of other African cocoa exporters (Ghana, Ivory Coast, Cameroon)
- **Prices and risk**
  - Post-harvest processing is a risky decision
  - Worse with thin markets and high price uncertainty
- **Implication**: net benefit effect unclear



## Research questions

(1) What is the **welfare effect** of the scheme for participants vs. non-participants?

(2) What is the **economic mechanism** through which welfare outcomes are generated



## **(3) EMPIRICAL METHODS**



# Data

- Repeated cross-section survey, 2005 and 2009
  - Not repeated households
- Detailed household and farm-level data
- “Treatment” group:
  - Based in areas certified by Esco
- “Control” group:
  - Non-certified areas
  - Similar agro-ecological conditions
- Random sampling within chosen locations
  - Sampling weights applied based on known village sizes



# Identification challenges

## 1. Endogenous programme placement

- scheme located in higher productivity areas

## 2. Self-selection bias

- only more entrepreneurial or risk-taking households actively participate in the scheme (selling fully processed cocoa to Esco)

## 3. Geographic heterogeneity

Very similar to challenges involved in evaluating the effect of micro-finance programmes

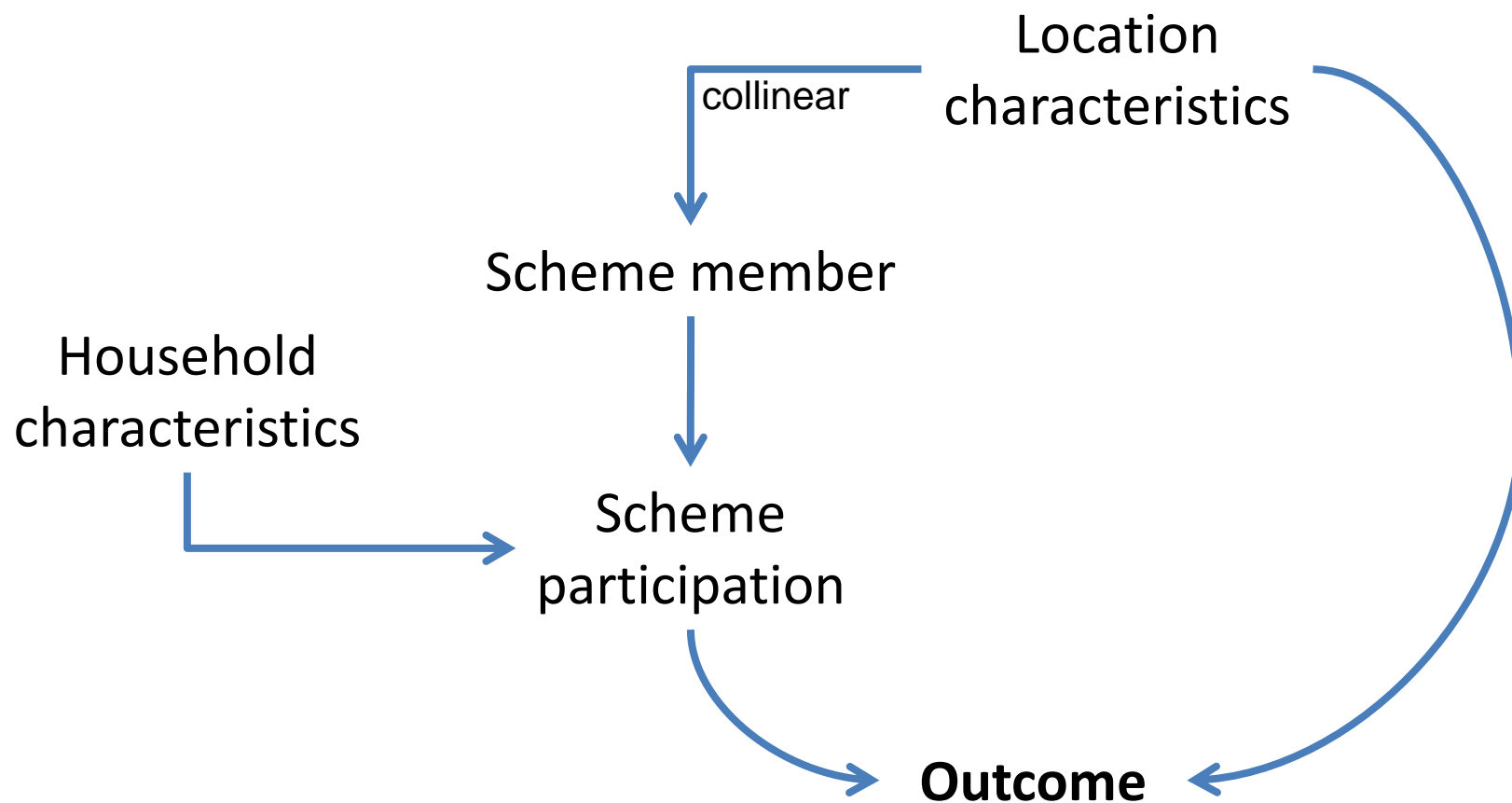


# Identification challenges

- A naive regression model is likely to be biased
- We require an “instrument” for **scheme participation** that is uncorrelated with other unobserved variables
- Good candidate is **scheme membership**:
  - Membership eligibility depends on location NOT individual characteristics
  - Cost of membership = free, virtually all households joined
- Problem:
  - Membership and location fixed effects are collinear
  - We cannot disentangle the effects



# Instrumentation issues





# Solution (1)

- Instead of using an IV (instrumental variables) approach, include a proxy for self-selection bias
- How?
  - We observe both members and non-members selling processed cocoa to other intermediaries => a revealed preference to process
