AJAE appendix for Firm Turnover Under Asymmetric Information: Tanzania's Agro-dealer Sector

Alix Naugler Hope Michelson Sarah Janzen Christopher Magomba

Note: The material contained herein is supplementary to the article named in the title and published in the *American Journal of Agricultural Economics*.

Appendix

A Supplemental Model Details

This is the detailed proof for Lemma 1 showing the partial derivative of π_{jimt} with respect to α_{jimt}. Yet given the negative sign associated with α_{jimt}, α_{-jimt}, and p_{jmt} in Equation 1, the partial derivative with respect to α_{jimt} yields the same result as that with respect to α_{-jimt} and p_{jmt}.

Since $\pi_{jimt} = \dfrac{1}{1+e^{-(\alpha_{jimt}+\alpha_{-jimt})-p_{jmt}}} = (1+e^{-(\alpha_{jimt}+\alpha_{-jimt})-p_{jmt}})^{-1}$, we get:

$$\begin{aligned}
\frac{\partial \pi_{jimt}}{\partial \alpha_{jimt}} &= -(1+e^{-(\alpha_{jimt}+\alpha_{-jimt})-p_{jmt}})^{-2}\left(e^{-(\alpha_{jimt}+\alpha_{-jimt})-p_{jmt}}\right)(-1) \\
&= (1+e^{-(\alpha_{jimt}+\alpha_{-jimt})-p_{jmt}})^{-2}\left(e^{-(\alpha_{jimt}+\alpha_{-jimt})-p_{jmt}}\right) \\
&= \pi_{jimt}^2\left(\frac{1-\pi_{jimt}}{\pi_{jimt}}\right) \\
&= \frac{\pi_{jimt}^2 - \pi_{jimt}^3}{\pi_{jimt}} \\
&= \pi_{jimt} - \pi_{jimt}^2 \\
&= \pi_{jimt}(1-\pi_{jimt}) > 0 \text{ given that } \pi_{jimt} \in (0,1)
\end{aligned}$$

$$\text{Thus, } \frac{\partial \pi_{jimt}}{\partial \alpha_{jimt}} = \frac{\partial \pi_{jimt}}{\partial \alpha_{-jimt}} = \frac{\partial \pi_{jimt}}{\partial p_{jmt}} = \pi_{jimt}(1-\pi_{jimt}) > 0$$

B Supplemental Tables and Figures

Table B.1: Descriptive Statistics for Agro-dealer Follow-up Survey

Agro-dealer Characteristics	Respondents (1)	Non-respondents (2)	Difference (3)
Owns a car or truck (1 = yes, 0 = no)	0.24	0.23	0.01
	(0.43)	(0.42)	(0.04)
Owns a smartphone or mobile phone (1 = yes, 0 = no)	1.00	0.98	0.01
	(0.07)	(0.14)	(0.01)
Has CNFA/TAGMARK certification displayed (1 = yes, 0 = no)	0.21	0.15	0.06*
	(0.41)	(0.35)	(0.03)
Uses outdoor signage for advertising (1 = yes, 0 = no)	0.65	0.77	-0.12***
	(0.48)	(0.42)	(0.04)
Number of other locations that sell fertilizer	0.33	0.29	0.03
	(0.61)	(0.72)	(0.06)
Has a license to sell fertilizer (1 = yes, 0 = no)	0.42	0.32	0.10**
	(0.49)	(0.47)	(0.04)
Number of additional employees present at time of interview	0.81	0.91	-0.10
	(0.72)	(0.72)	(0.07)
Number of years operating at current location	3.24	2.71	0.54
	(3.26)	(4.18)	(0.35)
Permanent as compared to a seasonal business (1 = yes, 0 = no)	0.97	0.95	0.02
	(0.17)	(0.21)	(0.02)
Observations	202	313	

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Columns 1-2 report means with standard deviations in parentheses. Column 3 reports mean differences between the 202 agro-dealers who completed the follow-up survey and the 313 agro-dealers who did not complete it with standard errors in parentheses. A CNFA/TAGMARK certificate is awarded to Tanzanian agro-dealers who completed the TAGMARK training program, which focused on improving agro-dealer professionalism, business practices, and technical knowledge. Characteristics are measured in the first census round in which each agro-dealer appears: round one for 224 agro-dealers, round two for 160, and round three for 131. Respondents and non-respondents together comprise the full set of 515 census-identified agro-dealers.

Table B.2: Descriptive Statistics for Markets by Round

Market Characteristics	Round 1 (1)	Round 2 (2)	Round 3 (3)
Share of markets with at least one agro-dealer in operation (0 to 1)	0.95	0.92	0.89
	(0.22)	(0.28)	(0.32)
Number of agro-dealers operating in a market	2.31	3.07	3.71
	(2.26)	(3.90)	(4.55)
Share of agro-dealer exits relative to the previous round (0 to 1)		0.37	0.22
		(0.39)	(0.31)
Share of agro-dealer entries relative to the previous round (0 to 1)		0.68	0.46
		(0.87)	(0.65)
Observations	97	97	97

Note: Each column reports the mean with the standard deviation in parentheses. The values in the last two rows report raw, non-annualized agro-dealer turnover *between* rounds at the market-level. We define the share of agro-dealer exits relative to the previous round as the number of agro-dealers that exited a market between two rounds, divided by the number of agro-dealers operating in that market at the start of the previous round. For example, if a market has four agro-dealers in round one (e.g., A, B, C, D), and B and C exit between rounds one and two, the market's share of agro-dealer exits relative to the previous round is 50 percent (i.e., two out of the original four agro-dealers in the market exited). The share of agro-dealer entries relative to the previous round is defined analogously following the approach of Liedholm (2002). Column 2 reflects agro-dealer turnover from rounds one to two and Column 3 reflects that from rounds two to three.

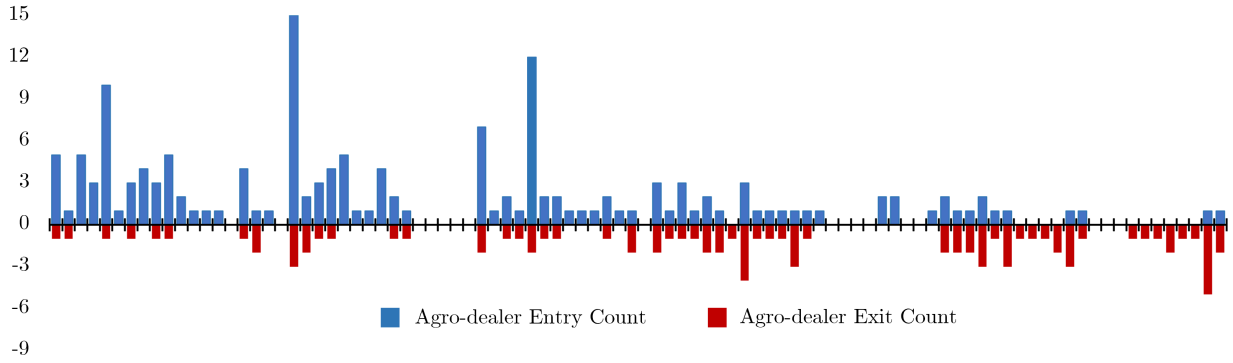

Figure B.1: Number of Agro-dealer Entries and Exits by Market Between Rounds One and Two

Note: The figure displays the number of agro-dealers that entered and exited each market between rounds one and two. Market order on the x-axis matches Figure 3, except for one omitted market because the market-linked farmer sample covers 94 markets rather than 95. The figure highlights greater variation in agro-dealer entry across markets relative to exit. Specifically, the sample variance is 5.97 for entry and 1.05 for exit. Also, a larger portion of markets experienced low levels of agro-dealer exit relative to entry: 78 percent had zero to one agro-dealer exit between rounds compared to 67 percent with zero to one agro-dealer entry. Notably, the annual agro-dealer entry and exit rates for these markets exhibit variances of 0.77 and 0.15, respectively. Thus agro-dealer entry shows greater variation than exit, both in absolute terms and relative to market size.

