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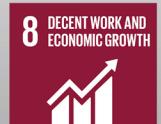
Primary Producers Sales Prices and Cooperatives:
A Cross-country, Multi-product Analysis

By

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Motivation I: Agriculture and Development

- Increasing primary producers' income in developing countries is key for the role of agriculture as a tool for development and poverty reduction.

- While productivity important for this objective, prices received by producers are also a focus of concern.

- Higher producer prices can foster investment, especially in credit constrained contexts, foster technological adoption, improve quality of produce along the value chain, and contribute to sustainability along different dimensions.

- Market power in agricultural value chains:
  - Perishability of products combined with lack of adequate storage capacity and can lead to opportunistic behaviour by marketing intermediaries (Bergquist & Dinerstein, 2020; Sexton & Iskow, 1988).
  - Transport costs can influence the effective geographic market of a farmer (Bernier & Dorosh, 1993; Mérel et al., 2009).
- Fixed search & transaction costs, and low bargaining power are particularly acute for smaller producers.

Motivation II: Marketing Cooperatives

- Agricultural marketing cooperatives can potentially increase farmers' incomes. These cooperatives allow farmers to integrate vertically by coordinating horizontally (Sexton, 1986).

- Marketing cooperatives can increase farmer prices by:
  i) reducing marketing margins in the face of market power;
  ii) improving the efficiency of marketing activities;
  iii) exploiting potential market power of the marketing sector in selling downstream.

- Marketing cooperatives can increase prices received by members and non-members. Sexton (1990) shows how open membership cooperatives can reduce the price margins of for-profit marketing firms. Fulton and Giannakas (2013) show that the positive effect of cooperatives on non-coop members (yardstick effect) depends on competitive conditions in the marketing sector, on constraints to new coop members, and on the pricing policy implemented.

Empirical Literature and Objectives of the Study

- The empirical literature has found that cooperatives have positive and significant effects on farmer prices in both developing and developed countries
  - Alwang et al. (2019); Carletti et al. (2019); Ebata et al. (2017); Hanisch et al. (2013); Jardine et al. (2014); Kumse et al. (2021); Milford (2012); Sauer et al. (2012); Ssebunya et al. (2018), Wollni and Zeller (2007)

- One feature that all of the studies cited above share is that they consider relationships between prices and a proxy for cooperative membership, ignoring interaction effects with farmer size
  - Useful first approximation
  - Ignores the possibility that small producers may benefit more from cooperative membership than large ones.

- This study tests the joint-hypothesis that:

The positive relationship between cooperative membership and producer sales prices declines with producer size

Data

- Bespoke survey questionnaires
  - Respondents selected using a stratified sampling by geographic region
  - Data collected on a wide range of variables in addition to prices, producer size and cooperative membership, including geographic region, value added, input provision by buyers, transport, business income, etc.
- Maize farmers in Lao PDR
  - 181 maize producers
  - May-June 2019
  - Xayaboury, Oudomxay and Xiengkhuang;
- Grape, apricot, and plum farmers in Uzbekistan
  - 103 commercial farms
  - Andijon, Fergana, Namangan, Samarkand, and Tashkent
- Herders in Mongolia
  - 168 herders
  - March-April 2020
  - Arkhangai, Bulgan, Dornod, Dornogobi, Khentii, Selenge, Tuv, and Uvurkhangai

Results - Summary

- Similar results obtained for maize farmers in Lao PDR and fruit farmers in Uzbekistan
  - Average annual **sales prices** **increase** with **farm size (Ha)**
    - Farm size may be proxying for a range of factors, including bargaining power, marketing costs, capital investment, production and post-harvest practices (e.g. storage).
  - Average annual **sales prices** **increase** with **cooperative membership**, but **cooperative membership** **weakens** the positive relationship between **farm size** and **prices**.
  - Results robust to:
    - control variables, including **region/province**; **processing/quality** of agricultural products; receiving **inputs** from buyers; and whether farmers sell at the **farmgate**
    - estimation methods that control for alternative forms of endogeneity bias
  - Failure to control for self-selection negatively biases the positive impact of cooperative membership on farmer prices
- Noticeably weaker relationships estimated for sales prices of Mongolian herders
  - No statistically significant relationships between herder prices and either herd size or cooperative membership

Headline results

	apricots (UZ)		grapes (UZ)		plums (UZ)		maize (LA)	
	est.	s.e.	est.	s.e.	est.	s.e.	est.	s.e.
sales prices (domestic currency per kg)								
sales fresh (fraction)	-12148 ***	1691	-26534 ***	3229	-5418 ***	1674	-626 ***	58
cultivated hectares	633 ***	67	655 ***	138	370 ***	161	2	8
customer inputs	-6564 ***	958	6623 ***	2596	124	1295	-39	37

