A Online Appendix

CAN FINANCIAL INCENTIVES TO FIRMS IMPROVE APPRENTICE TRAINING? EXPERIMENTAL EVIDENCE FROM GHANA

Gabriel Brown, Morgan Hardy, Isaac Mbiti, Jamie McCasland, and Isabelle Salcher

Table A1: Balance: Apprentice Characteristics (Full Sample—Men and Women)

	Observations (1)	Mean Control (2)	Mean Treatment (3)	Treatment Coefficient (4)	Coefficient p-value (5)
Garments	797	0.56	0.54		
North	797	0.34	0.35		
Program apprentices (incl. respondent)	797	2.51	2.45	-0.18	(0.17)
Female	797	0.92	0.96	0.04	(0.10)*
Age	774	22.87	22.96	0.10	(0.81)
Married (0/1)	772	0.37	0.34	-0.03	(0.38)
Number of children	781	0.74	0.79	-0.01	(0.85)
Lives with parent(s) (0/1)	778	0.49	0.45	-0.01	(0.81)
Household asset score (z-score)	766	0.00	0.16	0.13	(0.04)**
Years schooling	760	7.50	7.38	-0.17	(0.44)
Ability index (z-score)	780	0.00	0.01	0.01	(0.94)
Soft skills index (z-score)	778	0.00	0.08	0.09	(0.19)
Food security (z-score)	776	0.00	-0.03	-0.06	(0.40)
Self-reported health (z-score)	779	0.00	0.01	-0.01	(0.94)
Mother years schooling	647	3.28	3.53	0.32	(0.35)
Father years schooling	567	5.55	5.66	0.08	(0.86)
Prior apprenticeship experience (0/1)	780	0.26	0.27	0.01	(0.74)
Wage-employed (0/1)	781	0.04	0.04	0.00	(0.92)
Wage-employment earnings (GhC)	781	1.44	1.39	0.15	(0.82)
Self-employed (0/1)	781	0.22	0.18	-0.02	(0.59)
Self-employment profits (GhC)	781	11.74	10.59	0.36	(0.90)
Total weekly hours worked	772	18.54	16.61	-0.70	(0.72)
Desires self-employment (0/1)	781	0.55	0.52	-0.04	(0.22)

Notes: *North* indicates that the apprentice lives in the the northern regions of the country as of 2015, which are socio-culturally distinct from the 7 southern regions of Ghanas of 2015. The randomization was stratified by district, trade, and a measure of the number of NAP apprentices training at the firm, so we expect garments, north, and program apprentices (including respondent) to be balanced by construction. Each treatment coefficient in column (4) comes from a separate regression that includes strata fixed effects. Errors are clustered at the firm level. 781 of 797 apprentices participated in the baseline survey between August and December of 2012. This table includes all available data from the baseline survey. *Household Asset* is the first principal component of a set of housing quality (floor material, roof material, wall material, sanitation access, water source, lighting source, primary cooking implement, and number of people who sleep in the same room) and asset measures (mattress, tv, radio, refrigerator, car, motorbike, bicycle, working mobile phones, and shoes). *Ability Index* is the normalized sum of the normalized scores on each of four cognitive tests: Digit Span Recall, four math questions we developed ourselves, Ravens Matrices Group B, and a fifteen word oral English vocabulary recognition test. *Soft Skills Index* is the normalized sum of the normalized scores on each of two (adapted to context) non-cognitive tests: the Rosenberg Self-Esteem scale and the Rotter Locus of Control scale. *Food Security* is the first principal component of two food consumption measures: meals eaten per day and meals per day that included meat (excluding eggs). *Self-Reported Health* is the normalized response to *All in all, how would you describe your state of health these days?* on a four-point Likert scale. The top 0.5% of wage job earnings and self-employment profits have been winsorized; these variables are measured in October 2015 Ghana Cedis. *Desires Self-Employment* is an indicator variable for the respondent reporting that the reason they are interested in apprenticeship training is that it will lead to self-employment. An F test of the joint significance of all 20 covariates (from female to desires self-employment) in predicting treatment yields of p-value of 0.39. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A2: Pay for Performance Scheme

Group (Decile)	**Payment to MCP (Ghana Cedis)**
1	200
2	140
3	130
4	120
5	105
6	90
7	80
8	70
9	35
10	25

Notes: The above lists the payouts by apprentice performance decile for each apprentice in the treatment group. In addition, firm owners in the treatment group whose apprentice performed best in the region and craft earned their trainer 250 GhC. Firm owners in the control group received 100 GhC for every apprentice who took the test regardless of performance. Payouts for both control and treatment firms averaged 100 GhC per apprentice, both in expectation and ex-post.

Table A3: Correlation between practical test and endline measures

	Full sample	Women only
	(1)	(2)
Craft skills quiz (z-score)	0.10**	0.10**
	(0.04)	(0.04)
Observations	466	439

Notes: This Table shows the results from estimating the correlation between the practical test and one of the endline measures: Craft skills. The estimation includes strata fixed effects. Standard errors, clustered at the firm level, are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4: Balance: Apprentice Characteristics (Endline Sample—Men and Women)

	Observations	Mean Control	Mean Treatment	Treatment Coefficient	Coefficient p-value
	(1)	(2)	(3)	(4)	(5)
Garments	748	0.56	0.53		
North	748	0.34	0.35		
Program apprentices (incl. respondent)	748	2.52	2.46	-0.16	(0.23)
Female	748	0.92	0.96	0.03	(0.13)
Age	727	22.91	22.98	0.04	(0.92)
Married (0/1)	725	0.36	0.35	-0.02	(0.57)
Number of children	734	0.74	0.80	-0.02	(0.82)
Lives with parent(s) (0/1)	732	0.49	0.44	-0.01	(0.77)
Household asset score (z-score)	720	-0.01	0.14	0.15	(0.03)**
Years schooling	713	7.49	7.40	-0.11	(0.62)
Ability index (z-score)	733	-0.02	0.00	0.02	(0.82)
Soft skills index (z-score)	731	0.00	0.08	0.07	(0.30)
Food security (z-score)	730	-0.01	-0.02	-0.04	(0.58)
Self-reported health (z-score)	732	0.00	-0.01	-0.02	(0.85)
Mother years schooling	611	3.34	3.44	0.10	(0.76)
Father years schooling	536	5.60	5.74	0.00	(1.00)
Prior apprenticeship experience (0/1)	733	0.26	0.28	0.02	(0.50)
Wage-employed (0/1)	734	0.04	0.04	0.00	(0.86)
Wage-employment earnings (GhC)	734	1.46	1.36	0.12	(0.86)
Self-employed (0/1)	734	0.22	0.19	-0.02	(0.61)
Self-employment profits (GhC)	734	12.23	11.03	0.10	(0.98)
Total weekly hours worked	726	19.06	17.32	-0.41	(0.84)
Desires self-employment (0/1)	734	0.56	0.52	-0.05	(0.17)

Notes: *North* indicates that the apprentice lives in the the northern regions of the country as of 2015, which are socio-culturally distinct from the 7 southern regions of Ghanas of 2015. The randomization was stratified by district, trade, and a measure of the number of NAP apprentices training at the firm, so we expect garments, north, and program apprentices (including respondent) to be balanced by construction. Each treatment coefficient in column (4) comes from a separate regression that includes strata fixed effects. Errors are clustered at the firm level. 781 of 797 apprentices participated in the baseline survey between August and December of 2012. 748 apprentices participated in the endline survey. 734 participated in both and thus have baseline covariates against which to test for balance and endline survey data, from which most of our treatment effects are measured. This table restricts the sample to those who participated in the endline survey. *Household Asset* is the first principal component of a set of housing quality (floor material, roof material, wall material, sanitation access, water source, lighting source, primary cooking implement, and number of people who sleep in the same room) and asset measures (mattress, tv, radio, refrigerator, car, motorbike, bicycle, working mobile phones, and shoes). *Ability Index* is the normalized sum of the normalized scores on each of four cognitive tests: Digit Span Recall, four math questions we developed ourselves, Ravens Matrices Group B, and a fifteen word oral English vocabulary recognition test. *Soft Skills Index* is the normalized sum of the normalized scores on each of two (adapted to context) non-cognitive tests: the Rosenberg Self-Esteem scale and the Rotter Locus of Control scale. *Food Security* is the first principal component of two food consumption measures: meals eaten per day and meals per day that included meat (excluding eggs). *Self-Reported Health* is the normalized response to *All in all, how would you describe your state of health these days?* on a four-point Likert scale. The top 0.5% of wage job earnings and self-employment profits have been winsorized; these variables are measured in October 2015 Ghana Cedis. *Desires Self-Employment* is an indicator variable for the respondent reporting that the reason they are interested in apprenticeship training is that it will lead to self-employment. An F test of the joint significance of all 20 covariates (from female to desires self-employment) in predicting treatment yields of p-value of 0.56. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A5: Balance: Apprentice Characteristics (Assessment Sample—Men and Women)