Table B.3: Descriptive Statistics for Farmer Samples

Farmer Characteristics	Market-linked (1)	Supplemental (2)	Difference (3)
Is female (1 = yes, 0 = no)	0.42	0.27	0.14***
	(0.49)	(0.45)	(0.04)
Age	44.76	45.08	-0.32
	(12.46)	(13.25)	(1.08)
Number of household members	5.42	—	—
	(2.49)		
Highest level of education completed (1 = yes, 0 = no)			
No schooling	0.10	0.02	0.08***
	(0.30)	(0.14)	(0.02)
Primary school	0.77	0.66	0.11***
	(0.42)	(0.48)	(0.04)
Secondary school	0.11	0.27	-0.16***
	(0.31)	(0.44)	(0.03)
Vocational training	0.01	0.02	-0.01
	(0.09)	(0.14)	(0.01)
University (e.g., diploma, BSc, MSc, PhD)	0.01	0.03	-0.02*
	(0.11)	(0.18)	(0.01)
Number of acres of land owned	5.68	4.69	0.99**
	(4.93)	(4.86)	(0.43)
Is risk averse (1 = yes, 0 = no)	—	—	—
Observations	1,242	150	

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Columns 1-2 report means with standard deviations in parentheses. Column 3 reports mean differences between the two farmer samples with standard errors in parentheses. Dashes indicate that the variable is not available for that sample or that the corresponding difference cannot be estimated. We winsorize the variable "number of acres of land owned" in the market-linked farmer sample only for data above the 95th percentile given its long-tailed distribution.

Table B.4: Effect of Agro-dealer Turnover on Farmers' Market-level Fertilizer Quality Beliefs by Baseline Market Size

	Farmers out of Ten Receiving High-quality			Concerned About Quality (1 = Yes, 0 = No)		
	(1)	(2)	(3)	(4)	(5)	(6)
(A) Smaller Markets						
Baseline market size (β_1)	-0.134	0.086	-0.150	0.023	-0.010	0.022
	(0.225)	(0.237)	(0.215)	(0.029)	(0.031)	(0.029)
Agro-dealer exits (β_2)	0.541***		0.541***	-0.073**		-0.073**
	(0.196)		(0.196)	(0.029)		(0.029)
Agro-dealer entries (β_3)		0.069	0.069		0.008	0.008
		(0.082)	(0.080)		(0.011)	(0.012)
Outcome variable mean	6.74	6.74	6.74	0.71	0.71	0.71
R^2	0.040	0.030	0.041	0.026	0.018	0.026
Observations	851	851	851	851	851	851
(B) Larger Markets						
Baseline market size (β_1)	0.013	-0.014	-0.027	0.004	0.002	0.010
	(0.061)	(0.094)	(0.095)	(0.010)	(0.013)	(0.013)
Agro-dealer exits (β_2)	0.062		0.080	-0.049		-0.052
	(0.232)		(0.236)	(0.034)		(0.034)
Agro-dealer entries (β_3)		0.035	0.039		-0.003	-0.006
		(0.062)	(0.064)		(0.008)	(0.008)
Outcome variable mean	6.99	6.99	6.99	0.68	0.68	0.68
R^2	0.024	0.024	0.025	0.022	0.014	0.023
Observations	391	391	391	391	391	391
Farmer-level controls	Yes	Yes	Yes	Yes	Yes	Yes

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the market level. Columns 3 and 6 estimate Equation 6. "Baseline market size" is the number of agro-dealers operating in a market in round one, "agro-dealer exits" is the number of agro-dealers that exited a market between rounds one and two, and "agro-dealer entries" is the number of new agro-dealers that entered a market between rounds one and two. We use farmer beliefs that correspond to each farmer's associated market. Farmer-level controls are listed in Column 1 of Appendix Table B.3. Smaller markets as those with two or fewer agro-dealers, corresponding to the median in round one.

Table B.5: Effect of Agro-dealer Turnover on Farmers' Market-level Fertilizer Quality Beliefs by Farmer Risk Aversion

	Farmers out of Ten Receiving High-quality			Concerned About Quality (1 = Yes, 0 = No)		
	(1)	(2)	(3)	(4)	(5)	(6)
(A) Farmer is Risk Averse						
Baseline market size (β_1)	0.089	0.165*	0.015	0.008	-0.022	0.007
	(0.073)	(0.085)	(0.088)	(0.009)	(0.015)	(0.014)
Agro-dealer exits (β_2)	0.438**		0.476**	-0.095***		-0.095***
	(0.200)		(0.204)	(0.031)		(0.032)
Agro-dealer entries (β_3)		0.056	0.090		0.008	0.001
		(0.061)	(0.059)		(0.013)	(0.012)
Outcome variable mean	6.56	6.56	6.56	0.75	0.75	0.75
R^2	0.056	0.044	0.059	0.046	0.021	0.046
Observations	482	482	482	482	482	482
(B) Farmer is Not Risk Averse						
Baseline market size (β_1)	-0.113*	-0.086	-0.158*	0.012	0.004	0.017
	(0.061)	(0.078)	(0.090)	(0.009)	(0.010)	(0.012)
Agro-dealer exits (β_2)	0.199		0.223	-0.037		-0.040
	(0.169)		(0.171)	(0.028)		(0.028)
Agro-dealer entries (β_3)		0.029	0.048		-0.002	-0.005
		(0.067)	(0.071)		(0.009)	(0.009)
Outcome variable mean	6.98	6.98	6.98	0.67	0.67	0.67
R^2	0.021	0.018	0.022	0.010	0.006	0.010
Observations	760	760	760	760	760	760
Farmer-level controls	Yes	Yes	Yes	Yes	Yes	Yes

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the market level. Columns 3 and 6 estimate Equation 6. "Baseline market size" is the number of agro-dealers operating in a market in round one, "agro-dealer exits" is the number of agro-dealers that exited a market between rounds one and two, and "agro-dealer entries" is the number of new agro-dealers that entered a market between rounds one and two. We use farmer beliefs that correspond to each farmer's associated market. Farmer-level controls are listed in Column 1 of Appendix Table B.3; however, "is risk averse" is not included because it is used to examine heterogeneity. A farmer is "risk averse" if they believe they take much or somewhat fewer risks compared to others.

Table B.6: Effect of Agro-dealer Turnover on Farmers' Market-level Fertilizer Quality Beliefs by Fertilizer Purchase in Associated Market

	Farmers out of Ten Receiving High-quality			Concerned About Quality (1 = Yes, 0 = No)		
	(1)	(2)	(3)	(4)	(5)	(6)
(A) Purchased Fertilizer in Associated Market						
Baseline market size (β_1)	-0.021	0.005	-0.039	0.003	-0.007	0.009
	(0.057)	(0.087)	(0.099)	(0.010)	(0.013)	(0.015)
Agro-dealer exits (β_2)	0.144		0.156	-0.051		-0.055*
	(0.192)		(0.202)	(0.032)		(0.033)
Agro-dealer entries (β_3)		0.008	0.022		-0.002	-0.007
		(0.094)	(0.102)		(0.012)	(0.013)
Outcome variable mean	7.33	7.33	7.33	0.65	0.65	0.65
R^2	0.036	0.034	0.036	0.040	0.032	0.041
Observations	258	258	258	258	258	258
(B) Did Not Purchase Fertilizer in Associated Market						
Baseline market size (β_1)	-0.098**	-0.050	-0.198***	0.021***	0.002	0.025**
	(0.048)	(0.064)	(0.066)	(0.008)	(0.011)	(0.011)
Agro-dealer exits (β_2)	0.361**		0.409**	-0.063**		-0.065**
	(0.162)		(0.161)	(0.027)		(0.027)
Agro-dealer entries (β_3)		0.068	0.101**		0.001	-0.004
		(0.048)	(0.046)		(0.007)	(0.007)
Outcome variable mean	6.68	6.68	6.68	0.72	0.72	0.72
R^2	0.038	0.031	0.041	0.030	0.020	0.030
Observations	984	984	984	984	984	984
Farmer-level controls	Yes	Yes	Yes	Yes	Yes	Yes

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the market level. Columns 3 and 6 estimate Equation 6. "Baseline market size" is the number of agro-dealers operating in a market in round one, "agro-dealer exits" is the number of agro-dealers that exited a market between rounds one and two, and "agro-dealer entries" is the number of new agro-dealers that entered a market between rounds one and two. Panel A restricts the sample to farmers who purchased fertilizer from their associated market during the last long rains season. Panel B restricts the sample to farmers who did *not* purchase fertilizer from their associated market during the last long rains season. In both panels we use farmer beliefs that correspond to each farmer's associated market. Farmer-level controls are listed in Column 1 of Appendix Table B.3. The p-value for β_2 in Column 4 of Panel A is 0.121.

