

Technology Adoption and Smallholder Commercialization: Panel
Evidence from West Africa
Supplementary Information (Full model tables and robustness check)

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1 Descriptive statistics

Table SM1: Descriptive statistics by year and adoption status

Characteristic	2017, N = 2868			2018, N = 2868			2019, N = 2868		
	Non-adopter, N = 1,809	Adopter, N = 1,059	p-value	Non-adopter, N = 1,770	Adopter, N = 1,098	p-value	Non-adopter, N = 1,670	Adopter, N = 1,198	p-value
Country			<0.001			<0.001			<0.001
Ghana	327 (18%)	171 (16%)		353 (20%)	145 (13%)		340 (20%)	158 (13%)	
Mali	697 (39%)	143 (14%)		693 (39%)	147 (13%)		642 (38%)	198 (17%)	
Nigeria	785 (43%)	745 (70%)		724 (41%)	806 (73%)		688 (41%)	842 (70%)	
Age of household head (years)	48 (13)	47 (11)	0.073	49 (13)	47 (11)	<0.001	50 (12)	49 (12)	0.14
Sex of household head (dummy, male=1)	1,681 (93%)	1,004 (95%)	0.047	1,629 (92%)	1,056 (96%)	<0.001	1,546 (93%)	1,139 (95%)	0.007
Education level (Number of years)	2.5 (3.8)	3.4 (4.4)	<0.001	2.4 (3.8)	3.6 (4.4)	<0.001	2.1 (3.3)	3.9 (4.8)	<0.001
Household size (number of persons)	12 (7)	10 (6)	<0.001	12 (7)	10 (6)	<0.001	13 (10)	10 (7)	<0.001
Dependency ratio	1.59 (1.10)	1.77 (1.38)	0.029	1.64 (1.15)	1.69 (1.30)	0.8	1.74 (1.32)	1.95 (1.63)	0.015
Farmers group membership (dummy)	757 (42%)	551 (52%)	<0.001	771 (44%)	537 (49%)	0.005	696 (42%)	518 (43%)	0.4
Training on agriculture (dummy)	591 (33%)	473 (45%)	<0.001	557 (31%)	507 (46%)	<0.001	530 (32%)	565 (47%)	<0.001
Training on groundnut farming(dummy)	1,020 (56%)	587 (55%)	0.6	1,001 (57%)	606 (55%)	0.5	629 (38%)	766 (64%)	<0.001
Public agricultural extension service (number of visits)	1.21 (1.66)	3.32 (3.30)	<0.001	1.40 (1.84)	2.94 (3.29)	<0.001	1.71 (1.90)	2.47 (2.12)	<0.001
Private agricultural extension service (number of visits)	0.58 (0.90)	1.54 (1.89)	<0.001	0.62 (0.94)	1.44 (1.88)	<0.001	1.11 (1.33)	1.38 (1.57)	<0.001
Cash credit for groundnut farming (dummy)	32 (1.8%)	24 (2.3%)	0.4	30 (1.7%)	26 (2.4%)	0.2	49 (2.9%)	76 (6.3%)	<0.001
Credit in kind for groundnut farming (dummy)	62 (3.4%)	129 (12%)	<0.001	54 (3.1%)	137 (12%)	<0.001	87 (5.2%)	150 (13%)	<0.001
Distance to the nearest urban market (km)	15 (18)	11 (11)	<0.001	15 (19)	11 (11)	<0.001	13 (14)	12 (14)	<0.001
Distance the nearest village market (km)	3.8 (5.3)	3.5 (3.7)	0.004	3.9 (5.4)	3.4 (3.6)	0.003	4.8 (5.0)	3.6 (4.5)	<0.001
Crop rotation (dummy)	889 (49%)	397 (37%)	<0.001	905 (51%)	381 (35%)	<0.001	921 (55%)	393 (33%)	<0.001
Mixed Crops (dummy)	657 (36%)	448 (42%)	0.001	681 (38%)	424 (39%)	>0.9	725 (43%)	542 (45%)	0.3
Labor force (man.day)	3.9 (5.1)	6.5 (7.4)	<0.001	4.4 (5.5)	5.6 (7.1)	<0.001	7 (9)	7 (6)	<0.001
Unit selling price (USD/kg)	0.53 (0.07)	0.71 (0.08)	<0.001	0.53 (0.07)	0.72 (0.08)	<0.001	0.53 (0.07)	0.71 (0.09)	<0.001
Seed cost (USD/ha)	8 (16)	27 (19)	<0.001	8 (17)	25 (20)	<0.001	20 (21)	23 (19)	<0.001
Fertilizer cost (USD/ha)	17 (29)	53 (39)	<0.001	18 (30)	49 (40)	<0.001	19 (28)	49 (39)	<0.001
Pesticide cost (USD/ha)	4 (8)	14 (14)	<0.001	4 (8)	13 (14)	<0.001	6 (13)	11 (11)	<0.001
Labor cost (USD/ha)	21 (33)	49 (41)	<0.001	24 (34)	43 (41)	<0.001	50 (49)	50 (41)	0.031
Groundnut area (ha)	1.44 (1.47)	1.81 (1.62)	<0.001	1.49 (1.46)	1.72 (1.64)	<0.001	1.60 (1.47)	1.72 (1.32)	<0.001
Off-farm income (dummy)	80 (4.4%)	190 (18%)	<0.001	85 (4.8%)	185 (17%)	<0.001	142 (8.5%)	199 (17%)	<0.001
Clay soil (dummy)	279 (15%)	164 (15%)	>0.9	271 (15%)	172 (16%)	0.8	282 (17%)	207 (17%)	0.8
Sandy-clay soil (dummy)	987 (55%)	595 (56%)	0.4	977 (55%)	605 (55%)	>0.9	740 (44%)	516 (43%)	0.5
Silty soil (dummy)	281 (16%)	162 (15%)	0.9	278 (16%)	165 (15%)	0.6	306 (18%)	200 (17%)	0.3

¹ n (%); Mean (SD)² Pearson's Chi-squared test; Wilcoxon rank sum test

2 Pooled OLS Regressions

Table SM2: Full OLS estimates of the relationship between adoption and commercialization(Adoption)

variables	Sellers	Quantity sold	Sales value
Adoption dummy	0.021* (0.012)	0.145* (0.079)	0.132* (0.073)
Age of household head (years)	-0.001** (0.000)	-0.006** (0.002)	-0.005*** (0.002)
Sex of household head (dummy, male=1)	-0.012 (0.020)	0.105 (0.129)	0.112 (0.118)
Education level (Number of years)	0.001 (0.001)	-0.005 (0.006)	-0.005 (0.005)
Household size (number of persons)	0.000 (0.001)	0.015*** (0.005)	0.015*** (0.004)
Farmers group membership (dummy)	0.022*** (0.004)	0.132*** (0.029)	0.120*** (0.027)
Training on agriculture (dummy)	-0.057*** (0.011)	-0.320*** (0.074)	-0.282*** (0.068)
Training on groundnut farming (dummy)	-0.021*** (0.004)	-0.154*** (0.025)	-0.143*** (0.023)
Public agricultural extension service (number of visits)	0.001 (0.002)	-0.017 (0.014)	-0.018 (0.013)
Private agricultural extension service (number of visits)	0.007** (0.003)	0.034* (0.020)	0.027 (0.019)
Cash credit for groundnut farming (dummy)	0.011 (0.020)	0.034 (0.140)	0.026 (0.130)
Credit in kind for groundnut farming (dummy)	-0.008 (0.012)	0.039 (0.088)	0.043 (0.082)
Distance to the nearest urban market (km)	-0.002*** (0.000)	-0.015*** (0.002)	-0.014*** (0.002)
Distance the nearest village market (km)	-0.004*** (0.001)	-0.021*** (0.007)	-0.019*** (0.007)
Crop rotation (dummy)	0.010 (0.010)	0.085 (0.063)	0.078 (0.057)
Mixed Crops (dummy)	0.003 (0.008)	-0.095* (0.051)	-0.097** (0.047)
Labor force (man.day)	0.002*** (0.001)	0.024*** (0.004)	0.023*** (0.004)
Unit selling price (USD/kg)	0.068 (0.042)	0.579** (0.286)	2.001*** (0.264)
Seed cost (USD/ha)	0.001*** (0.000)	0.010*** (0.002)	0.009*** (0.002)
Fertilizer cost (USD/ha)	0.000 (0.000)	0.001* (0.001)	0.001* (0.001)
Pesticide cost (USD/ha)	-0.000 (0.000)	0.003 (0.002)	0.003 (0.002)
Labor cost (USD/ha)	0.000*** (0.000)	0.002*** (0.001)	0.002*** (0.001)
Groundnut area (ha)	0.019*** (0.003)	0.347*** (0.022)	0.335*** (0.021)
Off-farm income (dummy)	-0.033*** (0.010)	-0.151** (0.074)	-0.135** (0.069)
Dependency ratio	0.001 (0.003)	-0.002 (0.019)	-0.003 (0.017)
Clay soil (dummy)	-0.008 (0.011)	-0.097 (0.077)	-0.095 (0.071)
Sandy-clay soil (dummy)	0.007 (0.009)	0.035 (0.061)	0.031 (0.056)
Silty soil (dummy)	0.008 (0.011)	0.052 (0.076)	0.046 (0.070)

Table SM2: Full OLS estimates of the relationship between adoption and commercialization(Adoption) (*continued*)

variables	Sellers	Quantity sold	Sales value
Constant	0.852*** (0.038)	5.469*** (0.258)	4.157*** (0.236)
Observations	8,604	8,604	8,604
R-squared	0.274	0.421	0.451
Robust standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