	Observations	Mean Control	Mean Treatment	Treatment Coefficient	Coefficient p-value
	(1)	(2)	(3)	(4)	(5)
Garments	488	0.59	0.57		
North	488	0.47	0.48		
Program apprentices (incl. respondent)	488	2.65	2.51	-0.24	(0.16)
Female	488	0.91	0.96	0.03	(0.23)
Age	474	22.69	22.71	-0.07	(0.89)
Married (0/1)	473	0.41	0.42	-0.01	(0.80)
Number of children	480	0.75	0.88	0.01	(0.90)
Lives with parent(s) (0/1)	479	0.50	0.48	0.02	(0.60)
Household asset score (z-score)	472	-0.12	0.06	0.21	(0.01)**
Years schooling	463	7.16	7.42	0.29	(0.33)
Ability index (z-score)	480	-0.05	0.02	0.03	(0.79)
Soft skills index (z-score)	478	-0.07	-0.05	0.07	(0.50)
Food security (z-score)	477	-0.04	-0.09	-0.03	(0.76)
Self-reported health (z-score)	478	0.01	-0.04	0.00	(0.96)
Mother years schooling	416	2.75	2.86	0.15	(0.71)
Father years schooling	367	4.59	5.11	0.40	(0.47)
Prior apprenticeship experience (0/1)	479	0.30	0.26	-0.02	(0.65)
Wage-employed (0/1)	480	0.04	0.03	0.00	(0.89)
Wage-employment earnings (GhC)	480	1.28	1.28	0.18	(0.84)
Self-employed (0/1)	480	0.24	0.20	-0.03	(0.52)
Self-employment profits (GhC)	480	12.12	11.79	1.98	(0.62)
Total weekly hours worked	476	21.54	17.24	-2.69	(0.33)
Desires self-employment (0/1)	480	0.53	0.51	-0.03	(0.55)

Notes: *North* indicates that the apprentice lives in the the northern regions of the country as of 2015, which are socio-culturally distinct from the 7 southern regions of Ghanas of 2015. The randomization was stratified by district, trade, and a measure of the number of NAP apprentices training at the firm, so we expect garments, north, and program apprentices (including respondent) to be balanced by construction. Each treatment coefficient in column (4) comes from a separate regression that includes strata fixed effects. Errors are clustered at the firm level. 781 of 797 apprentices participated in the baseline survey between August and December of 2012. 488 apprentices participated in the assessment (excluding the pilot district). 480 participated in both and thus have baseline covariates against which to test for balance and assessment data, from which some of our skills treatment effects are measured. This table restricts the sample to those who participated in the assessment. *Household Asset* is the first principal component of a set of housing quality (floor material, roof material, wall material, sanitation access, water source, lighting source, primary cooking implement, and number of people who sleep in the same room) and asset measures (mattress, tv, radio, refrigerator, car, motorbike, bicycle, working mobile phones, and shoes). *Ability Index* is the normalized sum of the normalized scores on each of four cognitive tests: Digit Span Recall, four math questions we developed ourselves, Ravens Matrices Group B, and a fifteen word oral English vocabulary recognition test. *Soft Skills Index* is the normalized sum of the normalized scores on each of two (adapted to context) non-cognitive tests: the Rosenberg Self-Esteem scale and the Rotter Locus of Control scale. *Food Security* is the first principal component of two food consumption measures: meals eaten per day and meals per day that included meat (excluding eggs). *Self-Reported Health* is the normalized response to *All in all, how would you describe your state of health these days?* on a four-point Likert scale. The top 0.5% of wage job earnings and self-employment profits have been winsorized; these variables are measured in October 2015 Ghana Cedis. *Desires Self-Employment* is an indicator variable for the respondent reporting that the reason they are interested in apprenticeship training is that it will lead to self-employment. An F test of the joint significance of all 20 covariates (from female to desires self-employment) in predicting treatment yields of p-value of 0.62. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A6: Balance: Apprentice Characteristics (Full Sample—Women Only)

	Observations (1)	Mean Control (2)	Mean Treatment (3)	Treatment Coefficient (4)	Coefficient p-value (5)
Garments	751	0.53	0.52		
North	751	0.34	0.33		
Female	751	.00	.00		
Program apprentices (incl. respondent)	751	2.44	2.48	-0.15	(0.24)
Age	729	22.62	22.86	0.29	(0.43)
Married (0/1)	727	0.38	0.34	-0.05	(0.17)
Number of children	736	0.75	0.79	-0.03	(0.72)
Lives with parent(s) (0/1)	733	0.48	0.45	-0.01	(0.69)
Household asset score (z-score)	722	0.00	0.17	0.15	(0.03)**
Years schooling	715	7.40	7.30	-0.17	(0.45)
Ability index (z-score)	735	0.00	0.03	0.02	(0.80)
Soft skills index (z-score)	733	0.00	0.09	0.09	(0.18)
Food security (z-score)	731	0.00	-0.02	-0.05	(0.49)
Self-reported health (z-score)	734	0.00	0.03	0.01	(0.85)
Mother years schooling	611	3.37	3.59	0.26	(0.47)
Father years schooling	531	5.60	5.67	0.10	(0.84)
Prior apprenticeship experience (0/1)	735	0.25	0.25	0.01	(0.86)
Wage-employed (0/1)	736	0.02	0.03	0.01	(0.48)
Wage-employment earnings (GhC)	736	0.57	1.11	0.56	(0.19)
Self-employed (0/1)	736	0.21	0.18	-0.01	(0.68)
Self-employment profits (GhC)	736	11.43	9.03	-1.38	(0.60)
Total weekly hours worked	728	18.27	15.85	-0.95	(0.62)
Desires self-employment (0/1)	736	0.55	0.52	-0.05	(0.21)

Notes: *North* indicates that the apprentice lives in the the northern regions of the country as of 2015, which are socio-culturally distinct from the 7 southern regions of Ghanas of 2015. The randomization was stratified by district, trade, and a measure of the number of NAP apprentices training at the firm, so we expect garments, north, and program apprentices (including respondent) to be balanced by construction. All apprentices in this table are female. Each treatment coefficient in column (4) comes from a separate regression that includes strata fixed effects. Errors are clustered at the firm level. 736 of the 751 women in the analysis sample participated in the baseline survey between August and December of 2012. *Household Asset* is the first principal component of a set of housing quality (floor material, roof material, wall material, sanitation access, water source, lighting source, primary cooking implement, and number of people who sleep in the same room) and asset measures (mattress, tv, radio, refrigerator, car, motorbike, bicycle, working mobile phones, and shoes). *Ability Index* is the normalized sum of the normalized scores on each of four cognitive tests: Digit Span Recall, four math questions we developed ourselves, Ravens Matrices Group B, and a fifteen word oral English vocabulary recognition test. *Soft Skills Index* is the normalized sum of the normalized scores on each of two (adapted to context) non-cognitive tests: the Rosenberg Self-Esteem scale and the Rotter Locus of Control scale. *Food Security* is the first principal component of two food consumption measures: meals eaten per day and meals per day that included meat (excluding eggs). *Self-Reported Health* is the normalized response to *All in all, how would you describe your state of health these days?* on a four-point Likert scale. The top 0.5% of wage job earnings and self-employment profits have been winsorized; these variables are measured in October 2015 Ghana Cedis. *Desires Self-Employment* is an indicator variable for the respondent reporting that the reason they are interested in apprenticeship training is that it will lead to self-employment. An F test of the joint significance of all 19 covariates (from age to desires self-employment) in predicting treatment yields of p-value of 0.24. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A7: Balance: Apprentice Characteristics (Endline Sample—Women Only)

	Observations	Mean Control	Mean Treatment	Treatment Coefficient	Coefficient p-value
	(1)	(2)	(3)	(4)	(5)
Garments	706	0.53	0.52		
North	706	0.33	0.34		
Female	706	.00	.00		
Program apprentices (incl. respondent)	706	2.45	2.50	-0.14	(0.29)
Age	686	22.66	22.89	0.21	(0.58)
Married (0/1)	684	0.37	0.35	-0.04	(0.35)
Number of children	693	0.75	0.80	-0.03	(0.73)
Lives with parent(s) (0/1)	691	0.48	0.44	-0.01	(0.73)
Household asset score (z-score)	680	-0.01	0.16	0.15	(0.02)**
Years schooling	672	7.40	7.33	-0.10	(0.67)
Ability index (z-score)	692	-0.02	0.03	0.04	(0.63)
Soft skills index (z-score)	690	0.01	0.08	0.07	(0.36)
Food security (z-score)	689	-0.01	0.00	-0.04	(0.63)
Self-reported health (z-score)	691	0.00	0.01	0.01	(0.95)
Mother years schooling	578	3.43	3.52	0.07	(0.83)
Father years schooling	502	5.71	5.74	-0.03	(0.95)
Prior apprenticeship experience (0/1)	692	0.25	0.26	0.01	(0.70)
Wage-employed (0/1)	693	0.02	0.03	0.01	(0.38)
Wage-employment earnings (GhC)	693	0.60	1.18	0.67	(0.16)
Self-employed (0/1)	693	0.22	0.18	-0.01	(0.65)
Self-employment profits (GhC)	693	11.83	9.35	-2.09	(0.44)
Total weekly hours worked	686	18.84	16.62	-0.72	(0.72)
Desires self-employment (0/1)	693	0.56	0.52	-0.06	(0.14)

Notes: *North* indicates that the apprentice lives in the the northern regions of the country as of 2015, which are socio-culturally distinct from the 7 southern regions of Ghanas of 2015. The randomization was stratified by district, trade, and a measure of the number of NAP apprentices training at the firm, so we expect garments, north, and program apprentices (including respondent) to be balanced by construction. All workers in this table are female. Each treatment coefficient in column (4) comes from a separate regression that includes strata fixed effects. Errors are clustered at the firm level. 736 of the 751 women in the analysis sample participated in the baseline survey between August and December of 2012. 706 participated in the endline survey. 700 participated in both and thus have baseline covariates against which to test for balance and endline survey data, from which most of our treatment effects are measured. This table restricts the sample to those who participated in the endline survey. *Household Asset* is the first principal component of a set of housing quality (floor material, roof material, wall material, sanitation access, water source, lighting source, primary cooking implement, and number of people who sleep in the same room) and asset measures (mattress, tv, radio, refrigerator, car, motorbike, bicycle, working mobile phones, and shoes). *Ability Index* is the normalized sum of the normalized scores on each of four cognitive tests: Digit Span Recall, four math questions we developed ourselves, Ravens Matrices Group B, and a fifteen word oral English vocabulary recognition test. *Soft Skills Index* is the normalized sum of the normalized scores on each of two (adapted to context) non-cognitive tests: the Rosenberg Self-Esteem scale and the Rotter Locus of Control scale. *Food Security* is the first principal component of two food consumption measures: meals eaten per day and meals per day that included meat (excluding eggs). *Self-Reported Health* is the normalized response to *All in all, how would you describe your state of health these days?* on a four-point Likert scale. The top 0.5% of wage job earnings and self-employment profits have been winsorized; these variables are measured in October 2015 Ghana Cedis. *Desires Self-Employment* is an indicator variable for the respondent reporting that the reason they are interested in apprenticeship training is that it will lead to self-employment. An F test of the joint significance of all 19 covariates (from age to desires self-employment) in predicting treatment yields of p-value of 0.23. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A8: Balance: Apprentice Characteristics (Assessment Sample—Women Only)