Table B.7: Robustness Check for the Effect of Agro-dealer Turnover on Farmers' Market-level Fertilizer Quality Beliefs: Clustering Standard Errors at the Village Level

	Farmers out of Ten Receiving High-quality			Concerned About Quality (1 = Yes, 0 = No)		
	(1)	(2)	(3)	(4)	(5)	(6)
Baseline market size (β_1)	-0.029	0.017	-0.081	0.010*	-0.007	0.011
	(0.045)	(0.063)	(0.064)	(0.006)	(0.008)	(0.008)
Agro-dealer exits (β_2)	0.279**		0.305**	-0.056***		-0.057***
	(0.138)		(0.141)	(0.021)		(0.021)
Agro-dealer entries (β_3)		0.033	0.057		0.003	-0.002
		(0.051)	(0.052)		(0.006)	(0.006)
Outcome variable mean	6.82	6.82	6.82	0.70	0.70	0.70
Farmer-level controls	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.025	0.020	0.026	0.022	0.013	0.022
Observations	1,242	1,242	1,242	1,242	1,242	1,242

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. This robustness check clusters standard errors (in parentheses) at the village level. Columns 3 and 6 estimate Equation 6. "Baseline market size" is the number of agro-dealers operating in a market in round one, "agro-dealer exits" is the number of agro-dealers that exited a market between rounds one and two, and "agro-dealer entries" is the number of new agro-dealers that entered a market between rounds one and two. We use farmer beliefs that correspond to each farmer's associated market. Farmer-level controls are listed in Column 1 of Appendix Table B.3.

Table B.8: Robustness Check for the Effect of Agro-dealer Turnover on Farmers' Market-level Fertilizer Quality Beliefs: Variable Winzorization

	Farmers out of Ten Receiving High-quality			Concerned About Quality (1 = Yes, 0 = No)		
	(1)	(2)	(3)	(4)	(5)	(6)
(A) Winsorizing Agro-dealer Entries						
Baseline market size (β_1)		0.003	-0.084		-0.005	0.011
		(0.047)	(0.051)		(0.006)	(0.007)
Agro-dealer exits (β_2)			0.309**			-0.057**
			(0.146)			(0.023)
Agro-dealer entries (β_3)		0.117*	0.140**		0.001	-0.003
		(0.069)	(0.068)		(0.011)	(0.011)
R^2		0.022	0.028		0.013	0.022
(B) Winsorizing Baseline Market Size						
Baseline market size (β_1)	-0.033	0.053	-0.062	0.016	-0.009	0.016
	(0.091)	(0.078)	(0.102)	(0.011)	(0.010)	(0.011)
Agro-dealer exits (β_2)	0.273*		0.279*	-0.060**		-0.060**
	(0.160)		(0.161)	(0.024)		(0.023)
Agro-dealer entries (β_3)		0.026	0.032		0.001	0.000
		(0.043)	(0.048)		(0.005)	(0.005)
R^2	0.025	0.020	0.025	0.022	0.013	0.022
Outcome variable mean	6.82	6.82	6.82	0.70	0.70	0.70
Farmer-level controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,242	1,242	1,242	1,242	1,242	1,242

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. These robustness checks address long-tailed distributions by winsorizing "agro-dealer entries" (Panel A) and "baseline market size" (Panel B) at the 95th percentile. Standard errors (in parentheses) are clustered at the market level. Columns 3 and 6 estimate Equation 6. "Baseline market size" is the number of agro-dealers operating in a market in round one, "agro-dealer exits" is the number of agro-dealers that exited a market between rounds one and two, and "agro-dealer entries" is the number of new agro-dealers that entered a market between rounds one and two. We use farmer beliefs that correspond to each farmer's associated market. Farmer-level controls are listed in Column 1 of Appendix Table B.3.

Table B.9: Robustness Check for the Effect of Agro-dealer Turnover on Farmers' Market-level Fertilizer Quality Beliefs: Variable Scaling

	Farmers out of Ten Receiving High-quality			Concerned About Quality (1 = Yes, 0 = No)		
	(1)	(2)	(3)	(4)	(5)	(6)
Percentage of agro-dealer exits	0.642**		0.620**	-0.099**		-0.100**
	(0.266)		(0.267)	(0.040)		(0.040)
Percentage of agro-dealer entries		0.152*	0.131		0.004	0.008
		(0.090)	(0.086)		(0.014)	(0.014)
Outcome variable mean	6.79	6.79	6.79	0.70	0.70	0.70
Farmer-level controls	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.026	0.020	0.027	0.023	0.016	0.023
Observations	1,199	1,199	1,199	1,199	1,199	1,199

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. This robustness check replaces counts of agro-dealer exits and entries with percentages—calculated as the ratio of each count to the "baseline market size." "Baseline market size" is the number of agro-dealers operating in a market in round one. Each column includes only 1,199 farmers because this model specification uses percentage-based measures, requiring the exclusion of 43 farmers from three markets that had no agro-dealers in round one. Standard errors (in parentheses) are clustered at the market level. Columns 3 and 6 estimate Equation 6. We use farmer beliefs that correspond to each farmer's associated market. Farmer-level controls are listed in Column 1 of Appendix Table B.3.

Table B.10: Ordered Logit Model for Comparing Farmers' Agricultural Input Quality Beliefs for an Incumbent Relative to a New Market Entrant

	Farmers out of Ten Receiving High-quality			Concerned About Quality (1 = Yes, 0 = No)		
	(1)	(2)	(3)	(4)	(5)	(6)
New market entrant (β_1)	-1.225***	-0.083	-0.230	0.835***	-0.167	-0.401
	(0.223)	(0.337)	(0.606)	(0.232)	(0.375)	(0.902)
Stable relationship (β_2)		1.495***			-1.300***	
		(0.324)			(0.379)	
New market entrant ×		-1.946***	-4.003***		1.617***	3.985***
stable relationship (β_3)		(0.441)	(0.897)		(0.477)	(1.264)
$\beta_1 + \beta_3$		-2.029	-4.233		1.450	3.584
Reference group mean	8.37	7.14	7.14	0.47	0.66	0.66
Village fixed effects	Yes	Yes	No	Yes	Yes	No
Farmer fixed effects	No	No	Yes	No	No	Yes
Farmer-level controls	Yes	Yes	No	Yes	Yes	No
Pseudo R^2	0.048	0.070	0.335	0.084	0.116	0.698
Observations	300	300	300	300	300	300

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the farmer level. Columns 1 and 4 report the reduced model specification, omitting the $Stable_i$ and New_j indicators. Columns 2 and 5 estimate Equation 7 while Columns 3 and 6 replace village fixed effects with farmer fixed effects. "Reference group mean" reports the outcome variable mean for the baseline group in each model specification: farmers' quality beliefs about their current agro-dealer, calculated either for all farmers (Columns 1 and 4) or for only farmers without a stable agro-dealer relationship (Columns 2, 3, 5, and 6). A stable agro-dealer relationship is defined as *usually* purchasing agricultural inputs from the same agro-dealer over the past five years. Farmer-level controls are listed in Column 2 of Appendix Table B.3.

