NIGERIA YOUWIN! IMPACT EVALUATION PRE-ANALYSIS PLAN

David McKenzie

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1. Introduction

The Youth Enterprise With Innovation in Nigeria (YouWiN!) programme is a business plan competition for young entrepreneurs in Nigeria. It is collaboration between the Ministry of Finance, the Ministry of Communication Technology, and the Ministry of Youth Development with support from DFID and the World Bank, and has the stated objective of encouraging innovation and job creation through the creation of new businesses and expansion of existing businesses.

The YouWin impact evaluation is intended to measure the impact of participating in this program on Nigerian firms. The purpose of this document is to set out in advance how this impact will be measured and estimated, to serve as a roadmap for analysis once data is collected. A baseline report was prepared by the author and finalized on May 11, 2012 and provides details of the selection process, randomization, and baseline data collection, and so will not be repeated here. Since this plan is being compiled before any follow-up data are collected and analyzed, this pre-specification acts as a guard against selective reporting and data-mining.

2. Key aspects of the intervention

The program provides a four-day training course on preparation of a business plan to applicants who make it through a first stage, and then grants to the winning 1200 submissions, with each winner eligible for an amount up to 5 million Naira (approximately US$32,000) for new businesses and 10 million Naira (approximately US$64,000) for existing businesses, with the amount any winner getting varying between 1 and 10 million Naira depending on the funding needs identified in their business plan and the assessment of independent consultants of what actual needs are. Winners then receive ongoing monitoring, coupled with some mentoring and group training events.

3. Description of Data Sources and Anticipated Sample Sizes

a. Pre-intervention data

There are two sources of pre-intervention data.

i) Application data (November 2011): data from the original application forms are available for 23,844 individuals, corresponding to 20,230 new business applications and 3,614 existing business applications. This first stage application form has a relatively limited number of variables, but includes: age, gender, region, new or existing business, highest education level, application score, proposed industry, and

for existing businesses: number of years in business, turnover, number of employees.

ii) Business plan data (January 2012): somewhat more detailed data are available for the 4,510 individuals who submitted business plans. This includes marital status, whether they have lived abroad, whether or not they would choose a risky gamble, some asset ownership indicators, whether their business had had a loan before, and the business plan score.

b. Administrative program data: Data from the program administration unit will provide information on which firms received payments under the YouWin program and the dates when they received these payments.

c. November 2012 Follow-up Survey: A first follow-up survey is taking place in November and December 2012, and is being conducted by TNSRMS. This survey timing corresponds to 10-11 months after the business plan training; 7-8 months after the winners were announced (announcement took place March 20, 2012); and 4-5 months after the first disbursements were made to winners (first disbursements were made June 28, 2012). The follow-up survey collects data on personal characteristics, details of business operations for existing businesses and business plans for new businesses, and details of participation in enterprise programs like YouWin.

The sample for the follow-up survey consists of 3139 firms from the following three groups:

- Experimental sample: 1841 firms (729 treated, 1112 control) which were all semi-finalists in the business plan competition and selected by random number generator as to whether they were ordinary winners or not. This will form the basis of our main estimations.
- Non-experimental winner sample: 475 firms that were selected as national merit winners or zonal merit winners in the business plan competition. They will be used in supplementary analysis and in descriptive analysis of whether business plan scores predict business growth.
- Regression-discontinuity booster sample: Firms in the North-Central, South-Eastern, and South-Western regions, that are within 5 points either side of the cutoff. 770 of these firms (329 existing, 441 new) are already included in the 2316 firms noted above. This leaves up to 3890 firms that we could potentially add to the survey. We take all 323 existing firms, and then a random sample of 500 of the new firms. This gives a total booster RD sample of 823 firms

In practice this survey took place between November 2012 and May 2013, with a response rate of 79% for the experimental sample. The difficulty and prolonged length of time taken to do this survey pushed back the next round.

d. ~~April~~ October 2013 Follow-up Survey: ~~An additional survey 6 months after the November survey is currently planned, with the~~This survey will take place on the same samples and similar survey design as the ~~November~~ first round survey. ~~The timing of the survey depends in part on whether there are further delays in the disbursement of program payments – if so, we may choose to delay this survey further.~~ Additional rounds of follow-up surveys may take place depending on budget available.