	Observations (1)	Mean Control (2)	Mean Treatment (3)	Treatment Coefficient (4)	Coefficient p-value (5)
Garments	457	0.57	0.55		
North	457	0.46	0.46		
Female	457	.00	.00		
Program apprentices (incl. respondent)	457	2.61	2.55	-0.22	(0.22)
Age	443	22.40	22.61	0.16	(0.75)
Married (0/1)	442	0.43	0.41	-0.04	(0.45)
Number of children	449	0.76	0.87	0.00	(0.99)
Lives with parent(s) (0/1)	448	0.50	0.47	0.01	(0.88)
Household asset score (z-score)	441	-0.12	0.07	0.23	(0.01)***
Years schooling	432	6.96	7.32	0.36	(0.24)
Ability index (z-score)	449	-0.07	0.06	0.07	(0.47)
Soft skills index (z-score)	447	-0.07	-0.05	0.05	(0.63)
Food security (z-score)	446	-0.04	-0.07	-0.02	(0.81)
Self-reported health (z-score)	447	0.01	-0.04	0.00	(0.98)
Mother years schooling	391	2.82	2.93	0.15	(0.73)
Father years schooling	342	4.65	5.12	0.43	(0.47)
Prior apprenticeship experience (0/1)	448	0.28	0.24	-0.03	(0.53)
Wage-employed (0/1)	449	0.02	0.02	0.00	(1.00)
Wage-employment earnings (GhC)	449	0.40	0.88	0.40	(0.46)
Self-employed (0/1)	449	0.23	0.19	-0.03	(0.51)
Self-employment profits (GhC)	449	11.17	9.02	-1.12	(0.73)
Total weekly hours worked	446	21.03	16.25	-3.42	(0.20)
Desires self-employment (0/1)	449	0.53	0.52	-0.02	(0.69)

Notes: *North* indicates that the apprentice lives in the the northern regions of the country as of 2015, which are socio-culturally distinct from the 7 southern regions of Ghanas of 2015. The randomization was stratified by district, trade, and a measure of the number of NAP apprentices training at the firm, so we expect garments, north, and program apprentices (including respondent) to be balanced by construction. All workers in this table are female. Each treatment coefficient in column (4) comes from a separate regression that includes strata fixed effects. Errors are clustered at the firm level. 736 of the 751 women in the analysis sample participated in the baseline survey between August and December of 2012. 457 participated in the assesment (excluding the women from the pilot district where the assessment differed from other districts). 449 participated in both and thus have baseline covariates against which to test for balance and assessment data, from which some of our key skills treatment effects are measured. This table restricts the sample to those who participated in the assessment. *Household Asset* is the first principal component of a set of housing quality (floor material, roof material, wall material, sanitation access, water source, lighting source, primary cooking implement, and number of people who sleep in the same room) and asset measures (mattress, tv, radio, refrigerator, car, motorbike, bicycle, working mobile phones, and shoes). *Ability Index* is the normalized sum of the normalized scores on each of four cognitive tests: Digit Span Recall, four math questions we developed ourselves, Ravens Matrices Group B, and a fifteen word oral English vocabulary recognition test. *Soft Skills Index* is the normalized sum of the normalized scores on each of two (adapted to context) non-cognitive tests: the Rosenberg Self-Esteem scale and the Rotter Locus of Control scale. *Food Security* is the first principal component of two food consumption measures: meals eaten per day and meals per day that included meat (excluding eggs). *Self-Reported Health* is the normalized response to *All in all, how would you describe your state of health these days?* on a four-point Likert scale. The top 0.5% of wage job earnings and self-employment profits have been winsorized; these variables are measured in October 2015 Ghana Cedis. *Desires Self-Employment* is an indicator variable for the respondent reporting that the reason they are interested in apprenticeship training is that it will lead to self-employment. An F test of the joint significance of all 19 covariates (from age to desires self-employment) in predicting treatment yields of p-value of 0.26. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A9: Balance: Firm Characteristics—Firms Training Men and Women

	Observations	Mean Control	Mean Treatment	Treatment Coefficient	Coefficient p-value
	(1)	(2)	(3)	(4)	(5)
Garments	467	0.55	0.56		
North	467	0.31	0.32		
Program Apprentices	467	1.70	1.71	-0.10	(0.16)
Female	467	0.86	0.90	0.03	(0.34)
Age	457	35.47	35.05	-0.29	(0.69)
Years Schooling	462	8.52	8.48	-0.09	(0.78)
Completed Apprenticeship (0/1)	461	0.97	0.97	0.01	(0.62)
Ability Index (z-score)	421	0.00	0.02	0.01	(0.95)
Firm Age (Years)	463	11.22	10.72	-0.37	(0.59)
Revenues Last Month (GhC)	419	372	373.40	11.36	(0.78)
Profits Last Month (GhC)	419	187.70	199.10	21.48	(0.33)
Firm Size (Incl Owner)	421	4.43	4.52	-0.05	(0.86)
Wage Bill (GhC)	421	55.11	56.16	-3.84	(0.72)
Firm Assets (GhC)	421	2,870	3,029	249.05	(0.32)
Trade Association Member (0/1)	421	0.85	0.86	0.00	(0.94)
Past Completed Apprentices	420	12.39	10.29	-1.94	(0.28)
Customer Service Instruction (0/1)	406	0.98	0.97	0.00	(0.98)
Inventory Management Instruction (0/1)	406	0.59	0.65	0.05	(0.38)
Financial Management Instruction (0/1)	406	0.54	0.56	0.01	(0.90)
Business Confidence Instruction (0/1)	406	0.60	0.65	0.00	(0.97)
Provides More Instruction to Slow Apprentices (0/1)	402	0.30	0.30	-0.01	(0.84)
Months Until Apprentices Work with Clients	406	9.96	9.63	-0.14	(0.87)

Notes: *North* indicates that the firm is located in the the northern regions of the country as of 2015, which are socio-culturally distinct from the 7 southern regions of Ghanas of 2015. The randomization was stratified by district, trade, and a measure of the number of NAP apprentices training at the firm, so we expect garments, north, and number of program apprentices to be balanced by construction. This table includes all firms in our sample. Each treatment coefficient in column (4) comes from a separate regression that includes strata fixed effects. *Ability Index* is the normalized sum of the normalized scores on two cognitive tests: Digit Span Recall and four math questions we developed ourselves. All financial variables are in October 2015 GhC. An F test of the joint significance of all 19 covariates (from female to months until apprentices work with clients) in predicting treatment yields of p-value of 0.98. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A10: Balance: Firm Characteristics—Firms Training Women Only

	Observations	Mean Control	Mean Treatment	Treatment Coefficient	Coefficient p-value
	(1)	(2)	(3)	(4)	(5)
Garments	446	0.53	0.54		
North	446	0.31	0.31		
Program Apprentices	446	1.71	1.73	-0.08	(0.22)
Female	446	0.91	0.92	0.01	(0.61)
Age	436	35.37	35.20	-0.11	(0.88)
Years Schooling	441	8.46	8.44	-0.07	(0.83)
Completed Apprenticeship (0/1)	440	0.97	0.97	0.01	(0.67)
Ability Index (z-score)	403	0.00	0.03	0.02	(0.86)
Firm Age (Years)	442	11.20	10.80	-0.24	(0.73)
Revenues Last Month (GhC)	401	378.10	377.80	14.23	(0.73)
Profits Last Month (GhC)	401	191.80	201	20.67	(0.37)
Firm Size (Incl Owner)	403	4.44	4.52	-0.03	(0.92)
Wage Bill (GhC)	403	55.18	54.70	-5.80	(0.59)
Firm Assets (GhC)	403	2,849	3,054	240.90	(0.35)
Trade Association Member (0/1)	403	0.85	0.87	0.01	(0.84)
Past Completed Apprentices	402	12.81	10.68	-1.98	(0.30)
Customer Service Instruction (0/1)	389	0.98	0.97	0.00	(0.97)
Inventory Management Instruction (0/1)	389	0.59	0.67	0.07	(0.20)
Financial Management Instruction (0/1)	389	0.53	0.56	0.02	(0.77)
Business Confidence Instruction (0/1)	389	0.62	0.65	-0.02	(0.66)
Provides More Instruction to Slow Apprentices (0/1)	385	0.32	0.29	-0.03	(0.58)
Months Until Apprentices Work with Clients	389	9.68	9.38	-0.11	(0.90)

Notes: *North* indicates that the firm is located in the the northern regions of the country as of 2015, which are socio-culturally distinct from the 7 southern regions of Ghanas of 2015. The randomization was stratified by district, trade, and a measure of the number of NAP apprentices training at the firm, so we expect garments, north, and number of program apprentices to be balanced by construction. This table includes all firms training female workers in our sample. Each treatment coefficient in column (4) comes from a separate regression that includes strata fixed effects. *Ability Index* is the normalized sum of the normalized scores on two cognitive tests: Digit Span Recall and four math questions we developed ourselves. All financial variables are in October 2015 GhC. An F test of the joint significance of all 19 covariates (from female to months until apprentices work with clients) in predicting treatment yields of p-value of 0.97. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A11: Attrition