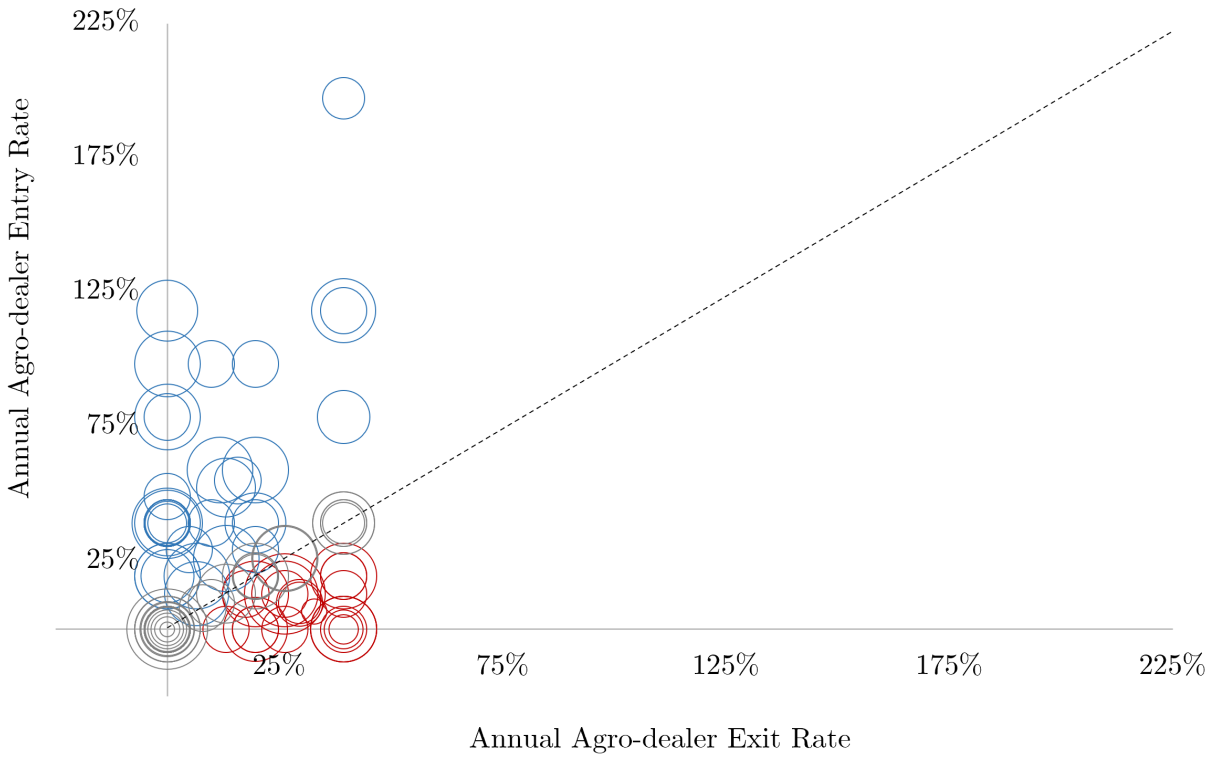

Figure B.2: Market-Linked Farmer Sample Concentration Relative to Annual Agro-dealer Entry and Exit Rates Across Markets

Note: The figure presents a scatter plot of the market-linked farmer sample across markets, depicting annual agro-dealer turnover rates between rounds one and two. Each circle represents a market with its size corresponding to the number of farmers whose associated market is that market. To determine whether a larger portion of the sample is linked to markets with a lower annual agro-dealer entry rate relative to exit rate, attention is given to circles below the $y = x$ diagonal line. At this line, the annual agro-dealer entry rate equals the exit rate. The area below and to the right of this line highlights markets with lower entry than exit rates. Of the 1,242 farmers in this sample, 24.2 percent have an associated market below the diagonal (red), 41.1 percent have an associated market above it (blue), and 34.6 percent have an associated market on it (gray). This indicates that most farmers are not linked to associated markets where the annual agro-dealer entry rate is *lower* than the exit rate.

C Agro-dealer Turnover Rate Estimation Details

To calculate the agro-dealer turnover rates that are reported in Section 5.1, we define the entry rate between two census rounds as the number of agro-dealers that enter a market between rounds r and $r+1$ ($E_{r\to r+1}$) divided by the number of agro-dealers present at the start of round r (N_r). Our exit rate is defined similarly: the number of agro-dealers that exit a market between two rounds ($X_{r\to r+1}$) divided by N_r. These definitions are consistent with standard methods used to calculate MSME turnover rates in low-income settings (see Liedholm (2002) and Kremer, Robinson, and Rostapshova (2014)).

Because the three rounds were conducted at unequal intervals—round one from November 2015 to May 2016, round two from December 2018 to January 2019, and round three in January 2020—we annualize these entry and exit rates. To do this, we divide each rate for a pair of rounds by the number of years between the rounds in each pair ($T_{r\to r+1}$). This adjustment ensures comparability across pairs of rounds: rounds one to two, and two to three. We then compute a weighted average of the annual rates to produce a single annual rate for the full between-round period. The weights ($W_{r\to r+1}$) reflect the proportion of total between-round time spanned by each round-pair. Time between rounds one and two ($T_{1\to 2}$) is 2.53 years (i.e., 925 days) and time between rounds two and three ($T_{2\to 3}$) is 1.02 years (i.e., 372 days). We calculate these durations by counting the number of days between the day after the last survey date of one round and the day before the first survey date of the next round. The resulting weights are $W_{1\to 2} = \frac{925}{925+372} = 0.71$ and $W_{2\to 3} = 0.29$.

Equations C.1 and C.2 define the annual agro-dealer entry and exit rates, respectively. In Equation C.1, $E_{1\to 2}$ and $E_{2\to 3}$ capture the number of agro-dealer entries between rounds one and two, and two and three, respectively. In Equation C.2, $X_{1\to 2}$ and $X_{2\to 3}$ represent the number of agro-dealer exits between rounds one and two, and two and three, respectively. N_1 and N_2 denote the number of agro-dealers at the start of rounds one and two, respectively, while $T_{1\to 2}$ and $T_{2\to 3}$ are the time intervals in years in between each round-pair. The weights $W_{2\to 3}$ and $W_{2\to 3}$ are functions of these time intervals and determine each pair's contribution to the overall annual rate.

$$\text{Annual Agro-dealer Entry Rate} = W_{1\to 2}\left(\frac{\left(\frac{E_{1\to 2}}{N_1}\right)}{T_{1\to 2}}\right) + W_{2\to 3}\left(\frac{\left(\frac{E_{2\to 3}}{N_2}\right)}{T_{2\to 3}}\right) \tag{C.1}$$

$$\text{Annual Agro-dealer Exit Rate} = W_{1\to 2}\left(\frac{\left(\frac{X_{1\to 2}}{N_1}\right)}{T_{1\to 2}}\right) + W_{2\to 3}\left(\frac{\left(\frac{X_{2\to 3}}{N_2}\right)}{T_{2\to 3}}\right) \tag{C.2}$$

D Predictors of Agro-dealer Exit

Researchers have used various approaches to identify predictors of MSME exit, such as saturated dummy variable regressions (McKenzie and Paffhausen 2019), correlations (Kremer, Robinson, and Rostapshova 2014), and fixed-effects probit models (Camacho and Rodriguez 2013; Aga and Francis 2017). Adopting a similar approach, we first construct a stacked sample from the agro-dealer census that includes agro-dealers observed in rounds one, two, or both, yielding 522 observations that correspond to 384 unique agro-dealers. Using this sample, we estimate a fixed-effects linear probability model (LPM) to examine predictors of agro-dealer exit in subsequent rounds. The LPM facilitates direct interpretation of marginal effects and our results are robust to alternative functional forms, including logit and probit model specifications (see Tables D.2 and D.3, respectively).

Equation D.1 presents our LPM specification:

$$Y_{im,t+1} = \beta_0 + \beta_1 \boldsymbol{X}'_{it} + \beta_2 \boldsymbol{Z}'_{mt} + \alpha_t + \gamma_m + \epsilon_{imt} \tag{D.1}$$

$Y_{im,t+1}$ is a binary variable equal to one if agro-dealer i in market m exited by round $t+1$. The vectors $\boldsymbol{X}'_{it}$ and $\boldsymbol{Z}'_{mt}$ include selected time-varying agro-dealer and market-level controls from Tables 1 and B.2. Round fixed effects (α_t) account for shocks to all markets between rounds, market fixed effects (γ_m) control for unobserved time-invariant market characteristics, and ϵ_{imt} is the error term. Standard errors are clustered at the agro-dealer level (i.e., 384 *unique* agro-dealers).