4. Theory of Change/Model for Interpreting Outcomes

The main objective of the YouWIN! program is to generate jobs by encouraging and supporting aspiring entrepreneurial youth in Nigeria to develop and execute business ideas that will lead to job creation. The announcement of the program claimed that it would generate 80,000 to 110,000 new jobs for currently unemployed Nigerian youth over the three years during which the three cycles will be implemented. This corresponds to 20-30 new jobs per winning firm.

How might participating in the YouWIN program lead to more jobs in the winning firms? Consider a simple model where a firm's production Y is a function f(.) of their productivity A, their capital stock K, the owner's entrepreneurial skill E, and outside labor L. The firm owner's problem is to choose K and L given A and E.

$$Y = f(A, K, E, L) \quad (1)$$

With complete markets the firm production decision will be separable from the household consumption decision and firms will choose capital and labor such that their marginal products are equal to the market interest rate and market wage rate respectively:

$$f_K(A, K^*, E, L^*) = r \quad (2)$$

$$f_L(A, K^*, E, L^*) = w \quad (3)$$

Case 1: Perfect markets, YouWIN program is just a grant

If firms are not credit-constrained and the program just changes the resources firm owners have available to them, then there is no change in the first-order conditions (2) and (3), and so no change in employment or output. The grant will merely make the owner richer, but not change their production decisions.

Case 2: Perfect markets, YouWIN program is a conditional grant

The YouWIN program does not make a single lump sum grant to firm owners, but instead is payable in tranches, conditional on the firm owner taking certain actions – with the first and second tranches typically paying for more working capital and investment, and the third and fourth tranches being triggered by reaching jobs and turnover triggers. This conditionality does not fundamentally change the equilibrium first-order conditions, but can be viewed as causing a temporary increase in the returns to capital and labor in the firm- therefore we would predict a short-term increase in capital and labor, which would then dissipate once all the tranche payments have been received.

Case 3: YouWIN program is more than just a grant

It is possible that participating in, and especially winning, the YouWIN program may also have other impacts on the productivity of the firm (A), and the skills of the owner (E). Potential channels for this include:

(i) Training increasing skills: the 4-day business plan training, and the short "school for start-ups" and online materials provided may increase the entrepreneurial skills of the owner. Assuming these are complementary with other inputs, we should have $dK^*/dE>0$ and $dL^*/dE>0$ so that both capital and labor increase.

(ii) Networks increase productivity or entrepreneurial skills: participating in the program may cause the firm owners to meet other successful business owners. This could increase their own productivity and skills if they learn from these owners, or can use these networks to obtain better business deals.

(iii) Improvements in confidence and attitudes: entrepreneurial self-confidence could directly impact on productivity, or the program, by declaring the owner a winner, may spur their self-belief in the business and cause them to work harder. In addition, the signal provided by winning the competition could cause firm owners who are uncertain about their entrepreneurial type to update their priors and thus change their output levels if they underinvest because they are unsure of whether they have the skills to make it at a larger scale.

(iv) Mentoring increases A and E. The YouWIN program in principle provides some basic mentoring services, which could increase A and E.

(v) Reputation effects: A could increase if winning the competition increases the businesses' reputation, signaling quality to customers and therefore allowing it to gain more customers.

(vi) Formalization effects: the program requires firms to be formal to receive the award. If firms are rationally informal, formalizing will have no effect, but if information barriers or other constraints stop firms from formalizing, formalizing may make the firms more productive.

(vii) Change in the interaction with government: winning the competition could give the firm some protection against government officials asking for bribes or otherwise inhibiting firm productivity, since now the firm is seen as a favored firm which shouldn't be touched; or conversely winning the competition may make the firm be targeted by rent-seeking officials therefore reducing productivity.

(viii) Changes in family demands: winning the competition may cause the firm owner be targeted for more requests for money and or free goods by extended family members. This could lower firm productivity, or conversely cause the firm owner to invest more in the firm if money in the firm is less subject to capture than money held at home.

Case 4: YouWIN program with capital and labor market constraints

If firms are credit-constrained, than they invest less in their firms than optimal according to (2). Winning the YouWIN program could reduce credit constraints in three ways:

(i) Directly by providing a grant to the firm

(ii) Indirectly, through providing a signal of quality that leads to more bank lending

(iii) Indirectly, through providing co-financing and a signal of quality that leads to more outside investments from partners.