	Targeted Sample	= 1 if Surveyed		Treatment Coefficient	Coefficient p-value
		Control	Treatment		
	(1)	(2)	(3)	(4)	(5)
Panel A: Full sample					
Apprentice Baseline Survey	797	0.98	0.98	0.00	(0.88)
Took Incentivized Test	797	0.65	0.63	-0.01	(0.87)
Apprentice Endline Survey	797	0.94	0.94	-0.01	(0.71)
Baseline survey	467	0.90	0.91	0.01	(0.72)
Firm Midline Survey	467	0.72	0.74	0.01	(0.81)
Panel B: Women only					
Apprentice Baseline Survey	751	0.98	0.98	0.00	(0.88)
Took Incentivized Test	751	0.64	0.63	0.00	(0.97)
Apprentice Endline Survey	751	0.94	0.94	-0.01	(0.66)
Baseline survey	446	0.90	0.90	0.00	(0.96)
Firm Midline Survey	446	0.72	0.73	0.01	(0.85)

Notes: Each treatment coefficient in column (4) comes from a separate regression that includes strata fixed effects. Standard errors in apprentice-level regressions are clustered at the firm level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A12: Correlates of Attrition—Apprentice Characteristics

	Full Sample		Women Only	
	Took incentivized test (0/1) (1)	Took incentivized test (0/1) (2)	Took incentivized test (0/1) (3)	Took incentivized test (0/1) (4)
Treatment	-0.00	0.12	0.01	0.12
	(0.04)	(0.12)	(0.04)	(0.13)
Age	-0.01	-0.00	-0.01	-0.00
	(0.00)	(0.00)	(0.00)	(0.01)
Age*Treatment		-0.01*		-0.01
		(0.01)		(0.01)
Married (0/1)	0.01	-0.02	0.01	-0.03
	(0.04)	(0.05)	(0.04)	(0.06)
Married*Treatment		0.07		0.08
		(0.07)		(0.08)
Number of Children	-0.01	-0.02	-0.01	-0.01
	(0.02)	(0.04)	(0.02)	(0.04)
Children*Treatment		0.01		-0.00
		(0.04)		(0.04)
Household Asset score (z-score)	0.01	0.01	0.02	0.02
	(0.02)	(0.03)	(0.02)	(0.03)
Asset Score*Treatment		-0.01		-0.01
		(0.04)		(0.04)
Years Schooling	0.01	0.00	0.01	0.00
	(0.01)	(0.01)	(0.01)	(0.01)
Years Schooling*Treatment		0.01		0.01
		(0.01)		(0.01)
Ability Index (z-score)	-0.00	-0.01	-0.00	-0.02
	(0.02)	(0.03)	(0.02)	(0.03)
Ability*Treatment		0.02		0.04
		(0.04)		(0.04)
Soft Skills Index (z-score)	-0.02	0.01	-0.02	0.01
	(0.02)	(0.02)	(0.02)	(0.02)
Soft Skills*Treatment		-0.05		-0.05
		(0.03)		(0.04)
Food Security (z-score)	-0.02	-0.01	-0.01	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)
Food Security*Treatment		-0.00		-0.00
		(0.03)		(0.04)
Self-Reported Health (z-score)	-0.01	0.00	-0.01	0.01
	(0.02)	(0.03)	(0.02)	(0.03)
Health*Treatment		-0.03		-0.05
		(0.03)		(0.04)
Desires Self-Employment (0/1)	0.00	-0.00	0.01	0.01
	(0.03)	(0.04)	(0.03)	(0.05)
Self Employment*Treatment		0.02		0.02
		(0.06)		(0.07)
Observations	797	797	751	751
Joint F-statistic p-value	0.47	0.41	0.56	0.28

Notes: Regressions include strata fixed effects. Standard errors, clustered at the firm level, are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A13: Correlates of Attrition—Firm Characteristics

	Full Sample		Women Only	
	Took incentivized test (0/1) (1)	Took incentivized test (0/1) (2)	Took incentivized test (0/1) (3)	Took incentivized test (0/1) (4)
Treatment	-0.00	-0.03	0.01	-0.04
	(0.04)	(0.19)	(0.04)	(0.19)
Years Schooling	-0.01	-0.01	-0.01	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)
Years Schooling*Treatment		-0.01		-0.01
		(0.01)		(0.01)
Ability Index (z-score)	0.01	-0.00	0.00	-0.01
	(0.02)	(0.04)	(0.02)	(0.04)
Ability*Treatment		0.02		0.03
		(0.05)		(0.05)
Firm Size (Incl Owner)	0.01	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)
Firm Size*Treatment		0.00		-0.00
		(0.02)		(0.02)
Above Median Apprentices Trained (0/1)	0.08*	0.09	0.07	0.08
	(0.05)	(0.07)	(0.05)	(0.07)
Above Med Apps Trained*Treatment		-0.01		0.00
		(0.09)		(0.10)
Trade Association Member (0/1)	0.08	0.11	0.10	0.15
	(0.07)	(0.09)	(0.08)	(0.10)
Association Member*Treatment		-0.08		-0.11
		(0.12)		(0.13)
Profits Last Month (log)	0.01	-0.03	0.01	-0.00
	(0.03)	(0.04)	(0.04)	(0.05)
Profits*Treatment		0.07		0.04
		(0.07)		(0.08)
Revenues Last Month (log)	-0.01	0.02	-0.03	-0.02
	(0.04)	(0.06)	(0.04)	(0.06)
Revenues*Treatment		-0.06		-0.01
		(0.07)		(0.07)
Wage Bill (log)	-0.00	0.00	-0.00	-0.00
	(0.01)	(0.02)	(0.01)	(0.02)
Wage Bill*Treatment		-0.01		-0.01
		(0.03)		(0.03)
Firm Assets (log)	0.00	-0.01	0.01	0.00
	(0.02)	(0.03)	(0.02)	(0.03)
Firm Assets*Treatment		0.02		0.02
		(0.04)		(0.04)
Observations	797	797	751	751
Joint F-statistic p-value	0.638	0.852	0.681	0.886

Notes: Regressions include strata fixed effects. Standard errors, clustered at the firm level, are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A14: Labor supply

	Working	Self-employment	Skilled self-employment	Unskilled self-employment	Wage employment	Skilled wage employment	Unskilled wage employment
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Full sample							
Treatment	0.04	0.01	0.05*	-0.03*	0.00	-0.00	0.01
	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.01)	(0.01)
Observations	2992	2992	2992	2992	2992	2992	2992
Mean of Dep Variable T=0	0.62	0.29	0.16	0.13	0.10	0.05	0.05
Panel B: Women only							
Treatment	0.03	0.00	0.04	-0.03*	-0.00	-0.00	0.00
	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.01)	(0.01)
Observations	2824	2824	2824	2824	2824	2824	2824
Mean of Dep Variable T=0	0.62	0.29	0.16	0.13	0.10	0.05	0.05

Notes: This table shows the results from estimating equation 2 for different labor market outcomes. All specifications include strata fixed effects and controls for the baseline household asset index (including a dummy for where the variable is missing). Full sample specifications include a control for apprentice gender. Outcomes are stacked across a four-round retrospective panel that asked respondents to report on labor supply 1 month ago, 4 months ago, 7 months ago, and 10 months ago. Working includes wage-employment, self-employment, farming, and apprenticeships. Wage employment and apprenticeships are treated as separate categories of work. Standard errors, clustered at the firm level, are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A15: Heterogeneity in treatment effects (Practical test (z-score))

	Full Sample					Women Only				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Apprentice characteristics										
	Asset score	Less than grade 8	Ability	Soft skills	Desires self-employment	Asset score	Less than grade 8	Ability	Soft skills	Desires self-employment
Treatment*Covariate	-0.09	0.31**	-0.02	-0.12**	0.05	-0.04	0.31**	0.00	-0.12**	0.09
	(0.07)	(0.14)	(0.07)	(0.06)	(0.15)	(0.07)	(0.14)	(0.07)	(0.06)	(0.14)
Observations	488	463	480	478	480	457	432	449	447	449
Panel B: Firm owner characteristics										
	Less than grade 8	Ability	Total workers	Above median sales	Apprentices trained	Less than grade 8	Ability	Total workers	Above median sales	Apprentices trained
Treatment*Covariate	-0.06	0.10	-0.03	-0.08	-0.00	0.10	0.08	-0.00	-0.07	-0.01
	(0.18)	(0.08)	(0.03)	(0.17)	(0.01)	(0.17)	(0.08)	(0.03)	(0.17)	(0.01)
Observations	486	464	464	462	464	455	434	434	432	434

Notes: The outcome variable is the practical component z-score. Each column shows the heterogeneous treatment effect by different worker (Panel A) and firm (Panel B) characteristics. For both panels, Columns 1-5 use the full apprentices sample and Columns 6-10 only the female apprentices sample. For apprentices characteristics: *Asset score* is the z-score of the apprentice's household asset score; *Less than grade 8* is a dummy variable that equals 1 if the apprentice has less than eight years of formal schooling; *Ability* is the z-score of the apprentice's ability index; *Soft skills* is the z-score of the apprentice's soft skills index; *Desires self-employment* is a dummy variable if the apprentice answered yes to the prompt. For firm owner characteristics: *Less than grade 8* is a dummy variable that equals 1 if the firm owner has less than eight years of formal schooling; *Ability* is the z-score of the firm owner's ability index; *Total workers* is the baseline firm size (including owner); *Above median sales* is a dummy variable that equals 1 if the firm earned more than median revenues last month; *Apprentices trained* is the total number of past completed apprentices. All specifications include strata fixed effects, assessor dummies and controls for the baseline household asset index (including a dummy for where the variable is missing). All specifications exclude pilot district. Standard errors, clustered at the firm level, are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A16: Heterogeneity in treatment effects (Craft skills (z-score))