Table SM3: Full OLS estimates of the relationship between adoption and commercialization (Area under Adoption)

variables	Sellers	Quantity sold	Sales value
Area under adoption (ha)	-0.006 (0.004)	-0.021 (0.032)	-0.015 (0.031)
Age of household head (years)	-0.001** (0.000)	-0.006** (0.002)	-0.005*** (0.002)
Sex of household head (dummy, male=1)	-0.011 (0.020)	0.110 (0.129)	0.116 (0.118)
Education level (Number of years)	0.001 (0.001)	-0.005 (0.006)	-0.006 (0.005)
Household size (number of persons)	0.000 (0.001)	0.014*** (0.005)	0.014*** (0.004)
Farmers group membership (dummy)	0.022*** (0.004)	0.132*** (0.029)	0.120*** (0.027)
Training on agriculture (dummy)	-0.056*** (0.011)	-0.319*** (0.074)	-0.282*** (0.068)
Training on groundnut farming (dummy)	-0.021*** (0.004)	-0.155*** (0.025)	-0.144*** (0.023)
Public agricultural extension service (number of visits)	0.001 (0.002)	-0.015 (0.014)	-0.016 (0.013)
Private agricultural extension service (number of visits)	0.008*** (0.003)	0.042** (0.020)	0.033* (0.019)
Cash credit for groundnut farming (dummy)	0.011 (0.020)	0.038 (0.140)	0.030 (0.131)
Credit in kind for groundnut farming (dummy)	-0.006 (0.012)	0.052 (0.087)	0.053 (0.082)
Distance to the nearest urban market (km)	-0.002*** (0.000)	-0.015*** (0.002)	-0.014*** (0.002)
Distance the nearest village market (km)	-0.004*** (0.001)	-0.021*** (0.007)	-0.019*** (0.007)
Crop rotation (dummy)	0.009 (0.010)	0.080 (0.063)	0.074 (0.058)
Mixed Crops (dummy)	0.002 (0.008)	-0.100* (0.051)	-0.102** (0.047)
Labor force (man.day)	0.002*** (0.001)	0.023*** (0.004)	0.022*** (0.004)
Unit selling price (USD/kg)	0.134*** (0.034)	0.982*** (0.235)	2.357*** (0.218)
Seed cost (USD/ha)	0.001*** (0.000)	0.010*** (0.002)	0.009*** (0.002)
Fertilizer cost (USD/ha)	0.000 (0.000)	0.002** (0.001)	0.002** (0.001)
Pesticide cost (USD/ha)	-0.000 (0.000)	0.004 (0.002)	0.004* (0.002)
Labor cost (USD/ha)	0.000*** (0.000)	0.002*** (0.001)	0.002*** (0.001)
Groundnut area (ha)	0.022*** (0.003)	0.355*** (0.022)	0.342*** (0.021)
Off-farm income (dummy)	-0.033*** (0.010)	-0.150** (0.074)	-0.134* (0.069)
Dependency ratio	0.001 (0.003)	-0.003 (0.019)	-0.003 (0.017)
Clay soil (dummy)	-0.009 (0.011)	-0.101 (0.077)	-0.099 (0.071)
Sandy-clay soil (dummy)	0.006 (0.009)	0.032 (0.060)	0.028 (0.055)
Silty soil (dummy)	0.008 (0.011)	0.053 (0.076)	0.046 (0.070)
Constant	0.819*** (0.036)	5.267*** (0.245)	3.980*** (0.225)
Observations	8,604	8,604	8,604

Table SM3: Full OLS estimates of the relationship between adoption and commercialization (Area under Adoption) (*continued*)

variables	Sellers	Quantity sold	Sales value
R-squared	0.273	0.421	0.451
Robust standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

Table SM4: Full OLS estimates of the relationship between adoption, production and yields(Adoption)

variables	Production	Production value	Yields
Adoption dummy	538.366*** (36.536)	359.340*** (24.099)	283.336*** (15.075)
Age of household head (years)	0.226 (0.882)	0.246 (0.625)	-0.023 (0.374)
Sex of household head (dummy, male=1)	-17.450 (31.798)	-20.938 (23.338)	-24.355 (17.706)
Education level (Number of years)	0.573 (2.929)	-0.462 (2.113)	1.681 (1.329)
Household size (number of persons)	-2.087 (1.918)	-3.346** (1.312)	0.531 (0.633)
Farmers group membership (dummy)	27.503* (14.436)	23.696** (10.143)	1.717 (5.305)
Training on agriculture (dummy)	20.058 (28.123)	10.166 (19.713)	12.945 (11.464)
Training on groundnut farming (dummy)	-2.803 (9.558)	-3.008 (6.533)	-2.129 (4.027)
Public agricultural extension service (number of visits)	-10.965 (7.583)	-9.267* (5.383)	-7.113** (2.889)
Private agricultural extension service (number of visits)	-20.005** (9.408)	-13.667** (6.454)	-3.053 (3.826)
Cash credit for groundnut farming (dummy)	-116.583* (62.411)	-96.283** (42.370)	-3.990 (27.589)
Credit in kind for groundnut farming (dummy)	19.798 (52.308)	39.725 (37.817)	-8.167 (19.779)
Distance to the nearest urban market (km)	-0.254 (0.828)	-0.150 (0.553)	0.039 (0.353)
Distance the nearest village market (km)	-3.361* (1.840)	-2.097* (1.198)	-1.617** (0.795)
Crop rotation (dummy)	-54.106* (27.676)	-50.565** (19.779)	1.007 (11.600)
Mixed Crops (dummy)	40.551* (21.514)	32.475** (15.265)	-1.605 (9.425)
Labor force (man.day)	-4.390 (2.721)	-3.713** (1.808)	-1.619** (0.788)
Unit selling price (USD/kg)	36.726 (128.183)	1,208.590*** (90.647)	93.809* (55.544)
Seed cost (USD/ha)	-0.542 (0.569)	-0.338 (0.402)	-0.371 (0.257)
Fertilizer cost (USD/ha)	-1.346*** (0.440)	-1.273*** (0.322)	-0.004 (0.199)
Pesticide cost (USD/ha)	2.260* (1.289)	2.177** (0.999)	0.024 (0.531)
Labor cost (USD/ha)	0.075 (0.265)	0.043 (0.191)	-0.082 (0.131)
Groundnut area (ha)	698.176*** (20.072)	436.072*** (13.993)	1.376 (3.300)
Off-farm income (dummy)	-15.131 (39.174)	-9.056 (29.191)	-21.645 (18.076)
Dependency ratio	-10.922 (7.625)	-9.494* (5.439)	-1.563 (3.538)
Clay soil (dummy)	6.092 (29.406)	0.292 (20.300)	3.708 (13.795)
Sandy-clay soil (dummy)	28.195 (25.243)	20.606 (17.693)	-1.381 (11.221)
Silty soil (dummy)	20.218 (30.870)	14.880 (21.598)	12.882 (13.986)
Constant	-56.343 (100.492)	-695.254*** (74.132)	605.495*** (42.744)
Observations	8,604	8,604	8,604

Table SM4: Full OLS estimates of the relationship between adoption, production and yields(Adoption) (*continued*)

variables	Production	Production value	Yields
R-squared	0.616	0.594	0.181
Robust standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

Table SM5: OLS estimates of the relationship between adoption, production and yields(Area under Adoption)

variables	Production	Production value	Yields
Area under adoption (ha)	238.550*** (34.459)	216.814*** (24.253)	57.226*** (6.403)
Age of household head (years)	0.377 (0.875)	0.374 (0.611)	0.025 (0.380)
Sex of household head (dummy, male=1)	-17.307 (29.621)	-23.796 (20.843)	-20.776 (17.751)
Education level (Number of years)	2.728 (2.916)	1.428 (2.076)	2.280* (1.354)
Household size (number of persons)	0.104 (1.852)	-1.326 (1.243)	1.023 (0.641)
Farmers group membership (dummy)	23.024 (14.530)	19.604* (10.143)	0.668 (5.411)
Training on agriculture (dummy)	19.017 (28.199)	8.794 (19.422)	13.199 (11.653)
Training on groundnut farming (dummy)	-6.485 (9.625)	-5.155 (6.519)	-4.435 (4.090)
Public agricultural extension service (number of visits)	-5.811 (7.401)	-6.431 (5.123)	-3.685 (2.924)
Private agricultural extension service (number of visits)	-10.123 (9.116)	-10.434* (6.215)	6.138 (3.799)
Cash credit for groundnut farming (dummy)	-87.350 (63.173)	-74.251* (42.902)	8.406 (28.328)
Credit in kind for groundnut farming (dummy)	-8.897 (50.662)	6.830 (35.263)	-6.967 (20.115)
Distance to the nearest urban market (km)	-0.735 (0.826)	-0.486 (0.541)	-0.196 (0.363)
Distance the nearest village market (km)	-3.326* (1.806)	-2.099* (1.139)	-1.568** (0.794)
Crop rotation (dummy)	-42.921 (26.863)	-38.056** (18.900)	0.911 (11.740)
Mixed Crops (dummy)	34.291 (21.331)	30.585** (14.868)	-7.613 (9.562)
Labor force (man.day)	-4.084 (2.927)	-3.021 (1.994)	-2.037** (0.808)
Unit selling price (USD/kg)	512.083*** (133.797)	1,339.478*** (96.971)	565.109*** (49.594)
Seed cost (USD/ha)	0.128 (0.546)	0.059 (0.370)	0.042 (0.259)
Fertilizer cost (USD/ha)	-0.846** (0.431)	-0.963*** (0.312)	0.288 (0.201)
Pesticide cost (USD/ha)	2.188* (1.325)	1.732* (1.024)	0.456 (0.540)
Labor cost (USD/ha)	0.010 (0.257)	-0.006 (0.179)	-0.110 (0.133)
Groundnut area (ha)	634.558*** (20.141)	376.027*** (13.418)	-11.249*** (3.596)
Off-farm income (dummy)	-3.625 (38.674)	0.179 (28.513)	-17.434 (18.365)
Dependency ratio	-7.874 (7.614)	-6.761 (5.353)	-0.786 (3.592)
Clay soil (dummy)	28.503 (29.032)	22.644 (19.653)	6.733 (14.049)
Sandy-clay soil (dummy)	45.222* (24.917)	36.851** (17.077)	1.791 (11.460)
Silty soil (dummy)	26.747 (30.838)	20.009 (21.038)	15.403 (14.258)
Constant	-246.760*** (102.298)	-720.479*** (74.363)	384.428*** (40.954)
Observations	8,604	8,604	8,604

Table SM5: OLS estimates of the relationship between adoption, production and yields(Area under Adoption) (*continued*)

variables	Production	Production value	Yields
R-squared	0.622	0.613	0.156
Robust standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