The impact of these channels will be to increase capital stock. This may increase or decrease labor depending on the shape of the production function – a heavily credit-constrained firm may

have previously substituted capital for labor, and so reduce workers once it can buy machines to replace them. Conversely, if capital and labor are complements in production, more capital will enable the firm to hire more workers.

Firms may also face constraints in the labor market, if workers are reluctant to work for unknown firms – winning the competition may make it easier for the firm to match to willing workers, increasing employment.

Finally, if firm owners are risk averse and insurance markets are incomplete, the grant may induce firm owners to undertake riskier investments through subsidizing these investments.

This simple model suggests we should therefore aim to measure the following channels of influence:

Participation in YOUWIN	→	Changes in A, E, and access to K and L	→	changes in use of inputs	→	firm growth

5. Estimation methodology

The core challenge for any impact evaluation is to derive an estimate of the *counterfactual* – what would have happened in the absence of the program. Simple comparisons of the winners to the losers of the business plan competition will overstate the impact if the judging has succeeded in selecting businesses with greater chances of growth. The approach used for impact evaluation will instead be to use a Randomized Controlled Trial (RCT) based on the random selection of ordinary winners, and to supplement this with matching analysis to estimate impacts on the national and zonal merit winners, and regression discontinuity analysis to estimate impacts of the 4-day business plan competition

RCT Analysis

Estimation of the effect of being selected to receive a grant through the YouWin! project on the YouWIN ordinary winner pool will take place through estimating a regression of the form:

$$Outcome_i = a + b * AssignTreat_i + c * Region * Gender_i + \varepsilon_i \quad (4)$$

Where this is estimated separately for existing and new businesses, and $Region*Gender_i$ controls for the randomization strata. Huber-White standard errors will be used. The coefficient *b* then gives the average effect of being assigned to receive a grant amongst the group of ordinary finalists. This is not the same as the effect of actually receiving the grant, since a small number of winners were later disqualified and replaced with 9 individuals non-randomly selected from the control group. We can therefore also estimate a local average treatment effect of actually getting the money by replacing AssignTreat with GetMoney in (4), and then instrumenting getting the money with treatment assignment.

Since the impacts of the outcomes are likely to vary with time and surveys are planned to be at least 6 months apart, we currently plan to estimate equation (4) wave by wave. When baseline data on the outcome of interest is available, we will control for it as an additional regressor in an ANCOVA specification, thereby increasing power as follows:

$$Outcome_i = a + b * AssignTreat_i + c * Region * Gender_i + d * BaselineOutcome_i + \varepsilon_i \quad (5)$$

Non-experimental analysis with other winners

This sample will be used for two main forms of analysis.

First, testing whether the business plan scores are predictive of firm outcomes among the 1200 winners. I will run the following regressions on the winner sample:

$$Outcome_i = a + b * Business\ PlanScore_i + c * Region * Gender_i + d * ApplicationScore_i + \varepsilon_i$$

And test b=0, d=0, and b=d=0. That is, that among the winner group the business plan score and application score are not significant predictors of success conditional on region and gender.

The outcomes to be tested here will include: Firm start-up (for new businesses), Firm survival (for existing businesses), Current wage and salary workers, Firm sales and firm profits (existing businesses), and employment index (all defined above).

I will also test further whether these scores have any additional predictive power beyond basic characteristics of the business also measured in the baseline:

$$Outcome_i = a + b * Business\ PlanScore_i + c * Region * Gender_i + d * ApplicationScore_i + f'X_i + \varepsilon_i$$

Where X is a vector of the following baseline control variables:

New businesses: Owner age, Owner is married, Owner has university education, Owner has postgraduate education, Owner has worked or lived abroad, Owner would choose a risky gamble, Owner has internet access at home, proposed sector is crop or animal, proposed sector is manufacturing, proposed sector is trade, proposed sector is IT.

Existing businesses: The same characteristics as for new businesses, plus years in business, number of workers at baseline, ever had a formal loan.

These same two regressions will also be run separately on the control group sample.

Second, propensity-score matching will be used to estimate the impact of the program on the national and zonal winners. This will proceed by the following steps:

1) Estimate propensity score following these specifications (pre-determined and coded before seeing the follow-up data):

New businesses:

#delimit ;

pscore psmtreat female age married highschooledn university postgraduate lived_worked_abro chooserisk have_internet owncomputer ownsatelitedish ownfreezer cropandanimal manufacturing trade IT if new==1, pscore(pscore1) comsup;

Existing businesses: We will use the variables as above, plus baseline workers and whether they had had a loan before at baseline. These latter two variables have missing values, which will be dummied out.