  - Define “potential member” as a dummy variable which takes a value of one if a household sells at least some fully fermented cocoa or is a scheme member
- OLS model:

$$y_{ijt} = \alpha_2 + \mu_j + \theta t + \pi \text{potential}_{it} + \delta \text{esco}_{it} + X'_{it} \beta + \varepsilon_{it}$$



## Solution (2)

- Weakness with solution (1): multicollinearity & no test for adequacy of chosen proxy
- Alternative is to use the IV (instrumental variables) approach, but define proxies for the location fixed effects
- How?
  - Use village means for observed variables
  - Also: metres above sea level, distance from district centre, schools in parish etc.
  - These proxies can be tested: results in our paper

- Two stage model:

$$esco_{ijt} = \alpha_3 + \vartheta t + \gamma member_{jt} + \mathbf{X}'_{it} \varphi + \mathbf{Z}'_{jt} \omega + v_{it}$$

$$y_{ijt} = \alpha_4 + \theta t + \delta \widehat{esco}_{ijt} + \mathbf{X}'_{it} \beta + \mathbf{Z}'_{jt} \lambda + \varepsilon_{it}$$



## (4) RESULTS



# Results (1): real income effect

	(I)	(II)	(III)	(IV)	(V)
	OLS	OLS	OLS	OLS	OLS
Esco participation	1.141 (0.12)***	0.962 (0.16)***	0.731 (0.42)*	0.675 (0.43)	0.700 (0.48)
Potential member	-	0.267 (0.18)	0.178 (0.18)	0.176 (0.18)	0.183 (0.30)
Period dummy	0.049 (0.13)	0.056 (0.12)	0.122 (0.08)	0.151 (0.12)	0.291 (0.26)
Cocoa trees (log)	0.694 (0.16)***	0.678 (0.17)***	0.683 (0.16)***	0.636 (0.15)***	0.655 (0.14)***
Farm size (log)	0.176 (0.16)	0.159 (0.16)	0.163 (0.17)	0.252 (0.15)*	0.254 (0.17)
Hhld farm workers	0.205 (0.11)*	0.192 (0.11)*	0.189 (0.11)	0.173 (0.11)	0.142 (0.12)
Hired labour (1=yes)	0.166 (0.21)	0.178 (0.22)	0.200 (0.24)	0.185 (0.24)	0.177 (0.17)
Age of hhld head	-0.006 (0.01)	-0.005 (0.01)	-0.006 (0.01)	-0.005 (0.01)	-0.006 (0.01)
Hhld head male	0.419 (0.24)*	0.431 (0.24)*	0.414 (0.25)	0.392 (0.24)	0.361 (0.23)
Fixed effects	None	None	3 subcounties	5 parishes	30 villages
Participation VIF	1.20	1.78	7.22	8.84	10.15