	Full Sample					Women Only				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Apprentice characteristics										
	Asset score	Less than grade 8	Ability	Soft skills	Desires self-employment	Asset score	Less than grade 8	Ability	Soft skills	Desires self-employment
Treatment*Covariate	0.09	0.27*	-0.12	-0.04	-0.17	0.07	0.29*	-0.13	-0.02	-0.18
	(0.08)	(0.16)	(0.08)	(0.07)	(0.16)	(0.08)	(0.16)	(0.08)	(0.08)	(0.17)
Observations	743	710	730	728	731	703	671	691	689	692
Panel B: Firm owner characteristics										
	Less than grade 8	Ability	Total workers	Above median sales	Apprentices trained	Less than grade 8	Ability	Total workers	Above median sales	Apprentices trained
Treatment*Covariate	0.23	-0.02	-0.03	-0.02	0.01	0.22	-0.00	-0.03	-0.07	0.01
	(0.18)	(0.09)	(0.03)	(0.17)	(0.00)	(0.18)	(0.09)	(0.03)	(0.17)	(0.00)
Observations	738	693	693	691	692	698	654	654	652	653

Notes: The outcome variable is the craft skills quiz z-score. Each column shows the heterogeneous treatment effect by different worker (Panel A) and firm (Panel B) characteristics. For both panels, Columns 1-5 use the full apprentices sample and Columns 6-10 only the female apprentices sample. For apprentices characteristics: *Asset score* is the z-score of the apprentice's household asset score; *Less than grade 8* is a dummy variable that equals 1 if the apprentice has less than eight years of formal schooling; *Ability* is the z-score of the apprentice's ability index; *Soft skills* is the z-score of the apprentice's soft skills index; *Desires self-employment* is a dummy variable if the apprentice answered yes to the prompt. For firm owner characteristics: *Less than grade 8* is a dummy variable that equals 1 if the firm owner has less than eight years of formal schooling; *Ability* is the z-score of the firm owner's ability index; *Total workers* is the baseline firm size (including owner); *Above median sales* is a dummy variable that equals 1 if the firm earned more than median revenues last month; *Apprentices trained* is the total number of past completed apprentices. All specifications include strata fixed effects and controls for the baseline household asset index (including a dummy for where the variable is missing). Standard errors, clustered at the firm level, are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A17: Heterogeneity in treatment effects (Sales skills (z-score))

	Full Sample					Women Only				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Apprentice characteristics										
	Asset score	Less than grade 8	Ability	Soft skills	Desires self-employment	Asset score	Less than grade 8	Ability	Soft skills	Desires self-employment
Treatment*Covariate	0.10	0.05	0.08	0.08	-0.20	0.13*	0.06	0.07	0.05	-0.22
	(0.07)	(0.14)	(0.07)	(0.06)	(0.13)	(0.06)	(0.14)	(0.07)	(0.06)	(0.14)
Observations	748	713	733	731	734	706	672	692	690	693
Panel B: Firm owner characteristics										
	Less than grade 8	Ability	Total workers	Above median sales	Apprentices trained	Less than grade 8	Ability	Total workers	Above median sales	Apprentices trained
Treatment*Covariate	-0.04	0.16**	0.02	0.02	0.01***	-0.03	0.17**	0.01	0.00	0.01***
	(0.14)	(0.07)	(0.03)	(0.15)	(0.00)	(0.14)	(0.08)	(0.03)	(0.15)	(0.00)
Observations	743	696	696	694	695	701	656	656	654	655

Notes: The outcome variable is the sales skills z-score. Each column shows the heterogeneous treatment effect by different worker (Panel A) and firm (Panel B) characteristics. For both panels, Columns 1-5 use the full apprentices sample and Columns 6-10 only the female apprentices sample. For apprentices characteristics: *Asset score* is the z-score of the apprentice's household asset score; *Less than grade 8* is a dummy variable that equals 1 if the apprentice has less than eight years of formal schooling; *Ability* is the z-score of the apprentice's ability index; *Soft skills* is the z-score of the apprentice's soft skills index; *Desires self employment* is a dummy variable if the apprentice answered yes to the prompt. For firm owner characteristics: *Less than grade 8* is a dummy variable that equals 1 if the firm owner has less than eight years of formal schooling; *Ability* is the z-score of the firm owner's ability index; *Total workers* is the baseline firm size (including owner); *Above median sales* is a dummy variable that equals 1 if the firm earned more than median revenues last month; *Apprentices trained* is the total number of past completed apprentices. All specifications include strata fixed effects and controls for the baseline household asset index (including a dummy for where the variable is missing). Standard errors, clustered at the firm level, are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A18: Heterogeneity in treatment effects (Total earnings (GhC))

	Full Sample					Women Only				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Apprentice characteristics										
	Asset score	Less than grade 8	Ability	Soft skills	Desires self-employment	Asset score	Less than grade 8	Ability	Soft skills	Desires self-employment
Treatment*Covariate	16.32*	-31.07	3.89	14.57**	18.62	17.98*	-26.58	-0.66	14.47**	16.94
	(9.38)	(22.79)	(5.31)	(6.37)	(16.05)	(9.69)	(23.69)	(5.25)	(6.57)	(16.13)
Observations	2,992	2,852	2,784	2,924	2,936	2,824	2,688	2,624	2,760	2,772
Panel B: Firm owner characteristics										
	Less than grade 8	Ability	Total workers	Above median sales	Apprentices trained	Less than grade 8	Ability	Total workers	Above median sales	Apprentices trained
Treatment*Covariate	-34.45***	3.89	-0.41	38.77***	0.08	-28.79**	-0.66	0.87	25.70**	-0.10
	(13.13)	(5.31)	(2.26)	(12.41)	(0.40)	(12.55)	(5.25)	(2.17)	(11.23)	(0.40)
Observations	2,972	2,784	2,784	2,776	2,780	2,804	2,624	2,624	2,616	2,620

Notes: The outcome variable is the total earnings. Each column shows the heterogeneous treatment effect by different worker (Panel A) and firm (Panel B) characteristics. For both panels, Columns 1-5 use the full apprentices sample and Columns 6-10 only the female apprentices sample. For apprentices characteristics: *Asset score* is the z-score of the apprentice's household asset score; *Less than grade 8* is a dummy variable that equals 1 if the apprentice has less than eight years of formal schooling; *Ability* is the z-score of the apprentice's ability index; *Soft skills* is the z-score of the apprentice's soft skills index; *Desires self-employment* is a dummy variable if the apprentice answered yes to the prompt. For firm owner characteristics: *Less than grade 8* is a dummy variable that equals 1 if the firm owner has less than eight years of formal schooling; *Ability* is the z-score of the firm owner's ability index; *Total workers* is the baseline firm size (including owner); *Above median sales* is a dummy variable that equals 1 if the firm earned more than median revenues last month; *Apprentices trained* is the total number of past completed apprentices. All specifications include strata fixed effects and controls for the baseline household asset index (including a dummy for where the variable is missing). Outcomes are stacked across a four-round retrospective panel that asked respondents to report on earnings 1 month ago, 4 months ago, 7 months ago, and 10 months ago. Total earnings includes earnings from wage-employment, self-employment, farming, and apprenticeship. Earnings are in October 2015 Ghana Cedis. Standard errors, clustered at the firm level, are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A19: Heterogeneity in treatment effects (Self-employment business profits (Unconditional; GhC))

	Full Sample					Women Only				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Apprentice characteristics										
	Asset score	Less than grade 8	Ability	Soft skills	Desires self-employment	Asset score	Less than grade 8	Ability	Soft skills	Desires self-employment
Treatment*Covariate	10.60	-30.69	-4.89	14.06**	17.64	11.81	-30.35	-5.22	13.86**	21.20
	(8.22)	(22.84)	(4.38)	(5.90)	(13.55)	(8.54)	(23.98)	(4.36)	(6.18)	(14.06)
Observations	2,992	2,852	2,784	2,924	2,936	2,824	2,688	2,624	2,760	2,772
Panel B: Firm owner characteristics										
	Less than grade 8	Ability	Total workers	Above median sales	Apprentices trained	Less than grade 8	Ability	Total workers	Above median sales	Apprentices trained
Treatment*Covariate	-0.96	-4.89	0.29	15.35	-0.02	-0.63	-5.22	0.84	13.44	-0.13
	(10.22)	(4.38)	(1.66)	(10.05)	(0.38)	(10.63)	(4.36)	(1.63)	(10.11)	(0.39)
Observations	2,972	2,784	2,784	2,776	2,780	2,804	2,624	2,624	2,616	2,620

Notes: The outcome variable is the unconditional self-employment business profits. Each column shows the heterogeneous treatment effect by different worker (Panel A) and firm (Panel B) characteristics. For both panels, Columns 1-5 use the full apprentices sample and Columns 6-10 only the female apprentices sample. For apprentices characteristics: *Asset score* is the z-score of the apprentice's household asset score; *Less than grade 8* is a dummy variable that equals 1 if the apprentice has less than eight years of formal schooling; *Ability* is the z-score of the apprentice's ability index; *Soft skills* is the z-score of the apprentice's soft skills index; *Desires self-employment* is a dummy variable if the apprentice answered yes to the prompt. For firm owner characteristics: *Less than grade 8* is a dummy variable that equals 1 if the firm owner has less than eight years of formal schooling; *Ability* is the z-score of the firm owner's ability index; *Total workers* is the baseline firm size (including owner); *Above median sales* is a dummy variable that equals 1 if the firm earned more than median revenues last month; *Apprentices trained* is the total number of past completed apprentices. All specifications include strata fixed effects and controls for the baseline household asset index (including a dummy for where the variable is missing). Outcomes are stacked across a four-round retrospective panel that asked respondents to report on earnings 1 month ago, 4 months ago, 7 months ago, and 10 months ago. Total earnings includes earnings from wage-employment, self-employment, farming, and apprenticeship. Earnings are in October 2015 Ghana Cedis. Standard errors, clustered at the firm level, are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A20: Heterogeneity in treatment effects (Self-employment business profits (Conditional; GhC))