Table D.1 reports the correlates of agro-dealer exit using the LPM. Columns 1, 2, and 3 present estimates with no fixed effects, round fixed effects only, and both round and market fixed effects, respectively. Column 3 corresponds to the full model specification in Equation D.1. The findings suggest that agro-dealer exit is not strongly associated with most observable firm characteristics. A notable exception is TFRA licensing status: operating without a license to sell fertilizer is associated with a 8.5 percentage point increase in the likelihood of exit in the subsequent round.

In our setting, neither MSME age nor size—proxied by the number of non-owner employees—are significant predictors of exit, despite consistent evidence from previous studies linking both factors to lower exit rates (Mead and Liedholm 1998; Kremer, Robinson, and Rostapshova 2014; Aga and Francis 2017; McKenzie and Paffhausen 2019). Instead, the results underscore the role of

market dynamics: agro-dealer exit is associated with increased local competition.

Market fixed effects in Equation D.1 account for time-invariant differences across markets, such as their overall size or typical competition levels. As a result, the coefficient on competition captures how changes in the number of competitors within a given market over time (rather than differences across markets) affect the likelihood of agro-dealer exit. A positive sign indicates that an increase in the number of competitors in a market raises the probability that an agro-dealer in that market exits by the next round, consistent with heightened competition making survival more difficult.

As shown in Column 3 of Table D.1, for each additional competitor in an agro-dealer's market, the likelihood of exit in the subsequent round increases by 2.4 percentage points. This relationship suggests that higher within-market competition intensity elevates the risk of exit.

Existing research has largely overlooked how market dynamics influence MSME survival (Mead and Liedholm 1998; Liedholm 2002; Kremer, Robinson, and Rostapshova 2014; Aga and Francis 2017; McKenzie and Paffhausen 2019). Yet two studies provide relevant insights. Rudder (2022) documents that in the wake of an environmental shock in Kenya, market-level competition increases—as more MSMEs enter and fewer exit—even as individual MSMEs report declines in sales, profits, and hiring. Moreover, Klapper and Richmond (2011) show that trade liberalization in Côte d'Ivoire led to increased competition, which in turn increased the exit rate among formally registered MSMEs.

Table D.1: Linear Probability Model for Predictors of Agro-dealer Exit

	(1)	(2)	(3)
Agro-dealer Characteristics			
Owns a car or truck (1 = yes, 0 = no)	-0.080*	-0.065	-0.087
	(0.047)	(0.046)	(0.057)
Has CNFA/TAGMARK certification displayed (1 = yes, 0 = no)	0.025	0.019	0.035
	(0.051)	(0.050)	(0.059)
Uses outdoor signage for advertising (1 = yes, 0 = no)	0.032	0.000	0.018
	(0.043)	(0.043)	(0.052)
Number of other locations that sell fertilizer	-0.004	-0.008	-0.020
	(0.032)	(0.031)	(0.035)
Has a license to sell fertilizer (1 = yes, 0 = no)	-0.058	-0.052	-0.085*
	(0.044)	(0.043)	(0.049)
Number of additional employees present at time of interview	0.053*	0.043	0.028
	(0.027)	(0.028)	(0.034)
Number of years operating at current location	-0.011*	-0.010*	-0.001
	(0.006)	(0.006)	(0.007)
Market Characteristics			
Number of agro-dealers operating in a market	-0.005	-0.002	0.024**
	(0.003)	(0.003)	(0.011)
Round fixed effects	No	Yes	Yes
Market fixed effects	No	No	Yes
R^2	0.027	0.045	0.267
Observations	522	522	522

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the agro-dealer level (i.e., 384 clusters). Column 1 presents results associated with the linear probability model (LPM) with no fixed effects. Column 2 adds round fixed effects while Column 3 includes both round and market fixed effects. We winsorize the variable "number of years operating at current location" only for data above the 95th percentile given its long-tailed distribution. A CNFA/TAGMARK certificate is awarded to Tanzanian agro-dealers who completed the TAGMARK training program, which focused on improving agro-dealer professionalism, business practices, and technical knowledge. The p-value for the estimate of "owns a car or truck" in Column 3 is 0.126. Results are robust to logit and probit model specifications (see Tables D.2 and D.3, respectively).

Table D.2: Logit Model for Predictors of Agro-dealer Exit

	(1)	(2)	(3)
Agro-dealer Characteristics			
Owns a car or truck (1 = yes, 0 = no)	-0.402	-0.335	-0.590*
	(0.250)	(0.250)	(0.354)
Has CNFA/TAGMARK certification displayed (1 = yes, 0 = no)	0.128	0.103	0.187
	(0.260)	(0.261)	(0.352)
Uses outdoor signage for advertising (1 = yes, 0 = no)	0.154	-0.003	0.115
	(0.211)	(0.217)	(0.297)
Number of other locations that sell fertilizer	-0.019	-0.038	-0.114
	(0.156)	(0.154)	(0.199)
Has a license to sell fertilizer (1 = yes, 0 = no)	-0.288	-0.255	-0.525*
	(0.218)	(0.220)	(0.292)
Number of additional employees present at time of interview	0.266**	0.217	0.160
	(0.133)	(0.136)	(0.179)
Number of years operating at current location	-0.057*	-0.053*	-0.003
	(0.032)	(0.032)	(0.038)
Market Characteristics			
Number of agro-dealers operating in a market	-0.025	-0.009	0.148**
	(0.017)	(0.017)	(0.060)
Round fixed effects	No	Yes	Yes
Market fixed effects	No	No	Yes
R^2	0.023	0.038	0.155
Observations	522	522	452

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the agro-dealer level (i.e., 384 clusters). Column 1 presents results associated with the logit model specification with no fixed effects. Column 2 adds round fixed effects while Column 3 includes both round and market fixed effects. We winsorize the variable "number of years operating at current location" only for data above the 95th percentile given its long-tailed distribution. A CNFA/TAGMARK certificate is awarded to Tanzanian agro-dealers who completed the TAGMARK training program, which focused on improving agro-dealer professionalism, business practices, and technical knowledge. Column 3 has a smaller sample size because 29 markets, representing 70 agro-dealers, showed no variation in agro-dealer exit and are dropped when market fixed effects are included. The p-value for the estimate of "owns a car or truck" in Column 1 is 0.108.

Table D.3: Probit Model for Predictors of Agro-dealer Exit

	(1)	(2)	(3)
Agro-dealer Characteristics			
Owns a car or truck (1 = yes, 0 = no)	-0.240*	-0.196	-0.347*
	(0.145)	(0.145)	(0.191)
Has CNFA/TAGMARK certification displayed (1 = yes, 0 = no)	0.071	0.059	0.068
	(0.156)	(0.155)	(0.196)
Uses outdoor signage for advertising (1 = yes, 0 = no)	0.096	-0.001	0.075
	(0.127)	(0.131)	(0.172)
Number of other locations that sell fertilizer	-0.018	-0.035	-0.052
	(0.093)	(0.092)	(0.113)
Has a license to sell fertilizer (1 = yes, 0 = no)	-0.170	-0.156	-0.297*
	(0.132)	(0.132)	(0.164)
Number of additional employees present at time of interview	0.159**	0.129	0.084
	(0.081)	(0.082)	(0.104)
Number of years operating at current location	-0.034*	-0.031	-0.002
	(0.019)	(0.019)	(0.022)
Market Characteristics			
Number of agro-dealers operating in a market	-0.015	-0.005	0.089***
	(0.010)	(0.010)	(0.033)
Round fixed effects	No	Yes	Yes
Market fixed effects	No	No	Yes
R^2	0.023	0.038	0.156
Observations	522	522	452

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the agro-dealer level (i.e., 384 clusters). Column 1 presents results associated with the probit model specification with no fixed effects. Column 2 adds round fixed effects while Column 3 includes both round and market fixed effects. We winsorize the variable "number of years operating at current location" only for data above the 95th percentile given its long-tailed distribution. A CNFA/TAGMARK certificate is awarded to Tanzanian agro-dealers who completed the TAGMARK training program, which focused on improving agro-dealer professionalism, business practices, and technical knowledge. Column 3 has a smaller sample size because 29 markets, representing 70 agro-dealers, showed no variation in agro-dealer exit and are dropped when market fixed effects are included. The p-value for the estimate of "number of years operating at current location" in Column 2 is 0.107.