## Results (2): real income effect

	(I) OLS	(II) OLS	(III) GMM2S	(IV) GMM2S	(V) OLS
Esco participation	0.720 (0.23)***	0.668 (0.16)***	0.729 (0.14)***	0.777 (0.16)***	-
Potential member	0.158 (0.16)	0.149 (0.18)	-	-	-
Organic member	-	-	-	-	0.656 (0.13)***
Period dummy	0.261 (0.20)	0.228 (0.10)**	0.158 (0.11)	0.151 (0.15)	0.433 (0.10)***
Cocoa trees (log)	0.558 (0.10)***	0.564 (0.09)***	0.667 (0.15)***	0.632 (0.12)***	0.667 (0.16)***
Farm size (log)	0.265 (0.13)**	0.227 (0.12)*	0.226 (0.14)*	0.236 (0.14)	0.225 (0.14)
Hhld farm workers	0.117 (0.11)	0.155 (0.09)*	0.162 (0.10)*	0.137 (0.10)	0.167 (0.11)
Hired labour (1=yes)	0.078 (0.12)	0.091 (0.13)	0.174 (0.21)	0.165 (0.14)	0.237 (0.25)
Age of hhld head	-0.003 (0.00)	-0.003 (0.00)	-0.006 (0.00)	-0.007 (0.00)	-0.006 (0.00)
Hhld head male	0.293 (0.22)	0.305 (0.20)	0.385 (0.22)*	0.368 (0.21)*	0.367 (0.22)



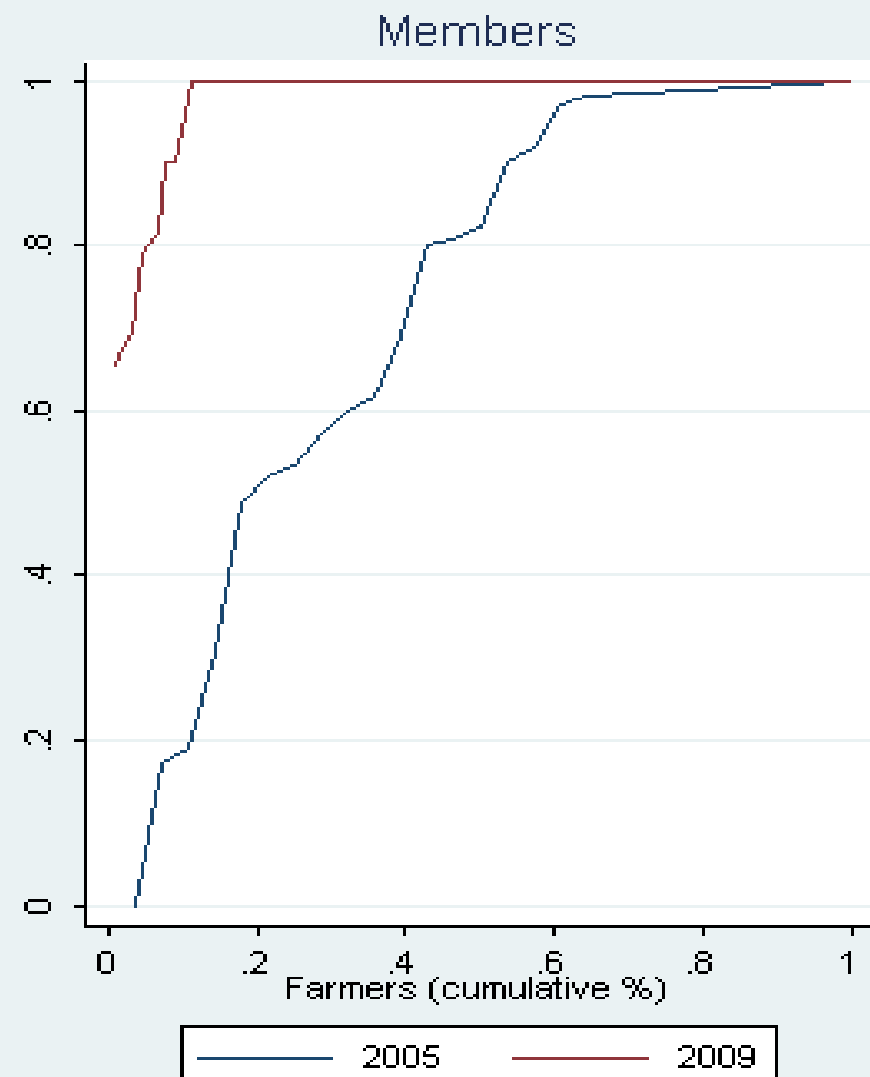
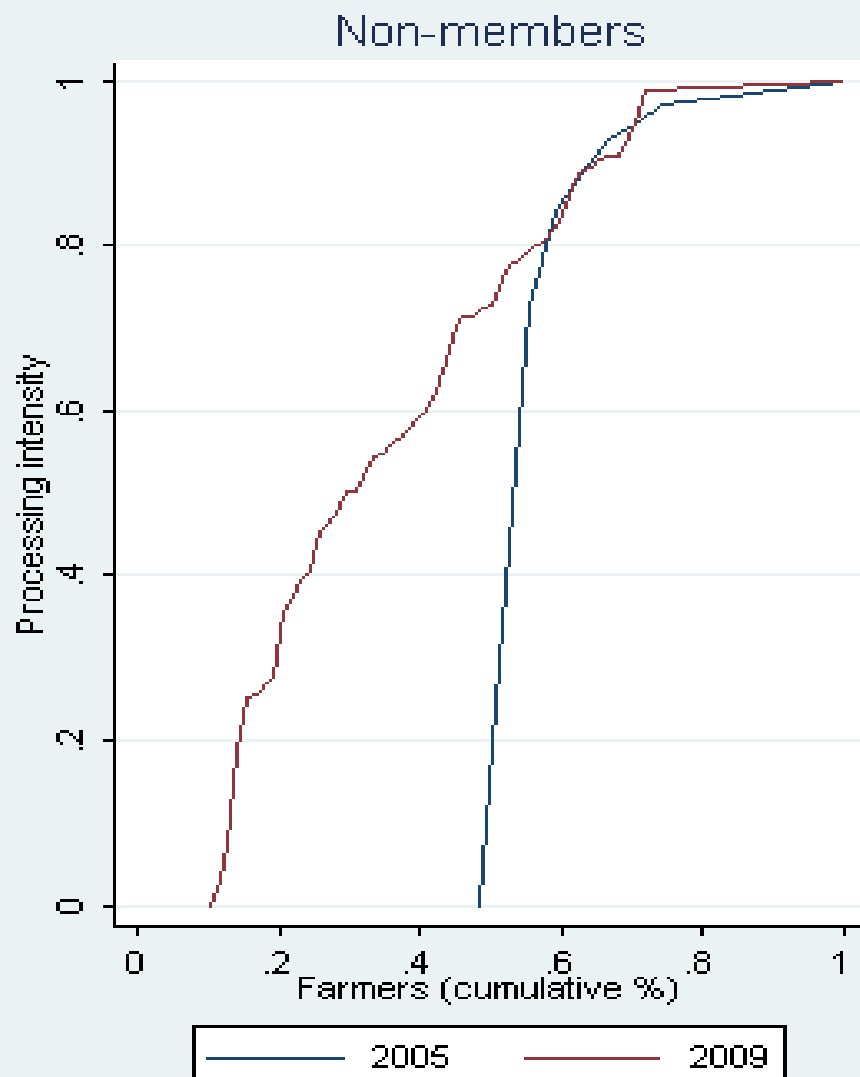
## Results (3): mechanism