	Full Sample					Women Only				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Apprentice characteristics										
	Asset score	Less than grade 8	Ability	Soft skills	Desires self-employment	Asset score	Less than grade 8	Ability	Soft skills	Desires self-employment
Treatment*Covariate	7.86	-17.25	6.97	25.97**	51.90**	12.32	-28.82	3.09	24.04*	64.24**
	(11.54)	(19.84)	(11.01)	(11.48)	(25.10)	(12.07)	(20.74)	(10.62)	(12.28)	(26.31)
Observations	869	831	787	856	860	806	771	727	796	800
Panel B: Firm owner characteristics										
	Less than grade 8	Ability	Total workers	Above median sales	Apprentices trained	Less than grade 8	Ability	Total workers	Above median sales	Apprentices trained
Treatment*Covariate	-6.66	6.97	-5.46	30.26	0.00	-18.70	3.09	-6.12	23.20	-0.35
	(24.12)	(11.01)	(4.44)	(31.47)	(1.22)	(25.70)	(10.62)	(4.90)	(31.08)	(1.24)
Observations	864	787	787	785	787	801	727	727	725	727

Notes: The outcome variable is the conditional self-employment business profits. Each column shows the heterogeneous treatment effect by different worker (Panel A) and firm (Panel B) characteristics. For both panels, Columns 1-5 use the full apprentices sample and Columns 6-10 only the female apprentices sample. For apprentices characteristics: *Asset score* is the z-score of the apprentice's household asset score; *Less than grade 8* is a dummy variable that equals 1 if the apprentice has less than eight years of formal schooling; *Ability* is the z-score of the apprentice's ability index; *Soft skills* is the z-score of the apprentice's soft skills index; *Desires self-employment* is a dummy variable if the apprentice answered yes to the prompt. For firm owner characteristics: *Less than grade 8* is a dummy variable that equals 1 if the firm owner has less than eight years of formal schooling; *Ability* is the z-score of the firm owner's ability index; *Total workers* is the baseline firm size (including owner); *Above median sales* is a dummy variable that equals 1 if the firm earned more than median revenues last month; *Apprentices trained* is the total number of past completed apprentices. All specifications include strata fixed effects and controls for the baseline household asset index (including a dummy for where the variable is missing). Outcomes are stacked across a four-round retrospective panel that asked respondents to report on earnings 1 month ago, 4 months ago, 7 months ago, and 10 months ago. Total earnings includes earnings from wage-employment, self-employment, farming, and apprenticeship. Earnings are in October 2015 Ghana Cedis. Standard errors, clustered at the firm level, are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A21: Skills—Robustness

	Assessment				Endline survey			
	Took incentivized test (0/1)	Practical component (z-score)	Theoretical component (z-score)	Earned certificate (0/1)	Craft skills quiz (z-score)	Craft skills quiz (z-score)	Sales skills (z-score)	Sales skills (z-score)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Full sample (Baseline controls)								
Treatment	-0.01	0.13*	-0.08	0.05	0.15**	0.14	0.12**	0.10
	(0.04)	(0.07)	(0.07)	(0.04)	(0.07)	(0.09)	(0.06)	(0.07)
Observations	763	488	488	488	743	466	748	468
Mean of Dep Variable T=0	0.65	0.00	0.00	0.80	0.00	0.05	0.00	-0.11
Incentivized Test Sample						Yes		Yes
Panel B: Full sample (No controls)								
Treatment	-0.01	0.13*	-0.06	0.05	0.16**	0.16*	0.12*	0.10
	(0.04)	(0.07)	(0.07)	(0.03)	(0.07)	(0.09)	(0.06)	(0.07)
Observations	763				743	466	748	468
Mean of Dep Variable T=0	0.65	0.00	0.00	0.79	0.00	0.05	0.00	-0.11
Incentivized Test Sample						Yes		Yes
Panel C: Women only (No controls)								
Treatment	-0.00	0.18**	-0.04	0.07*	0.16**	0.15*	0.14**	0.13*
	(0.04)	(0.07)	(0.07)	(0.04)	(0.07)	(0.09)	(0.06)	(0.08)
Observations	717	457	457	457	703	439	706	439
Mean of Dep Variable T=0	0.64	0.00	0.00	0.80	0.00	0.05	0.00	-0.09
Incentivized Test Sample						Yes		Yes

Notes: This table shows the results from estimating equation 1 for different skill measures. All specifications include strata fixed effects. Specifications from the assessment include assessor dummies. Sales skills specifications include surveyor fixed effects. Columns 1 through 4 exclude test-takers from the first district, because the assessment (being implemented in collaboration with our government partners) differed from the test given in all other districts. The first panel mirrors specifications in Table 1, including controls for the baseline value of the household asset index (and a dummy for where that variable in missing) in the full sample of 797 apprentices (including both men and women). Full sample specifications also include a control for apprentice gender. The second and third panels test for robustness to the exclusion of the baseline controls in the full sample (men and women) and the analysis sample (women only). Columns 1-4 exclude the pilot district. Standard errors, clustered at the firm level, are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A22: Earnings—Robustness

	Unconditional			Conditional	
	Total earnings (GhC) (1)	Self-employment profits (GhC) (2)	Wage employment earnings (GhC) (3)	Self-employment profits (GhC) (4)	Wage employment earnings (GhC) (5)
Panel A: Full sample (Baseline controls)					
Treatment	10.43*	8.41*	3.41	15.15	-4.10
	(5.56)	(4.70)	(3.40)	(12.23)	(19.55)
Observations	2992	2992	2992	869	301
Mean of Dep Variable T=0	44.34	24.18	12.98	83.58	136.89
Panel B: Full sample (No controls)					
Treatment	11.82**	9.36**	3.92	14.87	-12.65
	(5.43)	(4.58)	(3.44)	(12.09)	(24.53)
Observations	2992	2992	2992	869	301
Mean of Dep Variable T=0	44.34	24.18	12.98	83.58	136.89
Panel C: Women only (No controls)					
Treatment	14.84***	10.54**	3.42	22.79*	-10.60
	(5.34)	(4.65)	(3.62)	(12.58)	(26.86)
Observations	2824	2824	2824	806	287
Mean of Dep Variable T=0	41.52	22.99	13.10	80.62	135.34

Notes: This table shows the results from estimating equation 2 for different labor market outcomes. All specifications include strata fixed effects. Outcomes are stacked across a four-round retrospective panel that asked respondents to report on earnings 1 month ago, 4 months ago, 7 months ago, and 10 months ago. Total earnings includes earnings from wage-employment, self-employment, farming, and apprenticeship. Profits in self-employment follow self-reported question structures from De Mel, McKenzie and Woodruff (2009). All earnings are in October 2015 Ghana Cedis. The first panel mirrors specifications in Table 2, including controls for the baseline value of the household asset index (and a dummy for where that variable in missing) in the full sample of 797 apprentices (including both men and women). Full sample specifications also include a control for apprentice gender. The second and third panels test for robustness to the exclusion of the baseline controls in the full sample (men and women) and the analysis sample (women only). Standard errors, clustered at the firm level, are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A23: Impacts During the Intervention—Robustness

	Apprentice level labor inputs		Firm Midline Survey Financial Outcomes
	Apprentice hours last week	Firm owner instruction hours per day	Apprentice wages last month (GhC)
	(1)	(2)	(3)
Panel A: Full sample (Baseline controls)			
Treatment	4.13**	0.10	1.55
	(1.91)	(0.09)	(3.08)
Observations	565	595	566
Mean of Dep Variable T=0	44.18	1.29	22.17
Panel B: Full sample (No controls)			
Treatment	3.66*	0.11	1.53
	(1.91)	(0.09)	(3.04)
Observations	565	595	566
Mean of Dep Variable T=0	44.18	1.29	22.17
Panel C: Women only (No controls)			
Treatment	4.03**	0.08	1.94
	(2.03)	(0.09)	(3.20)
Observations	527	556	528
Mean of Dep Variable T=0	43.73	1.32	21.85

Notes: All specifications include strata fixed effects. Wages for each apprentice are reported by the firm owner. Wages are in October 2015 Ghana Cedis. The first panel mirrors specifications in Table 3, including controls for the baseline value of the household asset index. The second and third panels test for robustness to the exclusion of the imbalanced apprentice-level controls in the full sample (men and women) and the analysis sample (women only). Full sample specifications also include a control for apprentice gender. Standard errors, clustered at the firm level, are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A24: Apprentice completion and turnover—Robustness

	Apprentice completion				Apprentice turnover	
	Completed	Paid exit/ceremony	Completed and exited	Completed and retained	Exited	Missed months
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Full sample (Baseline Controls)						
Treatment	0.07**	0.10***	0.08**	-0.01	0.08**	1.50*
	(0.04)	(0.03)	(0.04)	(0.01)	(0.04)	(0.84)
Observations	748	748	748	748	748	748
Mean of Dep Variable T=0	0.31	0.15	0.28	0.03	0.39	7.73
Panel B: Full sample (No controls)						
Treatment	0.07*	0.10***	0.08**	-0.01	0.08**	1.47*
	(0.04)	(0.03)	(0.04)	(0.01)	(0.04)	(0.83)
Observations	748	748	748	748	748	748
Mean of Dep Variable T=0	0.31	0.15	0.28	0.03	0.39	7.73
Panel C: Women only (No controls)						
Treatment	0.07*	0.11***	0.07**	-0.00	0.08**	1.60*
	(0.04)	(0.03)	(0.04)	(0.01)	(0.04)	(0.86)
Observations	706	706	706	706	706	706
Mean of Dep Variable T=0	0.32	0.16	0.30	0.02	0.40	7.99