E Testing the Reverse Causality Channel

A potential concern regarding the results in Section 6.1 is that farmers' market-level fertilizer quality beliefs could affect subsequent agro-dealer turnover, rather than the other way around. For example, if farmers perceive fertilizer quality in their market to be low, agro-dealers may anticipate weaker demand or lower profitability, increasing the likelihood of exit or discouraging market entry. To evaluate this reverse causality mechanism, we test whether farmers' market-level fertilizer quality beliefs predict agro-dealer turnover between rounds two and three. Farmer beliefs data comes from the market-linked survey conducted during round two of the agro-dealer census (see Section 4.2).

We estimate the following model specifications:

$$Exit_{m,2\to3} = \beta_0 + \beta_1 MarketSize_{m,2} + \beta_2 \overline{Beliefs}_m + \beta_3 Entry_{m,2\to3} + \beta_4 \overline{X'}_m + \epsilon_m \tag{E.1}$$

$$Entry_{m,2\to3} = \beta_0 + \beta_1 MarketSize_{m,2} + \beta_2 \overline{Beliefs}_m + \beta_3 Exit_{m,2\to3} + \beta_4 \overline{\boldsymbol{X}'}_m + \epsilon_m \tag{E.2}$$

$Exit_{m,2\to3}$ is the number of agro-dealer exits in market m between rounds two and three while $Entry_{m,2\to3}$ is the number of agro-dealer entries in market m between rounds two and three. $\overline{Beliefs}_m$ captures the market-level average of farmer fertilizer quality beliefs in market m while $MarketSize_{m,2}$ controls for the number of agro-dealers in market m in round two. The vector $\overline{\boldsymbol{X}'}_m$ includes market-level averages of farmer characteristics listed in Column 1 of Appendix Table B.3 and ϵ_m is the error term. Standard errors are clustered at the market level.

Table E.1 show the results. Column 2 reports estimates from Equation E.1, where the outcome is the number of agro-dealer exits between rounds two and three. Column 4 reports estimates from Equation E.2, where the outcome is the number of agro-dealer entries between rounds two and three. For each outcome, the first column shows the unconditional model specification and the second column conditions on the corresponding agro-dealer turnover measure (i.e., conditioning on agro-dealer entry when estimating agro-dealer exit and conditioning on agro-dealer exit when estimating agro-dealer entry). The panels correspond to the farmer quality belief measures described in Section 4.2. In Panel A, $\overline{Beliefs}_m$ is the average number of farmers out of ten that farmers in market m believed would receive high-quality fertilizer from market m. In Panel B, $\overline{Beliefs}_m$ is the share of

farmers that expressed *any* concern about fertilizer quality in market m.

Across all model specifications, we find no statistically significant relationship between farmers' prior market-level fertilizer quality beliefs and subsequent agro-dealer exit or entry (i.e., β_2 is not statistically significant). This suggests that the reverse causality channel unlikely holds.

Table E.1: Effect of Farmers' Market-level Fertilizer Quality Beliefs on Agro-dealer Turnover

	Agro-dealer Exits		Agro-dealer Entries	
	(1)	(2)	(3)	(4)
(A) Farmers out of Ten Receiving High-quality				
Baseline market size (β_1)	0.254***	0.203***	0.369***	0.275***
	(0.024)	(0.035)	(0.032)	(0.062)
Farmer quality beliefs (β_2)	-0.102	-0.099	-0.024	0.014
	(0.067)	(0.068)	(0.132)	(0.134)
Agro-dealer exits (β_3)				0.374*
				(0.209)
Agro-dealer entries (β_3)		0.137		
		(0.100)		
R^2	0.663	0.680	0.612	0.632
(B) Concerned About Quality (1 = Yes, 0 = No)				
Baseline market size (β_1)	0.251***	0.201***	0.369***	0.276***
	(0.024)	(0.035)	(0.033)	(0.062)
Farmer quality beliefs (β_2)	0.739	0.696	0.317	0.044
	(0.487)	(0.453)	(1.123)	(1.100)
Agro-dealer exits (β_3)				0.369*
				(0.211)
Agro-dealer entries (β_3)		0.135		
		(0.097)		
R^2	0.664	0.681	0.613	0.632
Outcome variable mean	0.76	0.76	1.44	1.44
Farmer-level controls	Yes	Yes	Yes	Yes
Observations	90	90	90	90

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the market level. "Baseline market size" is the number of agro-dealers operating in a market in round two, "agro-dealer exits" is the number of agro-dealers that exited a market between rounds two and three, and "agro-dealer entries" is the number of new agro-dealers that entered a market between rounds two and three. Farmer-level controls used to construct market-level averages are listed in Column 1 of Appendix Table B.3. Panel A measures "farmer quality beliefs" as the market-level average number of farmers out of ten believed to receive high-quality fertilizer while Panel B uses the market-level share of farmers that expressed *any* fertilizer quality concern. Column 2 corresponds to Equation E.1 while Column 4 corresponds to Equation E.2. Note that only 90 of the 97 markets are represented in this farmer sample.

F Observable Agro-dealer Cues as Potential Quality Signals

To evaluate whether observable agro-dealer characteristics serve as meaningful quality signals, we assess whether farmers in markets where these characteristics are more prevalent hold systematically different beliefs about market-level fertilizer quality. This exercise is not a direct test of the model's maintained assumption that farmers lack reliable firm-specific information about new market entrants at the time of entry. Rather it asks whether differences in observable agro-dealer characteristics across markets predict farmers' market-level fertilizer quality beliefs.

We focus on several such cues that farmers could plausibly observe at the point of purchase and that may shape their perceptions of fertilizer quality in our setting. These include: (i) having a TFRA license; (ii) displaying CNFA/TAGMARK certification; (iii) using outdoor signage; and (iv) having a tin roof. Having a tin roof could signal superior storage conditions, potentially reducing moisture exposure and risk of fertilizer degradation.

Conceptually, this analysis examines whether observable agro-dealer cues function as alternative information signals in addition to or instead of those derived from farmers' own or others' experience with specific agro-dealers in their market (α_{jimt} and α_{-jimt}, respectively; see Section 2).

This exercise complements the analysis in Section 6.1. In particular, we extend Equation 6 and estimate variants of the following model specification:

$$Y_{im} = \beta_0 + \beta_1 MarketSize_{m,1} + \beta_2 Exit_{m,1\to 2} + \beta_3 Entry_{m,1\to 2} + \beta_4 Cue_{m,2} + \beta_5 \boldsymbol{X}_i' + \epsilon_{im} \tag{F.1}$$

Y_{im} captures farmer i's beliefs about market-level fertilizer quality in market m. $MarketSize_{m,1}$ controls for the number of agro-dealers in market m in round one. $Exit_{m,1\to 2}$ is the number of agro-dealer exits in market m between rounds one and two while $Entry_{m,1\to 2}$ is the the number of agro-dealer entries in market m between rounds one and two. $Cue_{m,2}$ captures the extent of a given observable agro-dealer characteristic in market m in round two. The vector $\boldsymbol{X}_i'$ includes farmer-level controls listed in Column 1 of Appendix Table B.3 and ϵ_{im} is the error term. Standard errors are clustered at the market level.

For each observable cue, we construct two market-level measures. First, we estimate the share of agro-dealers in a market that exhibit the characteristic in round two. Second, we define a binary

variable equal to one if *at least one* agro-dealer in the market has that characteristic in round two and zero otherwise. This dual construction helps distinguish whether farmers' beliefs vary with the prevalence of an observable cue among agro-dealers in a market or simply with its presence.

Tables F.1-F.4 report the results for licensing, certification display, outdoor signage, and tin-roof infrastructure, respectively. For Tables F.1-F.3, the outcome variable in Columns 1-2 is the number of farmers out of ten that farmer i in market m believed would receive high-quality fertilizer from market m while Columns 3-4 use a binary outcome variable equal to one if farmer i expressed *any* concern about fertilizer quality in market m. In Table F.4, whether a market has *at least one* agro-dealer with a tin roof is omitted due to limited cross-market variation; thus, only the share-based measure is reported for the two outcomes. Across all model specifications and outcomes, neither the share-based measure nor its binary version are statistically associated with farmers' market-level fertilizer quality beliefs. These null results indicate that observable agro-dealer cues do not function as salient or belief-relevant quality signals in this context. This supports the assumption in Section 2 that new market entrants lack credible observable cues that meaningfully shape consumer beliefs.