	Log. points	Percentage points	% total
<b>Aggregate income effect</b>	<b>0.66</b>	<b>92.7</b>	<b>100%</b>
Prices	0.15	16.0	23%
Productivity	0.43	53.9	66%
Post-harvest processing	0.30	35.0	46%
Organic practices	0.10	10.8	16%
Residual	0.03	2.8	4%
Residual	0.08	8.0	12%



# Dynamic spillover effects





## **(5) CONCLUSION**



# Results summary

- The scheme has a strong and persistent positive welfare effect!
- Primary mechanism is adoption of quality-enhancing methods
- How does the scheme achieve this?
  - “Exogenous” increase in demand for quality cocoa
  - Credible price incentives
  - Enhanced quality measurement
  - Contractual form: incentive-compatible and time-consistent for sellers & buyers
- Spillover effects also noted
  - ALL farmers increasing use of post-harvest technology
  - Market development seems to be occurring in the sense of moving to thicker local markets



# Replicability

- **Reservations:**
  - Fallacy of composition
  - Bright outlook for organic cocoa not matched across tropical commodities (e.g., vanilla)
  - Youth of Ugandan cocoa crop (absence of fungi)
- **BUT:**
  - Issue is not that we necessarily need “organic” or “fair-trade”, but rather:
    - (i) credible incentives to support improved farm practices & technology (often risky); and
    - (ii) access to export markets, with some price stability
  - Key role of export intermediaries & incentives they face ... Esco had resources to expand and improve the scheme, but also was small enough such that the scheme was material to its overall profitability