Notes: All specifications include strata fixed effects. The first panel mirrors specifications in Table 4, including controls for the baseline value of the household asset index (and a dummy for where that variable in missing) in the full sample of 797 apprentices (including both men and women). The second and third panels test for robustness to the exclusion of the baseline controls in the full sample (men and women) and the analysis sample (women only). Full sample specifications also include a control for apprentice gender. Standard errors, clustered at the firm level, are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A25: Labor supply—Robustness

	Working	Self-employment	Skilled self-employment	Unskilled self-employment	Wage employment	Skilled wage employment	Unskilled wage employment
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Full sample (Baseline controls)							
Treatment	0.04	0.01	0.05*	-0.03*	0.00	-0.00	0.01
	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.01)	(0.01)
Observations	2992	2992	2992	2992	2992	2992	2992
Mean of Dep Variable T=0	0.62	0.29	0.16	0.13	0.10	0.05	0.05
Panel B: Full sample (No controls)							
Treatment	0.04	0.01	0.04	-0.03	0.00	-0.00	0.01
	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.01)	(0.01)
Observations	2992	2992	2992	2992	2992	2992	2992
Mean of Dep Variable T=0	0.62	0.29	0.16	0.13	0.10	0.05	0.05
Panel B: Women only (No controls)							
Treatment	0.03	0.01	0.04	-0.03	-0.00	-0.00	0.00
	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.01)	(0.01)
Observations	2824	2824	2824	2824	2824	2824	2824
Mean of Dep Variable T=0	0.62	0.29	0.16	0.13	0.10	0.05	0.05

Notes: This table shows the results from estimating equation 2 for different labor market outcomes. All specifications include strata fixed effects and controls for the baseline household asset index (including a dummy for where the variable is missing). Full sample specifications also include a control for apprentice gender. Outcomes are stacked across a four-round retrospective panel that asked respondents to report on labor supply 1 month ago, 4 months ago, 7 months ago, and 10 months ago. Working includes wage-employment, self-employment, farming, and apprenticeships. Wage employment and apprenticeships are treated as separate categories of work. Standard errors, clustered at the firm level, are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A26: Apprentice time use

	Apprentice level					
	Firm owner instruction hours per day (1)	Other worker instruction hours per day (2)	Observation hours per day (3)	Practice hours per day (4)	Work on customer orders hours per day (5)	Errand hours per day (6)
Panel A: Full sample						
Treatment	0.10	0.05	0.03	0.01	-0.09	0.04
	(0.09)	(0.06)	(0.12)	(0.10)	(0.23)	(0.12)
Observations	595	595	595	595	595	595
Mean of Dep Variable T=0	1.29	0.34	1.39	0.96	3.93	0.59
Panel B: Women only						
Treatment	0.08	0.05	0.05	0.02	-0.08	0.08
	(0.09)	(0.07)	(0.12)	(0.11)	(0.24)	(0.12)
Observations	556	556	556	556	556	556
Mean of Dep Variable T=0	1.32	0.36	1.31	0.99	3.90	0.57

Notes: All specifications include strata fixed effects and controls for the baseline household asset index of the apprentice (including a dummy for where the variable is missing). Full sample specifications also include a control for apprentice gender. Standard errors, clustered at the firm level, are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A27: Syllabus Use by Type

	Firm level pedagogy	
	Occupational standards syllabus (0/1)	Trade association syllabus (0/1)
	(1)	(2)
Panel A: Full sample		
Treatment	0.05	0.07
	(0.05)	(0.05)
Observations	341	341
Mean of Dep Variable T=0	0.23	0.23
Panel B: Women only		
Treatment	0.06	0.07
	(0.05)	(0.05)
Observations	325	325
Mean of Dep Variable T=0	0.24	0.22

Notes: All specifications include strata fixed effects. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure S1: Timeline

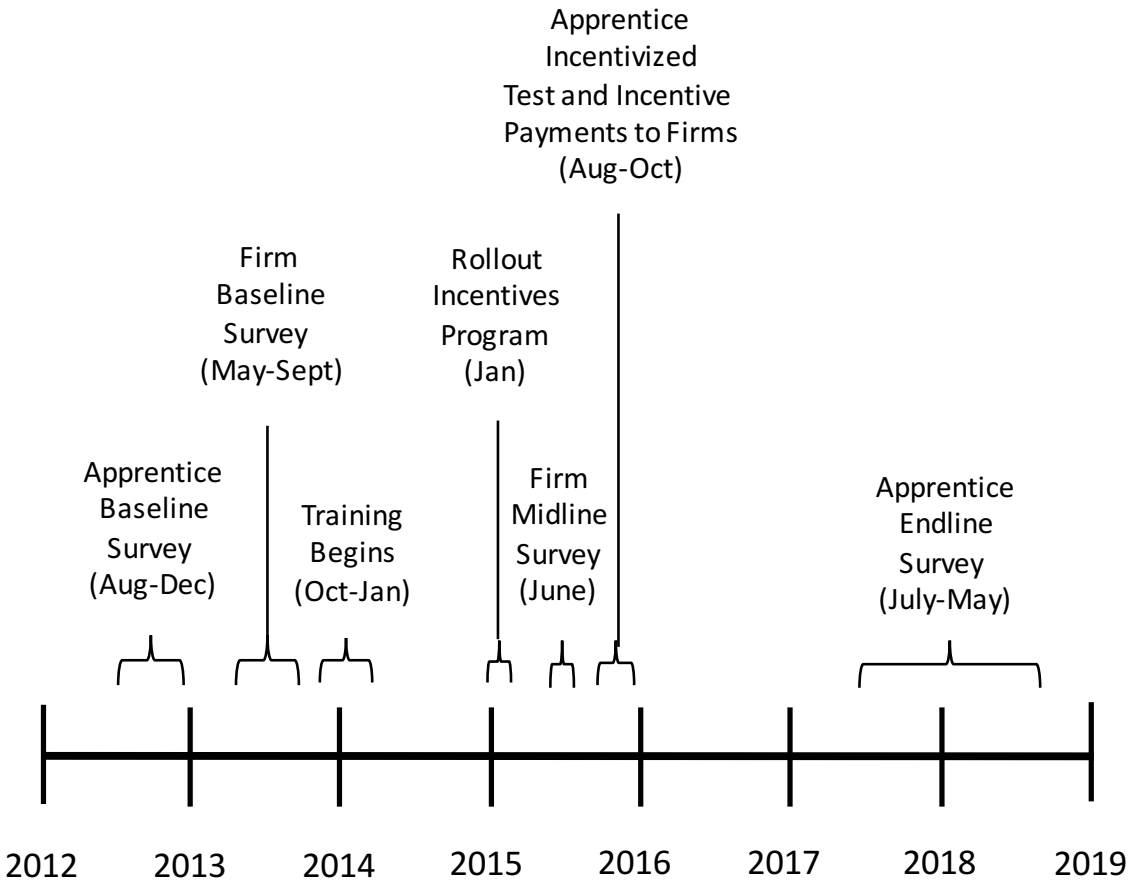
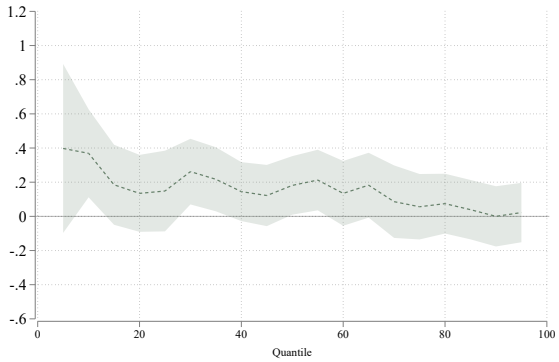
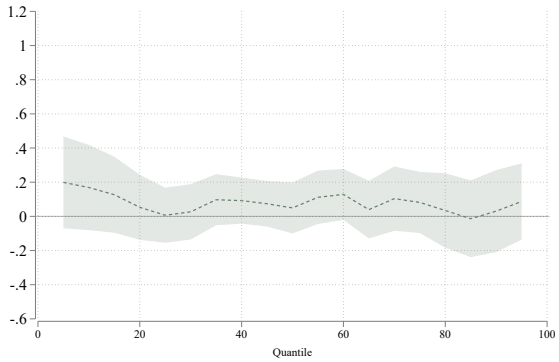


Figure S2: Quantile treatment effects (Full sample)

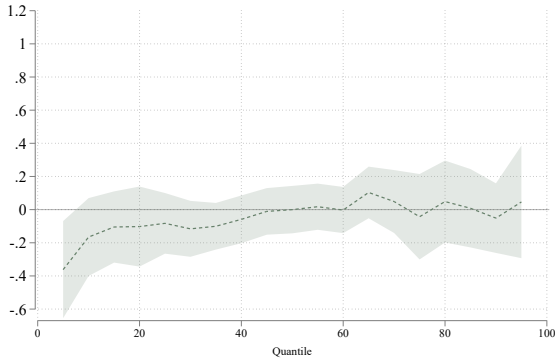
(a) Craft skills (z-score)



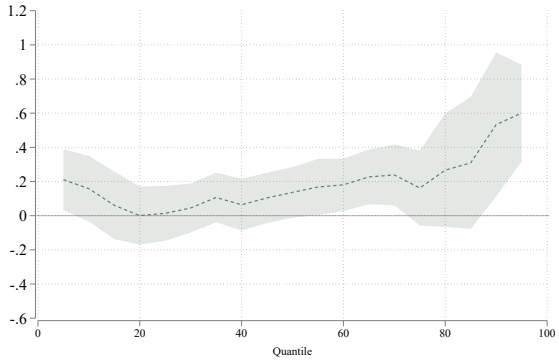
(b) Practical component (z-score)