The positive relationship between cooperative membership and producer sales prices declines with producer size

region	-	-	-	-	-	-	0.558 **	0.308
intercept	-1.119 ***	0.488	-0.894	0.668	1.888	1.940	-3.783 ***	0.601
rho	-1.000 ***	0.000	-1.000 ***	0.000	-0.775	0.460	-0.922 ***	0.099
sigma	2157 ***	228	3685 ***	404	1246 ***	414	228 ***	19
observations	27		47		35		180	
Wald test (p-value)	0.000		0.000		0.370		0.015	

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customer inputs	-6564 ***	958	6623 ***	2596	124	1295	-39	37
farm gate sales	-40 ***	9	-15	27	11	23	-	-
region	-5976 ***	488	1254	1708	2021	1914	-113	82
region x hectares	-	-	-604 ***	146	-229 **	125	31 ***	15
coop member	6906 ***	684	3220 *	2006	4223 ***	1777	658 ***	107
coop x hectares	-813 ***	133	-776 ***	364	-511 ***	193	-30 ***	12
intercept	16794 ***	1421	24163 ***	2243	4324	3801	1613 ***	48
incidence of cooperative membership								
sales fresh (fraction)	1.427 ***	0.711	2.401 ***	0.943	-1.873	2.430	2.938 ***	0.474
cultivated hectares	-0.003	0.015	-0.224 ***	0.037	-0.277 ***	0.084	0.052 ***	0.022
business income	0.122	0.191	0.661 **	0.400	-0.421	0.883	-1.052 ***	0.320
region	-	-	-	-	-	-	0.558 **	0.308
intercept	-1.119 ***	0.488	-0.894	0.668	1.888	1.940	-3.783 ***	0.601
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Headline results

	horses (MN)		goats (MN)		sheep (MN)		cows (MN)	
	est.	s.e.	est.	s.e.	est.	s.e.	est.	s.e.
sales prices (domestic currency per kg)								
sales live (fraction)	-48	538	-248	246	-632 **	356	-476 *	328
herd size (head)	0	1	0	0	0	1	0	1
Region identifiers								
Arkhangai	1019 ***	0	371	556	187	418	623	479
Bulgan	628 ***	0	50	298	587 ***	294	205	351
Dornod	859	845	276	235	-104	435	963 ***	302
Dornogobi	1983 ***	0	259	634	1595 ***	707	111	1293
Khentii	943 ***	0	146	567	-843	604	827	678
Selenge	1269 ***	0	504	388	1302 ***	381	80	444
Tuv	876 *	552	-122	265	340	416	1200 ***	436
coop member	3166 ***	0	-117	626	-1361 ***	619	1471	1029
coop x herd size	-2 ***	0	-1 *	1	-1 **	1	-1	1
intercept	3653 ***	626	4292 ***	321	5842 ***	381	4972 ***	345
incidence of cooperative membership								
sales live (fraction)	-0.554 ***	0.220	0.087	0.351	0.263	0.322	-0.301	0.351
herd size (head)	0.000	0.000	0.000	0.000	0.001 **	0.000	0.001 **	0.000
labour income	-1.699 ***	0.490	-0.637	0.443	-0.864 ***	0.393	-1.280 ***	0.498
intercept	0.327	0.332	-0.757 **	0.417	-0.854 ***	0.360	-0.690 ***	0.334
rho	-1.000 ***	0.000	0.490 *	0.265	0.586 ***	0.223	-0.591	0.373
sigma	2279 ***	658	965 ***	124	1348 ***	169	1476 ***	308
observations	58		68		82		66	
Wald test (p-value)	0.000		0.125		0.048		0.236	