3 Panel Regression

Table SM6: Full 2SLS estimates of the relationship between adoption and commercialization(Adoption)

variables	FE-MP	RE-MP	FE-QS	RE-QS	FE-SV	RE-SV
Adoption dummy	0.044** (0.017)	0.033** (0.015)	0.400*** (0.117)	0.354*** (0.105)	0.388*** (0.108)	0.346*** (0.097)
Age of household head (years)	0.002 (0.003)	-0.001* (0.000)	-0.009 (0.024)	-0.006** (0.003)	-0.011 (0.022)	-0.005** (0.003)
Sex of household head (dummy, male=1)		-0.011 (0.020)		0.121 (0.137)		0.127 (0.126)
Education level (Number of years)		0.001 (0.001)		-0.005 (0.009)		-0.005 (0.008)
Household size (number of persons)	0.002*** (0.001)	0.001* (0.001)	0.027*** (0.005)	0.020*** (0.004)	0.026*** (0.004)	0.019*** (0.004)
Farmers group membership (dummy)	0.022*** (0.005)	0.023*** (0.004)	0.126*** (0.035)	0.133*** (0.028)	0.113*** (0.032)	0.120*** (0.026)
Training on agriculture (dummy)	-0.043*** (0.011)	-0.052*** (0.009)	-0.310*** (0.078)	-0.317*** (0.064)	-0.284*** (0.072)	-0.283*** (0.059)
Training on groundnut farming (dummy)	-0.025*** (0.003)	-0.023*** (0.003)	-0.178*** (0.023)	-0.168*** (0.021)	-0.164*** (0.021)	-0.155*** (0.019)
Public agricultural extension service (number of visits)	0.002 (0.002)	0.002 (0.002)	-0.022 (0.016)	-0.017 (0.014)	-0.023 (0.015)	-0.019 (0.013)
Private agricultural extension service (number of visits)	0.004 (0.003)	0.005* (0.003)	0.051** (0.024)	0.034* (0.020)	0.048** (0.022)	0.028 (0.018)
Cash credit for groundnut farming (dummy)	-0.009 (0.023)	0.001 (0.020)	-0.174 (0.156)	-0.068 (0.136)	-0.181 (0.144)	-0.075 (0.125)
Credit in kind for groundnut farming (dummy)	-0.043*** (0.016)	-0.025* (0.014)	-0.035 (0.109)	-0.009 (0.093)	-0.011 (0.100)	0.004 (0.086)
Distance to the nearest urban market (km)	-0.000 (0.000)	-0.001*** (0.000)	-0.003* (0.002)	-0.009*** (0.002)	-0.003* (0.002)	-0.008*** (0.002)
Distance the nearest village market (km)	-0.003*** (0.001)	-0.003*** (0.001)	-0.012* (0.006)	-0.016*** (0.005)	-0.011* (0.006)	-0.015*** (0.005)
Crop rotation (dummy)	-0.025** (0.011)	-0.006 (0.009)	-0.158** (0.072)	-0.024 (0.061)	-0.147** (0.066)	-0.022 (0.056)
Mixed Crops (dummy)	0.004 (0.009)	0.002 (0.007)	-0.065 (0.061)	-0.083* (0.050)	-0.067 (0.056)	-0.085* (0.046)
Labor force (man.day)	0.002*** (0.001)	0.002*** (0.001)	0.026*** (0.005)	0.025*** (0.004)	0.025*** (0.004)	0.024*** (0.004)
Unit selling price (USD/kg)	0.051 (0.050)	0.058 (0.046)	0.275 (0.338)	0.243 (0.313)	1.687*** (0.311)	1.648*** (0.288)
Seed cost (USD/ha)	0.002*** (0.000)	0.002*** (0.000)	0.011*** (0.002)	0.010*** (0.001)	0.010*** (0.001)	0.009*** (0.001)
Fertilizer cost (USD/ha)	0.000 (0.000)	0.000 (0.000)	0.001 (0.001)	0.002* (0.001)	0.001 (0.001)	0.001 (0.001)
Pesticide cost (USD/ha)	-0.001*** (0.000)	-0.001** (0.000)	-0.004 (0.003)	-0.001 (0.003)	-0.003 (0.003)	-0.000 (0.002)
Labor cost (USD/ha)	0.000*** (0.000)	0.000*** (0.000)	0.002*** (0.001)	0.002*** (0.001)	0.002*** (0.001)	0.002*** (0.001)
Groundnut area (ha)	0.003 (0.003)	0.013*** (0.003)	0.200*** (0.023)	0.285*** (0.018)	0.197*** (0.021)	0.277*** (0.017)
Off-farm income (dummy)	-0.019 (0.014)	-0.027** (0.012)	-0.033 (0.098)	-0.099 (0.083)	-0.022 (0.090)	-0.086 (0.076)
Dependency ratio	0.002 (0.003)	0.001 (0.003)	0.012 (0.022)	0.003 (0.018)	0.011 (0.020)	0.002 (0.016)
Clay soil (dummy)	-0.017 (0.013)	-0.012 (0.011)	-0.164* (0.087)	-0.123* (0.073)	-0.158** (0.080)	-0.119* (0.067)
Sandy-clay soil (dummy)	0.006 (0.010)	0.006 (0.009)	0.052 (0.068)	0.035 (0.059)	0.048 (0.063)	0.032 (0.054)
Silty soil (dummy)	-0.004 (0.013)	0.002 (0.011)	-0.030 (0.087)	0.012 (0.073)	-0.031 (0.080)	0.008 (0.067)

Table SM6: Full 2SLS estimates of the relationship between adoption and commercialization(Adoption) (*continued*)

variables	FE-MP	RE-MP	FE-QS	RE-QS	FE-SV	RE-SV
Constant	0.770*** (0.184)	0.964*** (0.052)	6.406*** (1.244)	6.987*** (0.355)	5.192*** (1.144)	5.635*** (0.326)
Observations	8,604	8,604	8,604	8,604	8,604	8,604
Number of id	2,868	2,868	2,868	2,868	2,868	2,868
District FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

Table SM7: Full 2SLS estimates of the relationship between adoption and commercialization (Area under Adoption)

variables	FE-MP	RE-MP	FE-QS	RE-QS	FE-SV	RE-SV
Area under adoption (ha)	0.033*** (0.012)	0.023** (0.011)	0.299*** (0.084)	0.253*** (0.076)	0.290*** (0.078)	0.247*** (0.070)
Age of household head (years)	0.002 (0.004)	0.001 (0.004)	-0.012 (0.024)	-0.018 (0.024)	-0.014 (0.022)	-0.019 (0.022)
Sex of household head (dummy, male=1)		-0.014 (0.020)		0.069 (0.139)		0.078 (0.127)
Education level (Number of years)		0.001 (0.001)		-0.002 (0.009)		-0.003 (0.008)
Household size (number of persons)	0.002*** (0.001)	0.002*** (0.001)	0.029*** (0.005)	0.029*** (0.005)	0.028*** (0.005)	0.028*** (0.005)
Farmers group membership (dummy)	0.022*** (0.005)	0.022*** (0.005)	0.122*** (0.035)	0.123*** (0.035)	0.109*** (0.032)	0.110*** (0.032)
Training on agriculture (dummy)	-0.043*** (0.012)	-0.041*** (0.012)	-0.309*** (0.078)	-0.294*** (0.078)	-0.283*** (0.072)	-0.269*** (0.072)
Training on groundnut farming (dummy)	-0.025*** (0.003)	-0.026*** (0.003)	-0.180*** (0.023)	-0.182*** (0.023)	-0.166*** (0.021)	-0.168*** (0.021)
Public agricultural extension service (number of visits)	0.002 (0.002)	0.003 (0.002)	-0.023 (0.016)	-0.017 (0.017)	-0.024 (0.015)	-0.019 (0.015)
Private agricultural extension service (number of visits)	0.004 (0.003)	0.004 (0.003)	0.051** (0.024)	0.049** (0.023)	0.048** (0.022)	0.046** (0.022)
Cash credit for groundnut farming (dummy)	-0.006 (0.023)	-0.005 (0.023)	-0.146 (0.157)	-0.140 (0.156)	-0.154 (0.144)	-0.149 (0.144)
Credit in kind for groundnut farming (dummy)	-0.046*** (0.016)	-0.044*** (0.016)	-0.068 (0.110)	-0.058 (0.111)	-0.044 (0.102)	-0.035 (0.102)
Distance to the nearest urban market (km)	-0.000 (0.000)	-0.001*** (0.000)	-0.003 (0.002)	-0.009*** (0.002)	-0.003 (0.002)	-0.008*** (0.002)
Distance the nearest village market (km)	-0.003*** (0.001)	-0.003*** (0.001)	-0.012* (0.006)	-0.016*** (0.005)	-0.010* (0.006)	-0.015*** (0.005)
Crop rotation (dummy)	-0.022** (0.011)	-0.021* (0.011)	-0.134* (0.073)	-0.121* (0.073)	-0.124* (0.067)	-0.112* (0.067)
Mixed Crops (dummy)	0.005 (0.009)	0.001 (0.009)	-0.054 (0.061)	-0.073 (0.061)	-0.057 (0.056)	-0.074 (0.056)
Labor force (man.day)	0.002*** (0.001)	0.002*** (0.001)	0.027*** (0.005)	0.027*** (0.005)	0.026*** (0.004)	0.026*** (0.004)
Unit selling price (USD/kg)	0.050 (0.049)	0.073 (0.047)	0.269 (0.333)	0.379 (0.318)	1.682*** (0.306)	1.784*** (0.292)
Seed cost (USD/ha)	0.002*** (0.000)	0.002*** (0.000)	0.011*** (0.002)	0.011*** (0.002)	0.010*** (0.001)	0.010*** (0.001)
Fertilizer cost (USD/ha)	0.000 (0.000)	0.000 (0.000)	0.002* (0.001)	0.002* (0.001)	0.002* (0.001)	0.002* (0.001)
Pesticide cost (USD/ha)	-0.001*** (0.000)	-0.001*** (0.000)	-0.005* (0.003)	-0.006** (0.003)	-0.004 (0.003)	-0.005* (0.003)
Labor cost (USD/ha)	0.000*** (0.000)	0.000*** (0.000)	0.002*** (0.001)	0.002*** (0.001)	0.002*** (0.001)	0.002*** (0.001)
Groundnut area (ha)	-0.006 (0.005)	-0.002 (0.005)	0.118*** (0.033)	0.137*** (0.032)	0.117*** (0.031)	0.135*** (0.029)
Off-farm income (dummy)	-0.019 (0.015)	-0.021 (0.015)	-0.030 (0.098)	-0.042 (0.099)	-0.020 (0.091)	-0.030 (0.091)
Dependency ratio	0.002 (0.003)	0.002 (0.003)	0.015 (0.022)	0.018 (0.022)	0.014 (0.020)	0.017 (0.020)
Clay soil (dummy)	-0.015 (0.013)	-0.012 (0.011)	-0.151* (0.087)	-0.113 (0.074)	-0.145* (0.080)	-0.109 (0.068)
Sandy-clay soil (dummy)	0.008 (0.010)	0.007 (0.009)	0.064 (0.069)	0.053 (0.059)	0.059 (0.063)	0.049 (0.054)
Silty soil (dummy)	-0.004 (0.013)	0.002 (0.011)	-0.032 (0.087)	0.013 (0.074)	-0.032 (0.080)	0.010 (0.068)
Constant	0.795*** (0.183)	1.003*** (0.076)	6.901*** (1.240)	7.211*** (0.525)	5.670*** (1.141)	5.868*** (0.481)
Observations	8,604	8,604	8,604	8,604	8,604	8,604

Table SM7: Full 2SLS estimates of the relationship between adoption and commercialization (Area under Adoption) (*continued*)

variables	FE-MP	RE-MP	FE-QS	RE-QS	FE-SV	RE-SV
Number of id	2,868	2,868	2,868	2,868	2,868	2,868
District FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