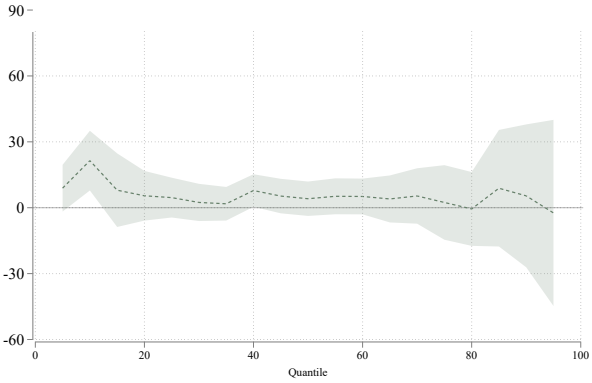
(c) Theoretical component (z-score)



(d) Sale skills (z-score)



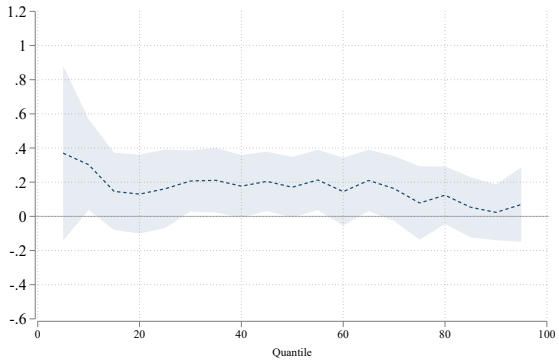
(e) Total earnings (GhC)



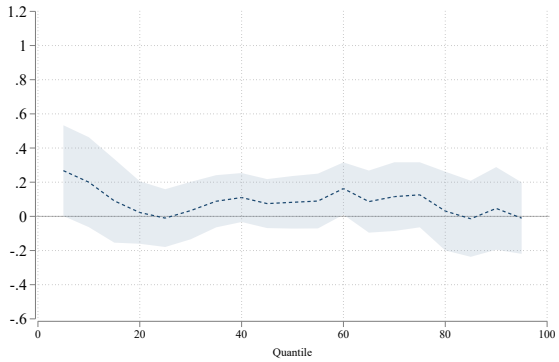
Note: This figures plots the coefficients from a quantile regression on several outcomes and their 95% confidence intervals. Standard errors are clustered at the firm level.

Figure S3: Quantile treatment effects (Women only)

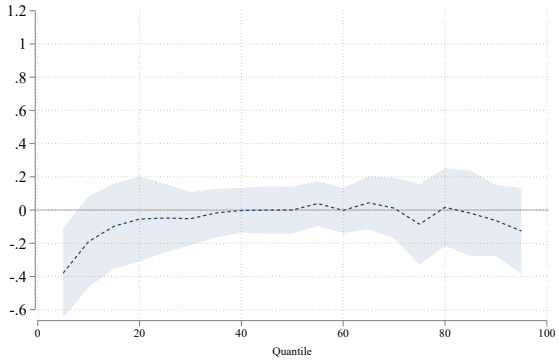
(a) Craft skills (z-score)



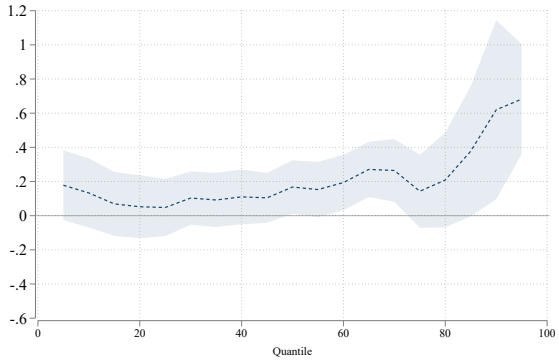
(b) Practical component (z-score)



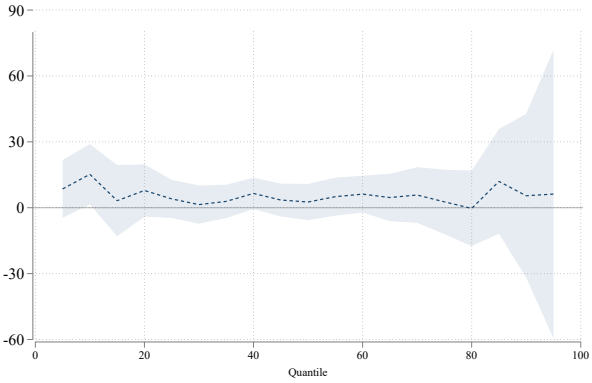
(c) Theoretical component (z-score)



(d) Sale skills (z-score)

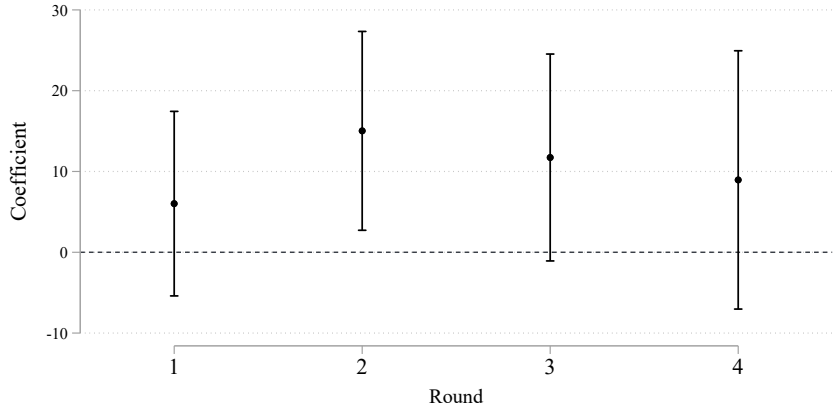


(e) Total earnings (GhC)



Note: This figures plots the coefficients from a quantile regression on several outcomes and their 95% confidence intervals. Standard errors are clustered at the firm level.

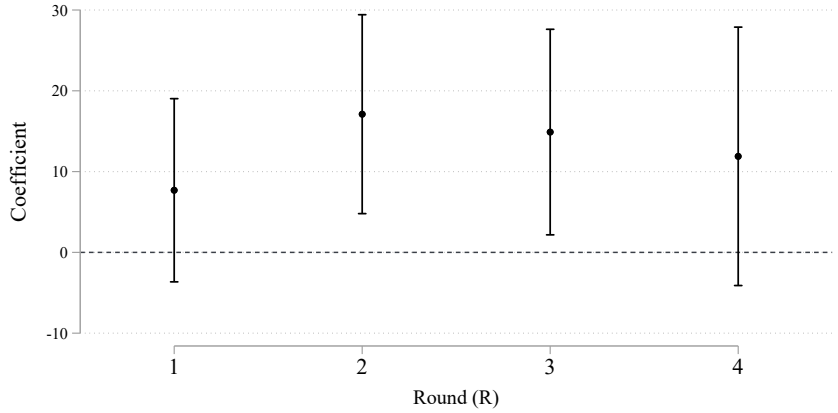
Figure S4: Treatment effects on earnings (Full sample)



p-value(H_0:R_1=R_2=R_3=R_4) = 0.27
p-value(H_0:R_1 = 0) = 0.30
p-value(H_0:R_2 = 0) = 0.02
p-value(H_0:R_3 = 0) = 0.07
p-value(H_0:R_4 = 0) = 0.27

Note: This figure shows the dynamic treatment effects (and their 95% confidence interval) on earnings from the four rounds of the retrospective panel that asked respondents to report on earnings 1 month ago, 4 months ago, 7 months ago, and 10 months ago from the endline survey.

Figure S5: Treatment effects on earnings (Women only)



p-value(H_0:R_1=R_2=R_3=R_4) = 0.21
p-value(H_0:R_1 = 0) = 0.18
p-value(H_0:R_2 = 0) = 0.01
p-value(H_0:R_3 = 0) = 0.02
p-value(H_0:R_4 = 0) = 0.14

Note: This figure shows the dynamic treatment effects (and their 95% confidence interval) on earnings from the four rounds of the retrospective panel that asked respondents to report on earnings 1 month ago, 4 months ago, 7 months ago, and 10 months ago from the endline survey.

B Bounds on Productivity Effects

Attanasio, Kugler and Meghir (2011) evaluate a randomized vocational training program in Colombia and find that access to the program increased significantly both employment and earnings. They develop a method to disentangle productivity effects among workers from composition effects driven by increased employment. They arrive at the following bounds for the causal effects of productivity:

$$E(S|L=1,R=1) - E(S|L=1,R=0) \pm$$
$$[E(S(p(0.90))) - E(S(p(0.10)))]$$
$$\frac{Pr(L=1|R=1) - Pr(L=1|R=0)}{Pr(L=1|R=1)}$$

Where S is earnings (salary), L is labour supply and R is treatment status (randomized). E(S(p(0.90))) and E(S(p(0.10))) are the earnings of the control group among those working at the 90th and 10th percentiles respectively. Intuitively, it's the earnings difference between treatment and control groups bounded by how much the introduction of compliers (only working because of the program) may affect the composition of workers. Refer to pages 202-204 and Appendix B (pages 214-219) of their paper for derivation.

In our study, as per table A14, we find no significant effects on labour supply or even self-employment but we do see treated apprentices moving from unskilled self-employment into skilled self-employment. Thus, the earnings gains could be driven either by this shift into skilled employment or increased profits among those working in skilled self-employment. Note that both of these factors can be interpreted as productivity gains since all participants in this sub-sample of self-employed people at endline are working. Still, we can show that there are productivity gains even among those working in skilled self-employment. Adapting the equation above by setting L to be skilled self-employment and S to be profits in skilled self-employment, we obtain the following bounds. For women, 9.23 GhC to 65.80 GhC and in the full sample, 0.72 GhC to 67.62 GhC. Both bounds exclude 0 and are rather large suggesting strong productivity effects.