Robustness checks

	Self-selection		M-method		MM-method		LTS-method		OLS	
	est	s.e.	est	s.e.	est	s.e.	est	s.e.	est	s.e.
apricots (27 observations)										
unprocessed (fraction)	-12148 ***	1691	-10690 ***	1567	-14849 ***	1309	-15101 ***	1187	-10276 ***	2217
cultivated hectares	633 ***	67	570 ***	97	521 ***	26	539 ***	53	576 ***	39
customer inputs	-6564 ***	958	-5616 ***	1681	-6115 ***	954	-3122 ***	1222	-5841 ***	2448
farm gate sales	-40 ***	9	-27	17	-42 ***	10	-6	15	-28	28
region	-5976 ***	488	-5459 ***	998	-11529 ***	1406	-4647 ***	756	-5771 ***	1591
coop member	6906 ***	684	2966 ***	1144	1934 ***	634	1093	919	2835 **	1396
coop x hectares	-813 ***	133	-729 ***	146	-525 ***	54	-260	213	-707 **	345
intercept	16794 ***	1421	16411 ***	1984	21094 ***	1738	17931 ***	1771	16258 ***	3023
grapes (47 observations)										
unprocessed (fraction)	-26534 ***	3229	-21247 ***	3024	-16878 ***	1500	-16723 ***	1025	-22305 ***	4838
cultivated hectares	655 ***	138	494 ***	65	-42	57	-56	43	617 ***	148
customer inputs	6623 ***	2596	3027 ***	1305	-2827 ***	1045	-2956 ***	610	7662 ***	3105
farm gate sales	-15	27	-13	17	8	6	9 *	6	-38	38
region	1254	1708	3906 ***	1729	2221 ***	341	2234 ***	564	4503 **	2431
region x hectares	-604 ***	146	-632 ***	101	-86	56	-72	49	-741 ***	166
coop member	3220 *	2006	2635 *	1524	1863 ***	695	1858 ***	522	4241 *	2847
coop x hectares	-776 ***	364	-1029 ***	263	-58	75	-43	98	-1641 ***	631
intercept	24163 ***	2243	22516 ***	2000	20644 ***	1189	20507 ***	687	22697 ***	2733

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	est	s.e.	est	s.e.	est	s.e.	est	s.e.	est	s.e.
plums (35 observations)										
unprocessed (fraction)	-5418 ***	1674	-7398 ***	978	-7336 ***	709	-6806 ***	357	-6607 ***	2163
cultivated hectares	370 ***	161	335 ***	51	47	72	212 ***	45	290 *	171
customer inputs	124	1295	541	593	175	427	-174	218	703	1132
farm gate sales	11	23	7	8	10	11	25 ***	3	2	32
region	2021	1914	1965 **	957	1710 ***	702	2811 ***	353	1204	3638
region x hectares	-229 **	125	-294 ***	66	-19	81	-137 ***	48	-215	216
coop member	4223 ***	1777	2793 ***	1021	2054 ***	532	3117 ***	364	2843 ***	1350
coop x hectares	-511 ***	193	-748 ***	273	-426 ***	151	-637 ***	97	-698 ***	325
intercept	4324	3801	7013 ***	1303	7502 ***	1522	5108 ***	538	6844 **	3339
maize (180 observation)										
unprocessed (fraction)	-626 ***	58	-577 ***	63	-581 ***	55	-662 ***	49	-560 ***	55
cultivated hectares	2	8	-2	10	-2	9	-10	8	2	8
customer inputs	-39	37	-59 *	36	-58 **	32	-45	29	-69 ***	32
region	-113	82	-127	85	-127	118	-195 ***	71	-84	96
region x hectares	31 **	15	51 ***	18	52 **	29	42 ***	15	38 *	22
coop member	658 ***	107	397 ***	89	412 ***	165	619 ***	80	313 ***	121
coop x hectares	-30 ***	12	-38 ***	16	-39	27	-27 **	13	-27	23
intercept	1613 ***	48	1633 ***	49	1630 ***	50	1686 ***	39	1620 ***	48

Robustness checks

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Methodological Issues

- Well-known challenges of finding strong and valid instruments in Instrumental Variable methods.
- Multiplicity of methods supports robustness of results but comparability should be taken with care (weights).
- Controlling for cooperative characteristics and performance indicators could add additional light.
- Given the sign and size of the observed self-selection bias, more work is needed to explore factors determining cooperative membership.
- Measurement error continues to be an important factor requiring use of robust estimation methods.
- Lack of availability of panel data, in particular for LDCs and LLDCs studied, limits the capacity to control for omitted group-specific variables.

Policy implications from the results

- Marketing cooperative membership can lead to higher farmgate prices for smallholders.
- 84% of the world's farms are smaller than 2 Ha and 94% are smaller than 5 Ha (Lowder et al., 2016).
- This builds on previous work showing the roles of cooperatives as providers of inputs and processors.
- Success of cooperatives depends on many factors (Markelova et al. 2009; Cook and Grashuis 2018):
  - the characteristics of members (heterogeneity)
  - whether cooperatives are open or closed
  - cooperative management and decision-making
  - pricing policies towards members and non-members
  - the specific functions carried out by the cooperative
  - the approach to produce quality control and pricing.
- Hence, fostering cooperatives is multi-dimensional.

Thank you!

Contact: *commodities@unctad.org*