Table SM8: Full 2SLS estimates of the relationship between adoption, production and yields

variables	FE-Prod	FE-ProdSUP	FE-ProdVal	FE-ProdValSup	FE-Yield	FE-YieldSup
Adoption dummy	657.610*** (61.271)		426.589*** (42.610)		333.418*** (27.166)	
Age of household head (years)	-5.689 (12.368)	-10.898 (12.411)	-0.137 (8.601)	-3.517 (8.439)	-1.650 (5.483)	-4.244 (5.772)
Household size (number of persons)	1.052 (2.522)	4.994* (2.556)	-1.639 (1.754)	0.918 (1.738)	1.623 (1.118)	3.605*** (1.189)
Farmers group membership (dummy)	15.416 (18.035)	9.491 (18.076)	17.999 (12.542)	14.154 (12.292)	-4.231 (7.996)	-7.186 (8.406)
Training on agriculture (dummy)	30.407 (40.632)	32.404 (40.660)	13.535 (28.257)	14.829 (27.649)	28.002 (18.015)	29.054 (18.909)
Training on groundnut farming (dummy)	9.514 (12.066)	6.534 (12.062)	5.426 (8.391)	3.493 (8.202)	1.121 (5.350)	-0.409 (5.609)
Public agricultural extension service (number of visits)	-4.873 (8.562)	-6.533 (8.580)	-4.387 (5.954)	-5.465 (5.835)	-2.660 (3.796)	-3.469 (3.990)
Private agricultural extension service (number of visits)	-16.058 (12.279)	-15.248 (12.273)	-9.929 (8.539)	-9.406 (8.346)	-3.798 (5.444)	-3.302 (5.708)
Cash credit for groundnut farming (dummy)	-101.688 (81.557)	-55.081 (81.540)	-97.788* (56.718)	-67.553 (55.447)	-34.280 (36.160)	-10.675 (37.920)
Credit in kind for groundnut farming (dummy)	27.745 (56.951)	-24.527 (57.502)	35.763 (39.605)	1.847 (39.101)	-11.136 (25.250)	-37.283 (26.741)
Distance to the nearest urban market (km)	-0.625 (1.034)	-0.351 (1.036)	-0.831 (0.719)	-0.653 (0.704)	0.268 (0.458)	0.405 (0.482)
Distance the nearest village market (km)	-3.092 (3.344)	-2.166 (3.345)	-3.193 (2.326)	-2.592 (2.275)	-0.880 (1.483)	-0.410 (1.556)
Crop rotation (dummy)	-64.875* (37.660)	-28.369 (38.209)	-61.367** (26.190)	-37.679 (25.982)	-0.107 (16.697)	18.082 (17.769)
Mixed Crops (dummy)	1.058 (31.642)	17.203 (31.726)	-1.179 (22.005)	9.296 (21.573)	-4.068 (14.029)	4.035 (14.754)
Labor force (man.day)	-5.352** (2.447)	-3.481 (2.467)	-3.873** (1.701)	-2.659 (1.678)	-1.867* (1.085)	-0.933 (1.147)
Unit selling price (USD/kg)	-214.873 (176.487)	-177.766 (173.254)	1,049.099*** (122.735)	1,073.062*** (117.811)	19.080 (78.249)	43.168 (80.570)
Seed cost (USD/ha)	-0.937 (0.815)	-0.182 (0.810)	-0.627 (0.567)	-0.138 (0.551)	-0.299 (0.361)	0.085 (0.377)
Fertilizer cost (USD/ha)	-1.690*** (0.558)	-0.987* (0.557)	-1.585*** (0.388)	-1.129*** (0.379)	-0.318 (0.248)	0.038 (0.259)
Pesticide cost (USD/ha)	3.015** (1.532)	1.000 (1.579)	2.605** (1.065)	1.298 (1.074)	0.533 (0.679)	-0.468 (0.734)
Labor cost (USD/ha)	-0.134 (0.406)	0.165 (0.408)	-0.225 (0.282)	-0.031 (0.277)	-0.134 (0.180)	0.016 (0.190)
Groundnut area (ha)	712.142***	582.511***	443.194***	359.092***	4.798	-60.396***

Table SM8: Full 2SLS estimates of the relationship between adoption, production and yields (*continued*)

variables	FE-Prod	FE-ProdSUP	FE-ProdVal	FE-ProdValSup	FE-Yield	FE-YieldSup
	(11.886)	(17.299)	(8.266)	(11.763)	(5.270)	(8.045)
Off-farm income (dummy)	-49.557	-45.223	-29.786	-26.974	-32.864	-30.659
	(51.249)	(51.289)	(35.640)	(34.876)	(22.722)	(23.851)
Dependency ratio	-10.777	-5.419	-9.190	-5.713	-2.597	0.089
	(11.377)	(11.408)	(7.912)	(7.758)	(5.044)	(5.305)
Clay soil (dummy)	-9.792	11.088	-5.638	7.909	-8.945	1.522
	(45.431)	(45.547)	(31.594)	(30.971)	(20.143)	(21.181)
Sandy-clay soil (dummy)	19.180	37.723	23.247	35.277	-6.721	2.610
	(35.702)	(35.770)	(24.828)	(24.323)	(15.829)	(16.635)
Silty soil (dummy)	44.725	42.505	39.507	38.066	18.335	17.251
	(45.208)	(45.249)	(31.439)	(30.769)	(20.044)	(21.043)
Constant	130.485	536.181	-704.916	-410.969	568.515**	736.882**
	(649.998)	(645.982)	(452.031)	(439.261)	(288.191)	(300.408)
Observations	8,604	8,604	8,604	8,604	8,604	8,604
Number of id	2,868	2,868	2,868	2,868	2,868	2,868
District FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

Table SM9: Full 2SLS estimates of the relationship between continuous adoption, production and yields

variables	MP	QS	SV
Three years continuous adoption	0.002 (0.057)	0.104 (0.358)	0.118 (0.328)
Age of household head	-0.001 (0.009)	-0.046 (0.056)	-0.044 (0.051)
Household size	0.003*** (0.001)	0.028*** (0.006)	0.026*** (0.005)
Farmers group membership	0.029*** (0.006)	0.196*** (0.041)	0.179*** (0.037)
Training on agriculture	-0.033** (0.014)	-0.199** (0.089)	-0.179** (0.081)
Training on groundnut farming	-0.029*** (0.004)	-0.205*** (0.026)	-0.191*** (0.024)
Public agricultural extension service	0.004 (0.003)	-0.015 (0.018)	-0.016 (0.016)
Private agricultural extension service	0.002 (0.004)	0.051** (0.026)	0.049** (0.023)
Cash credit for groundnut farming	0.031 (0.028)	0.125 (0.178)	0.087 (0.163)
Credit in kind for groundnut farming	-0.065*** (0.020)	-0.134 (0.128)	-0.099 (0.117)
Distance to the nearest urban market	0.000 (0.000)	-0.003 (0.003)	-0.003 (0.003)
Distance the nearest village market	-0.005*** (0.001)	-0.021*** (0.008)	-0.018** (0.007)
Crop rotation	-0.034*** (0.013)	-0.177** (0.082)	-0.162** (0.075)
Mixed Crops	0.008 (0.011)	0.126* (0.069)	0.116* (0.063)
Labor force	0.005*** (0.001)	0.045*** (0.006)	0.043*** (0.006)
Unit selling price	0.247*** (0.043)	1.837*** (0.271)	2.978*** (0.247)
Seed cost	0.002*** (0.000)	0.016*** (0.002)	0.015*** (0.002)
Fertilizer cost	0.000** (0.000)	0.005*** (0.001)	0.005*** (0.001)
Pesticide cost	-0.000 (0.001)	0.001 (0.004)	0.001 (0.004)
Labor cost	0.001*** (0.000)	0.004*** (0.001)	0.004*** (0.001)
Groundnut area	0.015***	0.281***	0.270***

Table SM9: Full 2SLS estimates of the relationship between continuous adoption, production and yields (*continued*)

variables	MP	QS	SV
	(0.004)	(0.027)	(0.024)
Off-farm income	-0.038**	-0.085	-0.058
	(0.019)	(0.120)	(0.110)
Dependency ratio	-0.012***	-0.074***	-0.066***
	(0.004)	(0.027)	(0.025)
Clay soil	-0.016	-0.174*	-0.168*
	(0.016)	(0.102)	(0.093)
Sandy-clay soil	0.004	0.028	0.026
	(0.013)	(0.082)	(0.075)
Silty soil	0.004	-0.057	-0.064
	(0.017)	(0.106)	(0.097)
Constant	-0.008	0.101	0.137
	(0.113)	(0.716)	(0.654)
Observations	5,418	5,418	5,418
Number of id	2,555	2,555	2,555
District FE	YES	YES	YES
Year FE	YES	YES	YES
Standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

4 Correlated random effects

Table SM10: Full Correlated random effects estimations of the relationship between adoption , commercialization and market orientation

variables	OLS-Share	FE-Share	RE-Share	OLS-orientation	FE-orientation	RE-orientation
Adoption dummy	-0.030** (0.013)	-0.043* (0.023)	-0.058*** (0.018)	-0.058*** (0.022)	-0.069 (0.043)	-0.093*** (0.031)
Age of household head (years)	-0.001** (0.000)	-0.018*** (0.005)	-0.017*** (0.004)	-0.001** (0.001)	-0.024*** (0.009)	-0.025*** (0.008)
Sex of household head (dummy, male=1)	-0.005 (0.016)		-0.004 (0.018)	0.013 (0.024)		0.012 (0.029)
Education level (Number of years)	-0.002* (0.001)		-0.002* (0.001)	-0.004** (0.002)		-0.005** (0.002)
Household size (number of persons)	0.001 (0.001)	0.003*** (0.001)	0.002*** (0.001)	0.001 (0.001)	0.004** (0.002)	0.004*** (0.002)
Farmers group membership (dummy)	0.013*** (0.004)	0.017** (0.007)	0.017*** (0.006)	0.013* (0.008)	0.021* (0.013)	0.018 (0.011)
Training on agriculture (dummy)	-0.050*** (0.011)	-0.040*** (0.015)	-0.044*** (0.014)	-0.054*** (0.018)	-0.066** (0.028)	-0.071*** (0.024)
Training on groundnut farming (dummy)	-0.020*** (0.004)	-0.023*** (0.005)	-0.025*** (0.004)	-0.018*** (0.006)	-0.023*** (0.008)	-0.026*** (0.007)
Public agricultural extension service (number of visits)	-0.005** (0.002)	-0.007** (0.003)	-0.007** (0.003)	-0.007* (0.004)	-0.013** (0.006)	-0.012** (0.005)
Private agricultural extension service (number of visits)	0.005* (0.003)	0.008* (0.004)	0.008** (0.004)	0.004 (0.005)	0.005 (0.008)	0.009 (0.007)
Cash credit for groundnut farming (dummy)	-0.002 (0.021)	0.003 (0.031)	-0.030 (0.027)	-0.035 (0.038)	-0.012 (0.056)	-0.063 (0.049)
Credit in kind for groundnut farming (dummy)	0.003 (0.013)	-0.025 (0.022)	-0.008 (0.019)	-0.012 (0.024)	-0.062 (0.040)	-0.025 (0.035)
Distance to the nearest urban market (km)	-0.003*** (0.000)	-0.001 (0.001)	-0.002*** (0.000)	-0.003*** (0.001)	-0.001 (0.001)	-0.003*** (0.001)
Distance the nearest village market (km)	-0.002** (0.001)	-0.000 (0.001)	-0.001 (0.001)	-0.001 (0.002)	0.002 (0.002)	0.000 (0.002)
Crop rotation (dummy)	0.023** (0.010)	-0.000 (0.014)	-0.002 (0.013)	0.013 (0.016)	-0.014 (0.026)	-0.023 (0.023)
Mixed Crops (dummy)	0.005 (0.008)	0.016 (0.012)	0.014 (0.011)	0.010 (0.014)	0.045** (0.022)	0.036* (0.019)
Labor force (man.day)	0.003*** (0.001)	0.003*** (0.001)	0.002*** (0.001)	0.004*** (0.001)	0.003 (0.002)	0.003 (0.002)
Unit selling price (USD/kg)	-0.023 (0.046)	0.046 (0.065)	0.051 (0.055)	-0.057 (0.080)	-0.036 (0.119)	-0.012 (0.098)
Seed cost (USD/ha)	0.001*** (0.000)	0.002*** (0.000)	0.002*** (0.000)	0.002*** (0.000)	0.002*** (0.001)	0.002*** (0.001)
Fertilizer cost (USD/ha)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.002*** (0.000)	0.001*** (0.000)
Pesticide cost (USD/ha)	0.002***	0.001*	0.002***	0.003***	0.003**	0.003***