Table F.1: Effect of Licensed Agro-dealers on Farmers' Market-level Fertilizer Quality Beliefs

	Farmers out of Ten Receiving High-quality		Concerned About Quality (1 = Yes, 0 = No)	
	(1)	(2)	(3)	(4)
Baseline market size (β_1)	-0.086	-0.090	0.011	0.009
	(0.066)	(0.066)	(0.008)	(0.008)
Agro-dealer exits (β_2)	0.280*	0.275*	-0.055**	-0.054**
	(0.150)	(0.149)	(0.024)	(0.024)
Agro-dealer entries (β_3)	0.060	0.059	-0.003	-0.003
	(0.054)	(0.054)	(0.006)	(0.006)
Licensed share (β_4)	-0.026		0.039	
	(0.263)		(0.040)	
Any licensed agro-dealer (β_4)		0.073		0.030
		(0.225)		(0.035)
Outcome variable mean	6.83	6.83	0.70	0.70
Farmer-level controls	Yes	Yes	Yes	Yes
R^2	0.024	0.024	0.021	0.021
Observations	1,161	1,161	1,161	1,161

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the market level. These estimates correspond to Equation F.1. "Baseline market size" is the number of agro-dealers operating in a market in round one, "agro-dealer exits" is the number of agro-dealers that exited a market between rounds one and two, and "agro-dealer entries" is the number of new agro-dealers that entered a market between rounds one and two. "Licensed share" is the share of agro-dealers operating in the market with a TFRA license in round two. "Any licensed agro-dealer" is a binary variable equal to one if *at least one* agro-dealer with a TFRA license operates in the market in round two and zero otherwise. Each column includes only 1,161 farmers because this model specification uses percentage-based measures, requiring the exclusion of 81 farmers from six markets that had no agro-dealers in round two. We use farmer beliefs that correspond to each farmer's associated market. Farmer-level controls are listed in Column 1 of Appendix Table B.3.

Table F.2: Effect of Agro-dealers Displaying Certification on Farmers' Market-level Fertilizer Quality Beliefs

	Farmers out of Ten Receiving High-quality		Concerned About Quality (1 = Yes, 0 = No)	
	(1)	(2)	(3)	(4)
Baseline market size (β_1)	-0.087	-0.084	0.011	0.010
	(0.065)	(0.068)	(0.008)	(0.008)
Agro-dealer exits (β_2)	0.269*	0.275*	-0.051**	-0.051**
	(0.150)	(0.151)	(0.024)	(0.024)
Agro-dealer entries (β_3)	0.066	0.062	-0.003	-0.003
	(0.053)	(0.055)	(0.006)	(0.006)
Certification display share (β_4)	-0.311		0.069	
	(0.402)		(0.057)	
Any agro-dealer displaying certification (β_4)		-0.049		0.019
		(0.244)		(0.035)
Outcome variable mean	6.83	6.83	0.70	0.70
Farmer-level controls	Yes	Yes	Yes	Yes
R^2	0.025	0.024	0.022	0.020
Observations	1,161	1,161	1,161	1,161

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the market level. These estimates correspond to Equation F.1. "Baseline market size" is the number of agro-dealers operating in a market in round one, "agro-dealer exits" is the number of agro-dealers that exited a market between rounds one and two, and "agro-dealer entries" is the number of new agro-dealers that entered a market between rounds one and two. "Certification display share" is the share of agro-dealers operating in the market that displayed a CNFA/TAGMARK certification in round two. "Any agro-dealer displaying certification" is a binary variable equal to one if *at least one* agro-dealer displays this certification in the market in round two and zero otherwise. A CNFA/TAGMARK certificate is awarded to Tanzanian agro-dealers who completed the TAGMARK training program, which focused on improving agro-dealer professionalism, business practices, and technical knowledge. Each column includes only 1,161 farmers because this model specification uses percentage-based measures, requiring the exclusion of 81 farmers from six markets that had no agro-dealers in round two. We use farmer beliefs that correspond to each farmer's associated market. Farmer-level controls are listed in Column 1 of Appendix Table B.3.

Table F.3: Effect of Agro-dealers With Outdoor Signage on Farmers' Market-level Fertilizer Quality Beliefs

	Farmers out of Ten Receiving High-quality		Concerned About Quality (1 = Yes, 0 = No)	
	(1)	(2)	(3)	(4)
Baseline market size (β_1)	-0.087	-0.091	0.011	0.010
	(0.066)	(0.066)	(0.008)	(0.008)
Agro-dealer exits (β_2)	0.268*	0.269*	-0.054**	-0.056**
	(0.152)	(0.151)	(0.024)	(0.024)
Agro-dealer entries (β_3)	0.059	0.060	-0.002	-0.002
	(0.054)	(0.054)	(0.006)	(0.006)
Outdoor signage share (β_4)	0.164		0.027	
	(0.273)		(0.038)	
Any agro-dealer with outdoor signage (β_4)		0.136		0.041
		(0.218)		(0.032)
Outcome variable mean	6.83	6.83	0.70	0.70
Farmer-level controls	Yes	Yes	Yes	Yes
R^2	0.025	0.025	0.020	0.021
Observations	1,161	1,161	1,161	1,161

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the market level. These estimates correspond to Equation F.1. "Baseline market size" is the number of agro-dealers operating in a market in round one, "agro-dealer exits" is the number of agro-dealers that exited a market between rounds one and two, and "agro-dealer entries" is the number of new agro-dealers that entered a market between rounds one and two. "Outdoor signage share" is the share of agro-dealers operating in the market that have outdoor signage in round two. "Any agro-dealer with outdoor signage" is a binary variable equal to one if *at least one* agro-dealer has outdoor signage in the market in round two and zero otherwise. Each column includes only 1,161 farmers because this model specification uses percentage-based measures, requiring the exclusion of 81 farmers from six markets that had no agro-dealers in round two. We use farmer beliefs that correspond to each farmer's associated market. Farmer-level controls are listed in Column 1 of Appendix Table B.3.

Table F.4: Effect of Agro-dealers Having a Tin Roof on Farmers' Market-level Fertilizer Quality Beliefs

	Farmers out of Ten Receiving High-quality	Concerned About Quality (1 = Yes, 0 = No)
	(1)	(2)
Baseline market size (β_1)	-0.094	0.011
	(0.066)	(0.008)
Agro-dealer exits (β_2)	0.299**	-0.054**
	(0.146)	(0.024)
Agro-dealer entries (β_3)	0.066	-0.002
	(0.057)	(0.006)
Tin roof share (β_4)	1.605	-0.071
	(0.985)	(0.179)
Outcome variable mean	6.83	0.70
Farmer-level controls	Yes	Yes
R^2	0.026	0.020
Observations	1,161	1,161

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the market level. These estimates correspond to Equation F.1. "Baseline market size" is the number of agro-dealers operating in a market in round one, "agro-dealer exits" is the number of agro-dealers that exited a market between rounds one and two, and "agro-dealer entries" is the number of new agro-dealers that entered a market between rounds one and two. "Tin roof share" is the share of agro-dealers operating in the market that have a tin roof in round two. A binary version of this variable is omitted since it exhibits no variation across markets. Each column includes only 1,161 farmers because this model specification uses percentage-based measures, requiring the exclusion of 81 farmers from six markets that had no agro-dealers in round two. We use farmer beliefs that correspond to each farmer's associated market. Farmer-level controls are listed in Column 1 of Appendix Table B.3.

G Farmer Beliefs about Agricultural Information Quality

Agro-dealers not only sell agricultural inputs to farmers but they also serve as informal sources of agricultural information—such as advice on agricultural input selection and application. However, just as farmers cannot directly observe the quality of agricultural inputs at the point of sale, they also cannot readily evaluate the quality of agricultural information provided by agro-dealers. Owing to the same underlying information asymmetries that characterize agricultural input markets, the quality of agro-dealer information is difficult for farmers to assess prior to implementation.