Table SM10: Full Correlated random effects estimations of the relationship between adoption , commercialization and market orientation (*continued*)

variables	OLS-Share	FE-Share	RE-Share	OLS-orientation	FE-orientation	RE-orientation
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Labor cost (USD/ha)	0.001***	0.001***	0.001***	0.001***	0.001**	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Groundnut area (ha)	-0.002	-0.013***	-0.010**	-0.014***	-0.018**	-0.014*
	(0.002)	(0.005)	(0.004)	(0.004)	(0.008)	(0.007)
Off-farm income (dummy)	0.003	0.010	-0.003	0.035	0.028	0.015
	(0.013)	(0.021)	(0.018)	(0.024)	(0.038)	(0.033)
Dependency ratio	0.002	-0.003	0.000	0.003	-0.000	0.002
	(0.003)	(0.005)	(0.004)	(0.005)	(0.009)	(0.007)
Clay soil (dummy)	0.015	-0.004	0.006	0.036*	0.011	0.026
	(0.012)	(0.017)	(0.012)	(0.020)	(0.032)	(0.021)
Sandy-clay soil (dummy)	0.019*	0.013	0.012	0.020	0.024	0.013
	(0.010)	(0.014)	(0.010)	(0.017)	(0.025)	(0.017)
Silty soil (dummy)	0.010	-0.023	0.001	-0.009	-0.055*	-0.017
	(0.012)	(0.018)	(0.012)	(0.021)	(0.033)	(0.021)
Constant	0.445***	1.073***	0.649***	0.461***	1.503***	0.666***
	(0.038)	(0.253)	(0.073)	(0.063)	(0.462)	(0.119)
Observations	5,418	5,418	5,418	5,418	5,418	5,418
R-squared	0.290			0.182		
Number of id		2,555	2,555		2,555	2,555
District FE		YES	YES		YES	YES
Year FE		Yes	Yes		Yes	Yes
Robust standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

Table SM11: Full Correlated random effects estimations of the relationship between adoption (area), commercialization and market orientation

variables	OLS-Share	FE-Share	RE-share	OLS-orientation	FE-orientation	RE-orientation
Area under adoption (ha)	-0.010*** (0.004)	-0.032* (0.018)	-0.040*** (0.013)	-0.013* (0.007)	-0.051 (0.032)	-0.065*** (0.022)
Age of household head (years)	-0.001** (0.000)	-0.017*** (0.005)	-0.016*** (0.004)	-0.001** (0.001)	-0.023** (0.009)	-0.023*** (0.008)
Sex of household head (dummy, male=1)	-0.005 (0.016)		-0.003 (0.018)	0.012 (0.024)		0.013 (0.029)
Education level (Number of years)	-0.002* (0.001)		-0.003** (0.001)	-0.004** (0.002)		-0.005*** (0.002)
Household size (number of persons)	0.001 (0.001)	0.003*** (0.001)	0.002** (0.001)	0.001 (0.001)	0.004** (0.002)	0.004** (0.002)
Farmers group membership (dummy)	0.014*** (0.004)	0.017** (0.007)	0.017*** (0.006)	0.014* (0.008)	0.021* (0.013)	0.018 (0.011)
Training on agriculture (dummy)	-0.050*** (0.011)	-0.041*** (0.015)	-0.045*** (0.014)	-0.054*** (0.017)	-0.066** (0.028)	-0.074*** (0.025)
Training on groundnut farming (dummy)	-0.020*** (0.004)	-0.023*** (0.005)	-0.025*** (0.004)	-0.017*** (0.006)	-0.023*** (0.008)	-0.026*** (0.007)
Public agricultural extension service (number of visits)	-0.005** (0.002)	-0.008** (0.003)	-0.007** (0.003)	-0.008** (0.004)	-0.013** (0.006)	-0.012** (0.005)
Private agricultural extension service (number of visits)	0.005 (0.003)	0.008* (0.004)	0.008** (0.004)	0.002 (0.005)	0.005 (0.008)	0.009 (0.007)
Cash credit for groundnut farming (dummy)	-0.003 (0.021)	-0.005 (0.031)	-0.038 (0.027)	-0.038 (0.038)	-0.025 (0.056)	-0.075 (0.049)
Credit in kind for groundnut farming (dummy)	0.004 (0.013)	-0.022 (0.022)	-0.004 (0.020)	-0.012 (0.025)	-0.057 (0.041)	-0.018 (0.035)
Distance to the nearest urban market (km)	-0.003*** (0.000)	-0.001 (0.001)	-0.002*** (0.000)	-0.003*** (0.001)	-0.001 (0.001)	-0.003*** (0.001)
Distance the nearest village market (km)	-0.002** (0.001)	-0.000 (0.001)	-0.001 (0.001)	-0.001 (0.002)	0.002 (0.002)	0.000 (0.002)
Crop rotation (dummy)	0.022** (0.010)	-0.002 (0.014)	-0.005 (0.013)	0.013 (0.016)	-0.017 (0.026)	-0.028 (0.023)
Mixed Crops (dummy)	0.006 (0.008)	0.015 (0.012)	0.013 (0.011)	0.011 (0.014)	0.044** (0.022)	0.035* (0.019)
Labor force (man.day)	0.003*** (0.001)	0.003*** (0.001)	0.002** (0.001)	0.004*** (0.001)	0.003 (0.002)	0.002 (0.002)
Unit selling price (USD/kg)	-0.055 (0.040)	0.051 (0.068)	0.055 (0.056)	-0.143** (0.068)	-0.030 (0.123)	-0.007 (0.100)
Seed cost (USD/ha)	0.001*** (0.000)	0.002*** (0.000)	0.002*** (0.000)	0.002*** (0.000)	0.002*** (0.001)	0.002*** (0.001)
Fertilizer cost (USD/ha)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)
Pesticide cost (USD/ha)	0.002***	0.001**	0.002***	0.003***	0.003**	0.004***

Table SM11: Full Correlated random effects estimations of the relationship between adoption (area), commercialization and market orientation (*continued*)

variables	OLS-Share	FE-Share	RE-share	OLS-orientation	FE-orientation	RE-orientation
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Labor cost (USD/ha)	0.001***	0.001***	0.001***	0.001***	0.001**	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Groundnut area (ha)	0.000	-0.004	0.002	-0.011**	-0.004	0.004
	(0.003)	(0.007)	(0.006)	(0.005)	(0.012)	(0.010)
Off-farm income (dummy)	0.003	0.013	0.001	0.035	0.031	0.021
	(0.013)	(0.021)	(0.018)	(0.024)	(0.038)	(0.033)
Dependency ratio	0.002	-0.003	0.000	0.003	-0.000	0.002
	(0.003)	(0.005)	(0.004)	(0.005)	(0.009)	(0.007)
Clay soil (dummy)	0.014	-0.005	0.001	0.035*	0.010	0.017
	(0.012)	(0.018)	(0.012)	(0.020)	(0.032)	(0.021)
Sandy-clay soil (dummy)	0.018*	0.013	0.009	0.019	0.024	0.007
	(0.010)	(0.014)	(0.010)	(0.017)	(0.025)	(0.017)
Silty soil (dummy)	0.009	-0.021	0.000	-0.009	-0.053	-0.018
	(0.012)	(0.018)	(0.012)	(0.021)	(0.033)	(0.021)
Constant	0.459***	1.026***	0.631***	0.499***	1.431***	0.639***
	(0.036)	(0.260)	(0.075)	(0.060)	(0.474)	(0.124)
Observations	5,418	5,418	5,418	5,418	5,418	5,418
R-squared	0.290			0.181		
Number of id		2,555	2,555		2,555	2,555
District FE		YES	YES		YES	YES
Year FE		Yes	Yes		Yes	Yes
Robust standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

5 Causal mediation analysis

Table SM12: Linear IV mediation analysis of adoption and commercialization (production)

variables	Sellers	Quantity Sold	Sales Value
Total effect (TE)	0.0422** (0.0190)	0.481*** (0.130)	0.469*** (0.119)
Direct effect	-0.0371 (0.0445)	-0.768** (0.356)	-0.783** (0.336)
Indirect effect	0.0792 (0.0589)	1.249*** (0.477)	1.252*** (0.452)
Observations	8,604	8,604	8,604
Additional controls	YES	YES	YES
District dummies	YES	YES	YES
Mediator share of TE (%)	187.9	259.7	266.8
F statistic on instrument (1)	5169	5169	5169
F statistic on instruments (2)	21.19	21.19	21.19
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1			

Table SM13: Linear IV mediation analysis of adoption and commercialization (Yield)

variables	Sellers	Quantity Sold	Sales Value
Total effect (TE)	0.0422** (0.0190)	0.481*** (0.130)	0.469*** (0.119)
Direct effect	-0.0664 (0.0675)	-1.230** (0.576)	-1.246** (0.551)
Indirect effect	0.109 (0.0828)	1.711** (0.714)	1.715** (0.684)
Observations	8,604	8,604	8,604
Additional controls	YES	YES	YES
District dummies	YES	YES	YES
Mediator share of TE (%)	257.4	355.8	365.5
F statistic on instrument (1)	5169	5169	5169
F statistic on instruments (2)	13.38	13.38	13.38
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1			

Table SM14: Linear IV mediation analysis of continuous adoption and commercialization (Production)

variables	Sellers	Quantity Sold	Sales Value
Total effect (TE)	96.98 (4,295)	696.8 (30,859)	682.2 (30,214)
Direct effect	-0.0875*** (0.0328)	-0.631*** (0.217)	-0.619*** (0.205)
Indirect effect	97.07 (4,295)	697.4 (30,859)	682.9 (30,214)
Observations	5,418	5,418	5,418
Additional controls	YES	YES	YES
District dummies	YES	YES	YES
Mediator share of TE (%)	100.1	100.1	100.1
F statistic on instrument (1)	0.000503	0.000503	0.000503
F statistic on instruments (2)	19.21	19.21	19.21
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1			

Table SM15: Linear IV mediation analysis of continuous adoption and commercialization (Yield)

variables	Sellers	Quantity Sold	Sales Value
Total effect (TE)	96.98 (4,295)	696.8 (30,859)	682.2 (30,214)
Direct effect	-0.0554*** (0.0191)	-0.401*** (0.123)	-0.393*** (0.114)
Indirect effect	97.03 (4,295)	697.2 (30,859)	682.6 (30,214)
Observations	5,418	5,418	5,418
Additional controls	YES	YES	YES
District dummies	YES	YES	YES
Mediator share of TE (%)	100.1	100.1	100.1
F statistic on instrument (1)	0.000503	0.000503	0.000503
F statistic on instruments (2)	50.51	50.51	50.51
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1			

6 Robustness checks

6.1 Cross country analysis

Table SM16: 2SLS estimates of the relationship between adoption and commercialization and yield across countries

variables	Ghana		Mali		Nigeria	
	Yield	Commercialization	Yield	Commercialization	Yield	Commercialization
Adoption dummy	198.475** (88.525)	-0.557 (0.501)	66.646** (33.390)	-0.141 (0.311)	373.278*** (25.196)	0.301*** (0.074)
Age of household head (years)	0.406 (16.311)	-0.095 (0.083)	0.083 (0.475)	-0.014** (0.006)	-3.233 (8.937)	-0.069*** (0.023)
Sex of household head (dummy, male=1)	-58.257** (28.936)	-0.170 (0.232)	24.809 (26.855)	-0.308 (0.348)	20.482 (48.954)	0.899*** (0.192)
Education level (Number of years)	0.110 (2.862)	0.034 (0.023)	-2.087 (2.355)	-0.035 (0.031)	3.167* (1.747)	-0.001 (0.007)
Household size (number of persons)	0.636 (4.523)	0.021 (0.022)	1.006 (0.669)	0.004 (0.007)	0.010 (2.300)	0.043*** (0.006)
Farmers group membership (dummy)	4.595 (17.846)	0.495*** (0.089)	-6.867 (6.863)	0.009 (0.067)	-1.255 (14.136)	0.024 (0.036)
Training on agriculture (dummy)	44.591 (46.961)	0.172 (0.233)	9.263 (13.136)	-0.571*** (0.128)	25.793 (32.491)	-0.107 (0.083)
Training on groundnut farming (dummy)	5.023 (15.475)	-0.054 (0.077)	5.172 (8.066)	-0.314*** (0.073)	-2.818 (11.287)	-0.069** (0.029)
Public agricultural extension service (number of visits)	1.280 (7.857)	0.008 (0.039)	-2.751 (4.690)	-0.028 (0.044)	-0.229 (6.118)	-0.050*** (0.016)
Private agricultural extension service (number of visits)	0.680 (10.184)	0.072 (0.051)	8.931* (5.135)	0.058 (0.049)	-0.805 (11.113)	0.080*** (0.028)
Cash credit for groundnut farming (dummy)	109.641 (91.464)	-0.111 (0.455)	8.110 (32.337)	-0.290 (0.297)	-96.634 (59.789)	0.106 (0.153)
Credit in kind for groundnut farming (dummy)	-45.602 (64.085)	-1.432*** (0.319)	45.213 (27.845)	0.280 (0.268)	-29.923 (37.305)	0.617*** (0.095)
Distance to the nearest urban market (km)	2.369 (2.494)	0.071*** (0.015)	-0.092 (0.525)	-0.040*** (0.005)	-0.042 (0.549)	-0.003* (0.001)
Distance the nearest village market (km)	-0.574 (3.130)	-0.012 (0.019)	-2.552*** (0.870)	-0.028*** (0.008)	0.569 (2.840)	0.005 (0.009)
Crop rotation (dummy)	33.715 (36.880)	-0.448** (0.185)	-3.575 (16.322)	0.626*** (0.160)	-8.976 (26.833)	-0.162** (0.069)
Mixed Crops (dummy)	1.771 (35.228)	-1.206*** (0.175)	-10.554 (12.650)	-0.140 (0.123)	6.306 (23.262)	0.092 (0.059)
Labor force (man.day)	-1.087 (3.575)	0.064*** (0.018)	-1.643 (1.169)	0.046*** (0.011)	-1.828 (1.575)	0.019*** (0.004)
Unit selling price (USD/kg)	-82.306 (149.874)	1.489* (0.771)	133.283 (100.291)	-0.727 (0.872)	126.910 (95.094)	0.407 (0.256)
Seed cost (USD/ha)	-0.075 (0.913)	0.031*** (0.005)	-0.096 (0.306)	0.002 (0.003)	-0.374 (0.755)	0.005** (0.002)
Fertilizer cost (USD/ha)	-0.442 (2.730)	0.035** (0.015)	-0.546 (0.391)	0.018*** (0.004)	-0.055 (0.323)	0.001 (0.001)

Table SM16: 2SLS estimates of the relationship between adoption and commercialization and yield across countries (*continued*)

variables	Yield	Commercialization	Yield	Commercialization	Yield	Commercialization
Pesticide cost (USD/ha)	-0.643 (2.680)	-0.033** (0.013)	0.307 (0.729)	0.004 (0.007)	0.147 (0.928)	0.005** (0.002)
Labor cost (USD/ha)	-0.327 (0.384)	0.003 (0.002)	-0.347* (0.208)	0.002 (0.002)	-0.006 (0.282)	0.002** (0.001)
Groundnut area (ha)	5.053 (13.991)	-0.080 (0.070)	0.561 (3.734)	0.384*** (0.037)	-3.373 (9.832)	0.223*** (0.025)
Off-farm income (dummy)	57.474 (93.944)	-0.947** (0.466)	39.093 (39.762)	-0.608 (0.411)	-51.019* (27.937)	0.124* (0.071)
Dependency ratio	-2.751 (14.027)	-0.067 (0.070)	-0.736 (5.426)	-0.119** (0.053)	-2.717 (7.012)	0.054*** (0.018)
Clay soil (dummy)	24.369 (32.001)	0.040 (0.188)	5.305 (18.647)	-0.261 (0.178)	-3.759 (21.723)	-0.068 (0.067)
Sandy-clay soil (dummy)	4.704 (26.400)	0.134 (0.156)	1.097 (15.708)	0.055 (0.149)	-6.283 (16.916)	0.013 (0.051)
Silty soil (dummy)	56.265* (33.087)	0.008 (0.200)	13.858 (18.359)	0.009 (0.175)	-1.547 (21.509)	0.029 (0.066)
Constant	869.112*** (144.262)	0.222 (1.103)	474.191*** (69.625)	7.394*** (0.717)	540.381*** (128.192)	5.076*** (0.490)
Observations	1,494	1,494	2,520	2,520	4,590	4,590
Number of id	498	498	840	840	1,530	1,530
District FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

6.2 Control function approach

Table SM17: Full Control function estimations of the relationship between adoption and market participation

variables	MP-FE	MP-CRE	QS-FE	QS-CRE	SV-FE	SV-CRE
Adoption dummy	0.073** (0.029)	0.041* (0.023)	0.598*** (0.187)	0.416*** (0.150)	0.588*** (0.171)	0.417*** (0.137)
Age of household head (years)	0.002 (0.006)	-0.001 (0.006)	-0.031 (0.039)	-0.047 (0.035)	-0.033 (0.035)	-0.047 (0.032)
Sex of household head (dummy, male=1)		-0.024 (0.024)		0.014 (0.159)		0.029 (0.145)
Education level (Number of years)		0.001 (0.002)		-0.001 (0.011)		-0.001 (0.010)
Household size (number of persons)	0.003** (0.001)	0.003** (0.001)	0.029*** (0.008)	0.027*** (0.007)	0.026*** (0.007)	0.026*** (0.006)
Farmers group membership (dummy)	0.028*** (0.009)	0.031*** (0.008)	0.187*** (0.055)	0.201*** (0.051)	0.172*** (0.050)	0.183*** (0.046)
Training on agriculture (dummy)	-0.032* (0.019)	-0.040** (0.018)	-0.198 (0.121)	-0.271** (0.111)	-0.179 (0.110)	-0.248** (0.102)
Training on groundnut farming (dummy)	-0.028*** (0.006)	-0.034*** (0.005)	-0.197*** (0.036)	-0.234*** (0.033)	-0.183*** (0.033)	-0.217*** (0.030)
Public agricultural extension service (number of visits)	0.003 (0.004)	0.006* (0.004)	-0.026 (0.024)	-0.002 (0.023)	-0.026 (0.022)	-0.005 (0.021)
Private agricultural extension service (number of visits)	0.002 (0.006)	0.001 (0.005)	0.042 (0.035)	0.035 (0.033)	0.039 (0.032)	0.033 (0.030)
Cash credit for groundnut farming (dummy)	0.021 (0.038)	0.011 (0.035)	0.049 (0.243)	-0.045 (0.222)	0.015 (0.222)	-0.072 (0.203)
Credit in kind for groundnut farming (dummy)	-0.066** (0.027)	-0.048* (0.025)	-0.152 (0.174)	-0.022 (0.158)	-0.120 (0.159)	0.003 (0.144)
Distance to the nearest urban market (km)	-0.000 (0.001)	-0.003*** (0.000)	-0.004 (0.004)	-0.021*** (0.003)	-0.004 (0.004)	-0.020*** (0.003)
Distance the nearest village market (km)	-0.006*** (0.002)	-0.005*** (0.001)	-0.026** (0.011)	-0.029*** (0.008)	-0.023** (0.010)	-0.026*** (0.007)
Crop rotation (dummy)	-0.037** (0.018)	-0.023 (0.016)	-0.194* (0.111)	-0.122 (0.103)	-0.176* (0.102)	-0.111 (0.094)
Mixed Crops (dummy)	0.011 (0.015)	0.019 (0.014)	0.140 (0.094)	0.160* (0.087)	0.129 (0.086)	0.145* (0.080)
Labor force (man.day)	0.005*** (0.001)	0.004*** (0.001)	0.044*** (0.009)	0.036*** (0.008)	0.042*** (0.008)	0.035*** (0.007)
Unit selling price (USD/kg)	0.096 (0.082)	0.156** (0.072)	0.618 (0.521)	0.957** (0.456)	1.781*** (0.476)	2.131*** (0.416)
Seed cost (USD/ha)	0.002*** (0.000)	0.002*** (0.000)	0.015*** (0.003)	0.016*** (0.002)	0.014*** (0.002)	0.014*** (0.002)
Fertilizer cost (USD/ha)	0.000 (0.000)	0.000 (0.000)	0.004** (0.002)	0.004** (0.002)	0.004** (0.002)	0.004** (0.002)
Pesticide cost (USD/ha)	-0.000	-0.001	0.001	0.001	0.000	0.001