Table G.1 presents descriptive statistics for farmers' beliefs about agricultural information quality using the supplemental farmer sample (see Section 4.2). In addition to evaluating the agricultural input quality for their current agro-dealer and a hypothetical new market entrant, the supplemental survey also asked farmers to rate the agricultural information quality of these two agro-dealer types. Agricultural information quality refers to the reliability and quality of advice and expertise related to how or when to apply agricultural inputs, or about different product and brand offerings. Farmer beliefs about agricultural information quality were measured using a rating scale of one to ten, where ten indicates the highest perceived quality. A corresponding binary variable equals one if the farmer expressed *any* concern about the agricultural information quality provided by either agro-dealer type (i.e., reported a quality rating below ten for that agro-dealer type).

Relative to their current agro-dealer, farmers evaluated the agricultural information quality of a hypothetical new market entrant less favorably. When measured using the binary variable, a larger farmer share expressed concern about the agricultural information quality offered by a hypothetical new market entrant. These patterns align with those for agricultural *input* quality (see Table 2).

Columns 2 and 5 of Table G.2 present estimates of Equation 7 for farmers' beliefs about agricultural *information* quality. A similar pattern emerges relative to the results for agricultural *input* quality reported in Table 6: on average, farmers rate the agricultural information quality of a hypothetical new market entrant 2.0 points lower than that of their current agro-dealer (see Column 1) and are 24.7 percentage points more likely to express concern about hypothetical new market entrants' quality (see Column 4). The sum $\beta_1 + \beta_3$ in Column 2 indicates that farmers with a stable agro-dealer relationship rate the agricultural information quality of a hypothetical new market entrant 2.8 points lower than that of their current agro-dealer. These farmers are also 38.3 percentage

points more likely to express concern about the quality of such new market entrants (see Column 5). Conversely, there is no statistically significant difference in agricultural information quality beliefs between the two agro-dealer types among farmers without stable agro-dealer relationships (see β_1 in Columns 2 and 5). This suggests that farmers *with* stable agro-dealer relationships drive the observed differences. These results mirror both the empirical patterns and theoretical implications discussed in Section 6.2; they are also robust to using farmer fixed effects (see Columns 3 and 6) and to estimating an ordered logit model specification (see Table G.3).

Table G.1: Agricultural Information Quality Belief Measures for Supplemental Farmer Sample

	Mean	Std. Dev.	Min	Max
Quality rating (1 to 10)				
For current agro-dealer	7.85	2.34	1.00	10.00
For hypothetical new market entrant	5.81	2.53	1.00	10.00
Share of farmers concerned about quality (0 to 1)				
From current agro-dealer	0.59	0.49	0.00	1.00
From hypothetical new market entrant	0.84	0.37	0.00	1.00
Observations				150

Note: The rating scale for agricultural information quality is from one to ten, where one indicates the lowest perceived quality and ten indicates the highest.

Table G.2: Comparing Farmers' Agricultural Information Quality Beliefs for an Incumbent Relative to a New Market Entrant

	Quality Rating (1 to 10)			Concerned About Quality (1 = Yes, 0 = No)		
	(1)	(2)	(3)	(4)	(5)	(6)
New market entrant (β_1)	-2.037***	-0.714	-0.714	0.247***	0.018	0.018
	(0.295)	(0.491)	(0.669)	(0.048)	(0.067)	(0.092)
Stable relationship (β_2)		1.906***			-0.280***	
		(0.402)			(0.077)	
New market entrant ×		-2.110***	-2.110**		0.365***	0.365***
stable relationship (β_3)		(0.599)	(0.817)		(0.091)	(0.124)
$\beta_1 + \beta_3$		-2.824	-2.824		0.383	0.383
Reference group mean	7.85	6.67	6.67	0.59	0.77	0.77
Village fixed effects	Yes	Yes	No	Yes	Yes	No
Farmer fixed effects	No	No	Yes	No	No	Yes
Farmer-level controls	Yes	Yes	No	Yes	Yes	No
R^2	0.204	0.263	0.604	0.148	0.196	0.645
Observations	300	300	300	300	300	300

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the farmer level. Columns 1 and 4 report the reduced model specification, omitting the $Stable_i$ and New_j indicators. Columns 2 and 5 estimate Equation 7 while Columns 3 and 6 replace village fixed effects with farmer fixed effects. "Reference group mean" reports the outcome variable mean for the baseline group in each model specification: farmers' quality beliefs about their current agro-dealer, calculated either for all farmers (Columns 1 and 4) or for only farmers without a stable agro-dealer relationship (Columns 2, 3, 5, and 6). Columns 1-3 report responses on a scale from one to ten, where one indicates the lowest perceived quality and ten indicates the highest. A stable agro-dealer relationship is defined as *usually* purchasing agricultural inputs from the same agro-dealer over the past five years. Farmer-level controls are listed in Column 2 of Appendix Table B.3.

Table G.3: Ordered Logit Model for Comparing Farmers' Agricultural Information Quality Beliefs for an Incumbent Relative to a New Market Entrant

	Quality Rating (1 to 10)			Concerned About Quality (1 = Yes, 0 = No)		
	(1)	(2)	(3)	(4)	(5)	(6)
New market entrant (β_1)	-1.528***	-0.595	-1.006*	1.397***	0.110	0.308
	(0.242)	(0.376)	(0.571)	(0.281)	(0.398)	(1.116)
Stable relationship (β_2)		1.446***			-1.396***	
		(0.322)			(0.401)	
New market entrant ×		-1.583***	-2.349***		2.087***	4.297***
stable relationship (β_3)		(0.466)	(0.702)		(0.567)	(1.534)
$\beta_1 + \beta_3$		-2.178	-3.356		2.197	4.605
Reference group mean	7.85	6.67	6.67	0.59	0.77	0.77
Village fixed effects	Yes	Yes	No	Yes	Yes	No
Farmer fixed effects	No	No	Yes	No	No	Yes
Farmer-level controls	Yes	Yes	No	Yes	Yes	No
Pseudo R^2	0.057	0.075	0.246	0.131	0.173	0.750
Observations	300	300	300	300	300	300

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (in parentheses) are clustered at the farmer level. Columns 1 and 4 report the reduced model specification, omitting the $Stable_i$ and New_j indicators. Columns 2 and 5 estimate Equation 7 while Columns 3 and 6 replace village fixed effects with farmer fixed effects. "Reference group mean" reports the outcome variable mean for the baseline group in each model specification: farmers' quality beliefs about their current agro-dealer, calculated either for all farmers (Columns 1 and 4) or for only farmers without a stable agro-dealer relationship (Columns 2, 3, 5, and 6). Columns 1-3 report responses on a scale from one to ten, where one indicates the lowest perceived quality and ten indicates the highest. A stable agro-dealer relationship is defined as *usually* purchasing agricultural inputs from the same agro-dealer over the past five years. Farmer-level controls are listed in Column 2 of Appendix Table B.3.

References

Aga, Gemechu, and David Francis. 2017. "As the Market Churns: Productivity and Firm Exit in Developing Countries." *Small Business Economics* 49:379–403.

Camacho, Adriana, and Catherine Rodriguez. 2013. "Firm Exit and Armed Conflict in Colombia." *Journal of Conflict Resolution* 57 (1): 89–116.

Klapper, Leora, and Christine Richmond. 2011. "Patterns of Business Creation, Survival and Growth: Evidence from Africa." *Labour Economics* 18:S32–S44.

Kremer, Michael, Jonathan Robinson, and Olga Rostapshova. 2014. "Success in Entrepreneurship: Doing the Math." In *African Successes, Volume II: Human Capital,* 281–303. University of Chicago Press.

Liedholm, Carl. 2002. "Small Firm Dynamics: Evidence from Africa and Latin America." *Small Business Economics* 18:225–240.

McKenzie, David, and Anna Luisa Paffhausen. 2019. "Small Firm Death in Developing Countries." *Review of Economics and Statistics* 101 (4): 645–657.

Mead, Donald C., and Carl Liedholm. 1998. "The Dynamics of Micro and Small Enterprises in Developing Countries." *World Development* 26 (1): 61–74.

Rudder, Jess. 2022. "The Effect of Drought on Entry, Exit, and Firm Performance in Rural Kenya."