Table SM17: Full Control function estimations of the relationship between adoption and market participation (*continued*)

variables	MP-FE	MP-CRE	QS-FE	QS-CRE	SV-FE	SV-CRE
	(0.001)	(0.001)	(0.006)	(0.005)	(0.005)	(0.004)
Labor cost (USD/ha)	0.001***	0.001***	0.004***	0.004***	0.004***	0.004***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Groundnut area (ha)	0.014**	0.017***	0.274***	0.303***	0.263***	0.291***
	(0.006)	(0.005)	(0.036)	(0.033)	(0.033)	(0.031)
Off-farm income (dummy)	-0.041	-0.038	-0.110	-0.143	-0.082	-0.119
	(0.026)	(0.023)	(0.164)	(0.148)	(0.150)	(0.136)
Dependency ratio	-0.011*	-0.004	-0.071*	-0.027	-0.064*	-0.024
	(0.006)	(0.005)	(0.037)	(0.033)	(0.034)	(0.030)
Clay soil (dummy)	-0.012	-0.003	-0.154	-0.063	-0.149	-0.065
	(0.022)	(0.016)	(0.139)	(0.101)	(0.127)	(0.092)
Sandy-clay soil (dummy)	0.009	0.009	0.056	0.052	0.050	0.046
	(0.017)	(0.013)	(0.111)	(0.082)	(0.101)	(0.075)
Silty soil (dummy)	0.012	0.016	-0.013	0.056	-0.026	0.044
	(0.023)	(0.016)	(0.143)	(0.102)	(0.131)	(0.094)
Constant	0.509*	0.965***	5.042***	6.685***	4.083**	5.467***
	(0.305)	(0.096)	(1.932)	(0.632)	(1.766)	(0.577)
Observations	5,418	5,418	5,418	5,418	5,418	5,418
R-squared	0.116		0.150		0.175	
Number of id	2,555	2,555	2,555	2,555	2,555	2,555
District FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

6.3 Using access as lone IV

Table SM18: Full 2SLS estimates of the relationship between adoption, commercialization, production and yield (instrument for access)

variables	MP-CRE	QS-CRE	SV-CRE	Prod-FE	ProdV-FE	Yield-FE
Adoption dummy	0.065** (0.027)	0.564*** (0.172)	0.555*** (0.157)	724.946*** (101.622)	469.954*** (71.418)	312.473*** (40.778)
Age of household head (years)	-0.001 (0.005)	-0.050 (0.035)	-0.050 (0.032)	-24.420 (17.526)	-13.717 (12.317)	-13.525* (7.033)
Sex of household head (dummy, male=1)	-0.024 (0.025)	0.012 (0.163)	0.028 (0.149)			
Education level (Number of years)	0.001 (0.002)	-0.001 (0.011)	-0.001 (0.010)			
Household size (number of persons)	0.003*** (0.001)	0.027*** (0.007)	0.026*** (0.006)	7.038** (3.410)	2.586 (2.396)	3.529*** (1.368)
Farmers group membership (dummy)	0.031*** (0.008)	0.201*** (0.050)	0.183*** (0.046)	36.491 (24.841)	27.391 (17.458)	-1.659 (9.968)
Training on agriculture (dummy)	-0.040** (0.017)	-0.267** (0.109)	-0.245** (0.100)	44.605 (54.430)	23.344 (38.252)	28.040 (21.841)
Training on groundnut farming (dummy)	-0.033*** (0.005)	-0.229*** (0.032)	-0.212*** (0.030)	-0.632 (16.208)	-2.097 (11.391)	-7.340 (6.504)
Public agricultural extension service (number of visits)	0.006 (0.004)	-0.005 (0.022)	-0.007 (0.021)	-37.303*** (10.990)	-27.114*** (7.724)	-13.457*** (4.410)
Private agricultural extension service (number of visits)	0.000 (0.005)	0.029 (0.033)	0.028 (0.030)	-0.691 (16.044)	2.166 (11.276)	3.688 (6.438)
Cash credit for groundnut farming (dummy)	0.011 (0.034)	-0.042 (0.218)	-0.069 (0.200)	-165.336 (109.825)	-169.693** (77.183)	-8.697 (44.070)
Credit in kind for groundnut farming (dummy)	-0.051** (0.024)	-0.041 (0.156)	-0.015 (0.142)	57.123 (78.836)	45.060 (55.404)	13.322 (31.634)
Distance to the nearest urban market (km)	-0.003*** (0.000)	-0.020*** (0.003)	-0.019*** (0.003)	-0.580 (1.928)	-1.119 (1.355)	0.608 (0.774)
Distance the nearest village market (km)	-0.005*** (0.001)	-0.029*** (0.008)	-0.026*** (0.007)	-2.888 (4.782)	-3.766 (3.361)	0.084 (1.919)
Crop rotation (dummy)	-0.023 (0.016)	-0.119 (0.101)	-0.108 (0.093)	-25.995 (50.161)	-31.067 (35.252)	2.525 (20.128)
Mixed Crops (dummy)	0.018 (0.013)	0.161* (0.086)	0.146* (0.079)	-49.338 (42.612)	-42.325 (29.947)	-18.569 (17.099)
Labor force (man.day)	0.004*** (0.001)	0.037*** (0.008)	0.035*** (0.007)	9.352** (3.883)	5.658** (2.729)	2.204 (1.558)
Unit selling price (USD/kg)	0.108 (0.075)	0.659 (0.482)	1.853*** (0.441)	-298.709 (260.167)	1,284.525*** (182.839)	28.298 (104.397)
Seed cost (USD/ha)	0.002*** (0.000)	0.015*** (0.002)	0.014*** (0.002)	-0.520 (1.147)	-0.525 (0.806)	-0.283 (0.460)
Fertilizer cost (USD/ha)	0.000 (0.000)	0.004** (0.002)	0.003** (0.001)	-2.554*** (0.833)	-2.740*** (0.586)	0.212 (0.334)
Pesticide cost (USD/ha)	-0.001	0.000	0.001	6.536***	5.991***	3.357***

Table SM18: Full 2SLS estimates of the relationship between adoption, commercial-ization, production and yield (instrument for access) (*continued*)

variables	MP-CRE	QS-CRE	SV-CRE	Prod-FE	ProdV-FE	Yield-FE
	(0.001)	(0.005)	(0.004)	(2.496)	(1.754)	(1.002)
Labor cost (USD/ha)	0.001***	0.004***	0.004***	-0.013	-0.164	-0.000
	(0.000)	(0.001)	(0.001)	(0.570)	(0.401)	(0.229)
Groundnut area (ha)	0.017***	0.300***	0.289***	745.783***	460.858***	-5.427
	(0.005)	(0.033)	(0.030)	(16.342)	(11.485)	(6.558)
Off-farm income (dummy)	-0.039*	-0.146	-0.123	-90.713	-51.820	-25.487
	(0.023)	(0.146)	(0.134)	(74.325)	(52.234)	(29.824)
Dependency ratio	-0.004	-0.028	-0.025	-6.288	-3.957	-4.791
	(0.005)	(0.032)	(0.030)	(16.715)	(11.747)	(6.707)
Clay soil (dummy)	-0.004	-0.065	-0.067	-51.543	-35.999	-37.126
	(0.016)	(0.101)	(0.092)	(62.532)	(43.946)	(25.092)
Sandy-clay soil (dummy)	0.009	0.050	0.045	24.169	27.638	-23.155
	(0.013)	(0.082)	(0.075)	(49.907)	(35.074)	(20.026)
Silty soil (dummy)	0.015	0.050	0.039	108.827*	70.832	25.685
	(0.016)	(0.102)	(0.094)	(64.731)	(45.491)	(25.974)
Constant	0.996***	6.875***	5.643***	1,362.136	30.664	1,357.141***
	(0.101)	(0.656)	(0.599)	(897.819)	(630.966)	(360.267)
Observations	5,418	5,418	5,418	5,418	5,418	5,418
Number of id	2,555	2,555	2,555	2,555	2,555	2,555
District FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

6.4 Hausman Taylor IV

Table SM19: Full HAUSMAN TAYLOR IV estimations

variables	MP	QS	SV
Age of household head (years)	-0.004*** (0.001)	-0.031*** (0.005)	-0.031*** (0.005)
Household size (number of persons)	0.000 (0.001)	0.007 (0.005)	0.007 (0.005)
Farmers group membership (dummy)	0.015** (0.006)	0.110*** (0.040)	0.110*** (0.040)
Training on agriculture (dummy)	-0.063*** (0.014)	-0.385*** (0.089)	-0.385*** (0.089)
Training on groundnut farming (dummy)	-0.017*** (0.004)	-0.096*** (0.028)	-0.096*** (0.028)
Public agricultural extension service (number of visits)	-0.007** (0.003)	-0.065*** (0.018)	-0.065*** (0.018)
Private agricultural extension service (number of visits)	-0.004 (0.004)	-0.026 (0.027)	-0.026 (0.027)
Cash credit for groundnut farming (dummy)	0.057** (0.029)	0.304 (0.188)	0.304 (0.188)
Credit in kind for groundnut farming (dummy)	-0.058*** (0.020)	-0.117 (0.131)	-0.117 (0.131)
Distance to the nearest urban market (km)	-0.001*** (0.000)	-0.006** (0.003)	-0.006** (0.003)
Distance the nearest village market (km)	-0.007*** (0.001)	-0.041*** (0.008)	-0.041*** (0.008)
Crop rotation (dummy)	-0.047*** (0.012)	-0.434*** (0.079)	-0.434*** (0.079)
Mixed Crops (dummy)	0.051*** (0.011)	0.382*** (0.070)	0.382*** (0.070)
Labor force (man.day)	0.006*** (0.001)	0.053*** (0.006)	0.053*** (0.006)
Unit selling price (USD/kg)	-0.044 (0.065)	-0.152 (0.411)	-0.152 (0.411)
Seed cost (USD/ha)	0.003*** (0.000)	0.018*** (0.002)	0.018*** (0.002)
Fertilizer cost (USD/ha)	0.001*** (0.000)	0.010*** (0.001)	0.010*** (0.001)
Pesticide cost (USD/ha)	-0.001 (0.001)	0.003 (0.004)	0.003 (0.004)
Labor cost (USD/ha)	0.001*** (0.000)	0.002** (0.001)	0.002** (0.001)
Groundnut area (ha)	0.039*** (0.004)	0.457*** (0.025)	0.457*** (0.025)
Off-farm income (dummy)	-0.036* (0.018)	-0.051 (0.121)	-0.051 (0.121)
Dependency ratio	0.000 (0.004)	-0.012 (0.027)	-0.012 (0.027)
Clay soil (dummy)	-0.020 (0.017)	-0.187* (0.108)	-0.187* (0.108)
Sandy-clay soil (dummy)	-0.003 (0.013)	-0.019 (0.088)	-0.019 (0.088)
Silty soil (dummy)	0.003 (0.017)	-0.061 (0.111)	-0.061 (0.111)
Adoption dummy	0.087*** (0.019)	0.656*** (0.123)	0.656*** (0.123)
Sex of household head (dummy, male=1)	-0.048 (0.029)	-0.065 (0.207)	-0.065 (0.207)
Education level (Number of years)	0.002 (0.002)	0.012 (0.013)	0.012 (0.013)
Constant	0.933*** (0.066)	5.857*** (0.445)	5.857*** (0.445)

Table SM19: Full HAUSMAN TAYLOR IV estimations (*continued*)

variables	MP	QS	SV
Observations	5,418	5,418	5,418
Number of id	2,555	2,555	2,555
Standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

6.5 Lewbels Test

Table SM20: Full Lewbel instrumental variable estimations of the relationship between adoption and commercialization

variables	MP	QS	SV	MP-Access	QS-Access	SV-Access
Adoption dummy	0.108*** (0.026)	0.769*** (0.162)	0.718*** (0.149)	0.108*** (0.026)	0.769*** (0.162)	0.718*** (0.149)
Age of household head	-0.002 (0.006)	-0.050 (0.041)	-0.049 (0.038)	-0.002 (0.006)	-0.050 (0.041)	-0.049 (0.038)
Household size	0.003* (0.002)	0.027** (0.011)	0.025** (0.010)	0.003* (0.002)	0.027** (0.011)	0.025** (0.010)
Farmers group membership	0.030** (0.012)	0.207*** (0.078)	0.189*** (0.071)	0.030** (0.012)	0.207*** (0.078)	0.189*** (0.071)
Training on agriculture	-0.035 (0.027)	-0.212 (0.171)	-0.191 (0.157)	-0.035 (0.027)	-0.212 (0.171)	-0.191 (0.157)
Training on groundnut farming	-0.026*** (0.008)	-0.188*** (0.050)	-0.175*** (0.045)	-0.026*** (0.008)	-0.188*** (0.050)	-0.175*** (0.045)
Public agricultural extension service	0.004 (0.005)	-0.019 (0.031)	-0.020 (0.028)	0.004 (0.005)	-0.019 (0.031)	-0.020 (0.028)
Private agricultural extension service	-0.002 (0.007)	0.022 (0.046)	0.022 (0.042)	-0.002 (0.007)	0.022 (0.046)	0.022 (0.042)
Cash credit for groundnut farming	0.026 (0.049)	0.089 (0.318)	0.053 (0.292)	0.026 (0.049)	0.089 (0.318)	0.053 (0.292)
Credit in kind for groundnut farming	-0.073* (0.038)	-0.189 (0.248)	-0.151 (0.231)	-0.073* (0.038)	-0.189 (0.248)	-0.151 (0.231)
Distance to the nearest urban market	0.000 (0.001)	-0.002 (0.005)	-0.003 (0.005)	0.000 (0.001)	-0.002 (0.005)	-0.003 (0.005)
Distance the nearest village market	-0.005* (0.003)	-0.023 (0.018)	-0.020 (0.017)	-0.005* (0.003)	-0.023 (0.018)	-0.020 (0.017)
Crop rotation	-0.030 (0.025)	-0.144 (0.152)	-0.132 (0.138)	-0.030 (0.025)	-0.144 (0.152)	-0.132 (0.138)
Mixed Crops	0.008 (0.021)	0.120 (0.134)	0.111 (0.123)	0.008 (0.021)	0.120 (0.134)	0.111 (0.123)
Labor force	0.005*** (0.002)	0.044*** (0.012)	0.042*** (0.011)	0.005*** (0.002)	0.044*** (0.012)	0.042*** (0.011)
Unit selling price	0.031 (0.081)	0.287 (0.511)	1.535*** (0.469)	0.031 (0.081)	0.287 (0.511)	1.535*** (0.469)
Seed cost	0.002*** (0.001)	0.015*** (0.004)	0.013*** (0.004)	0.002*** (0.001)	0.015*** (0.004)	0.013*** (0.004)
Fertilizer cost	0.000 (0.000)	0.004** (0.002)	0.004** (0.002)	0.000 (0.000)	0.004** (0.002)	0.004** (0.002)
Pesticide cost	-0.001 (0.001)	-0.001 (0.007)	-0.001 (0.006)	-0.001 (0.001)	-0.001 (0.007)	-0.001 (0.006)
Labor cost	0.001** (0.000)	0.004** (0.002)	0.004** (0.002)	0.001** (0.000)	0.004** (0.002)	0.004** (0.002)
Groundnut area	0.015** (0.007)	0.278*** (0.055)	0.268*** (0.051)	0.015** (0.007)	0.278*** (0.055)	0.268*** (0.051)
Off-farm income	-0.044 (0.030)	-0.129 (0.212)	-0.098 (0.198)	-0.044 (0.030)	-0.129 (0.212)	-0.098 (0.198)
Dependency ratio	-0.012 (0.008)	-0.075 (0.047)	-0.067 (0.043)	-0.012 (0.008)	-0.075 (0.047)	-0.067 (0.043)
Clay soil	-0.016 (0.032)	-0.174 (0.202)	-0.167 (0.184)	-0.016 (0.032)	-0.174 (0.202)	-0.167 (0.184)
Sandy-clay soil	0.004 (0.024)	0.027 (0.150)	0.024 (0.137)	0.004 (0.024)	0.027 (0.150)	0.024 (0.137)
Silty soil	0.003 (0.032)	-0.063 (0.199)	-0.069 (0.181)	0.003 (0.032)	-0.063 (0.199)	-0.069 (0.181)
Observations	5,418	5,418	5,418	5,418	5,418	5,418
R-squared	0.092	0.129	0.156	0.092	0.129	0.156
Robust standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

6.6 Continuous adoption (2 years)

Table SM21: Full 2SLS estimates of the relationship between continuous adoption (two-year) and commercialization

variables	MP	QS	SV
Two years continuous adoption	0.005 (0.043)	0.104 (0.270)	0.114 (0.246)
Age of household head	-0.001 (0.009)	-0.049 (0.056)	-0.048 (0.051)
Household size	0.003*** (0.001)	0.028*** (0.006)	0.026*** (0.005)
Farmers group membership	0.029*** (0.006)	0.196*** (0.041)	0.179*** (0.037)
Training on agriculture	-0.033** (0.014)	-0.199** (0.089)	-0.179** (0.081)
Training on groundnut farming	-0.029*** (0.004)	-0.205*** (0.026)	-0.191*** (0.024)
Public agricultural extension service	0.004 (0.003)	-0.015 (0.018)	-0.016 (0.016)
Private agricultural extension service	0.002 (0.004)	0.051** (0.026)	0.049** (0.023)
Cash credit for groundnut farming	0.031 (0.028)	0.125 (0.178)	0.087 (0.163)
Credit in kind for groundnut farming	-0.065*** (0.020)	-0.134 (0.128)	-0.099 (0.117)
Distance to the nearest urban market	0.000 (0.000)	-0.003 (0.003)	-0.003 (0.003)
Distance the nearest village market	-0.005*** (0.001)	-0.021*** (0.008)	-0.018** (0.007)
Crop rotation	-0.034*** (0.013)	-0.177** (0.082)	-0.162** (0.075)
Mixed Crops	0.008 (0.011)	0.126* (0.069)	0.116* (0.063)
Labor force	0.005*** (0.001)	0.045*** (0.006)	0.043*** (0.006)
Unit selling price	0.247*** (0.043)	1.836*** (0.271)	2.978*** (0.247)
Seed cost	0.002*** (0.000)	0.016*** (0.002)	0.015*** (0.002)
Fertilizer cost	0.000** (0.000)	0.005*** (0.001)	0.005*** (0.001)
Pesticide cost	-0.000 (0.001)	0.001 (0.004)	0.001 (0.004)
Labor cost	0.001*** (0.000)	0.004*** (0.001)	0.004*** (0.001)
Groundnut area	0.015*** (0.004)	0.281*** (0.027)	0.270*** (0.024)
Off-farm income	-0.038** (0.019)	-0.086 (0.120)	-0.058 (0.110)
Dependency ratio	-0.012*** (0.004)	-0.074*** (0.027)	-0.066*** (0.025)
Clay soil	-0.016 (0.016)	-0.174* (0.102)	-0.168* (0.093)
Sandy-clay soil	0.004 (0.013)	0.029 (0.082)	0.026 (0.075)
Silty soil	0.004 (0.017)	-0.057 (0.106)	-0.063 (0.097)
Constant	-0.004 (0.082)	0.076 (0.517)	0.101 (0.473)
Observations	5,418	5,418	5,418
Number of id	2,555	2,555	2,555
District FE	YES	YES	YES

Table SM21: Full 2SLS estimates of the relationship between continuous adoption (two-year) and commercialization (*continued*)

variables	MP	QS	SV
Year FE	YES	YES	YES
Standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

Table SM22: Linear IV mediation analysis of continuous adoption (2 Years) and commercialization (Production)

variables	Sellers	Quantity Sold	Sales Value
Total effect (TE)	54.00 (1,344)	388.0 (9,656)	379.9 (9,454)
Direct effect	-0.0946*** (0.0353)	-0.683*** (0.234)	-0.670*** (0.221)
Indirect effect	54.10 (1,344)	388.7 (9,657)	380.6 (9,455)
Observations	5,418	5,418	5,418
Additional controls	YES	YES	YES
District dummies	YES	YES	YES
Mediator share of TE (%)	100.2	100.2	100.2
F statistic on instrument (1)	0.00159	0.00159	0.00159
F statistic on instruments (2)	19.30	19.30	19.30
Standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

Table SM23: Linear IV mediation analysis of continuous adoption (2 Years) and commercialization (Yield)

variables	Sellers	Quantity Sold	Sales Value
Total effect (TE)	54.00 (1,344)	388.0 (9,656)	379.9 (9,454)
Direct effect	-0.0552*** (0.0191)	-0.400*** (0.123)	-0.393*** (0.114)
Indirect effect	54.06 (1,344)	388.4 (9,656)	380.3 (9,455)
Observations	5,418	5,418	5,418
Additional controls	YES	YES	YES
District dummies	YES	YES	YES
Mediator share of TE (%)	100.1	100.1	100.1
F statistic on instrument (1)	0.00159	0.00159	0.00159
F statistic on instruments (2)	50.51	50.51	50.51
Standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			