(These are the variables in the test of randomization except for the application and business plan scores – since the point is to find firms that are similar among the semi-finalists, without paying heed to their business plan score).

2) Estimate the treatment effect using this propensity score within the common support, using the following two specifications:
    a) attr outcome psmtreat if new==1, pscore(pscore1) comsup
    b) attk outcome psmtreat if new==1, pscore(pscore1) comsup

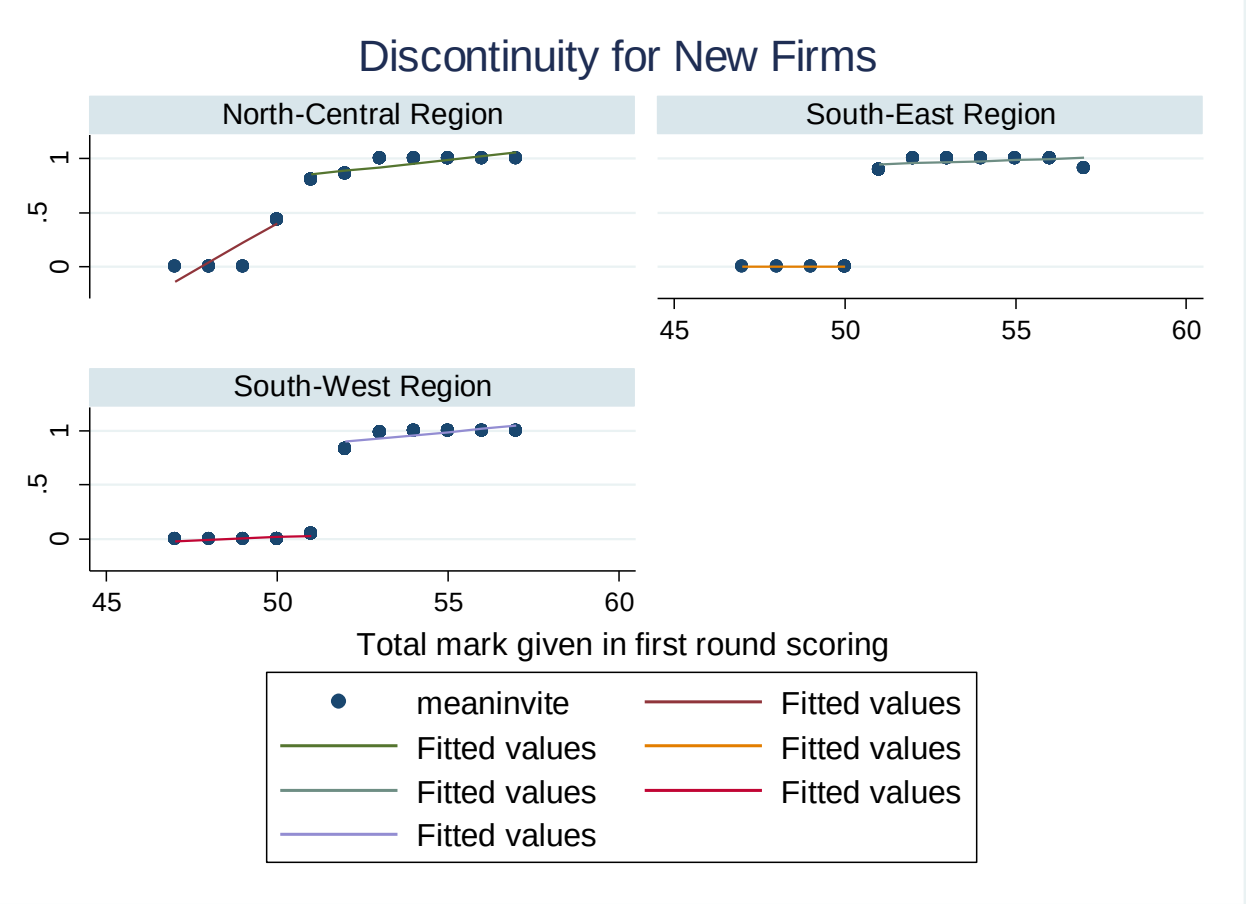
And likewise for the existing firms setting new==0.

Regression-discontinuity analysis

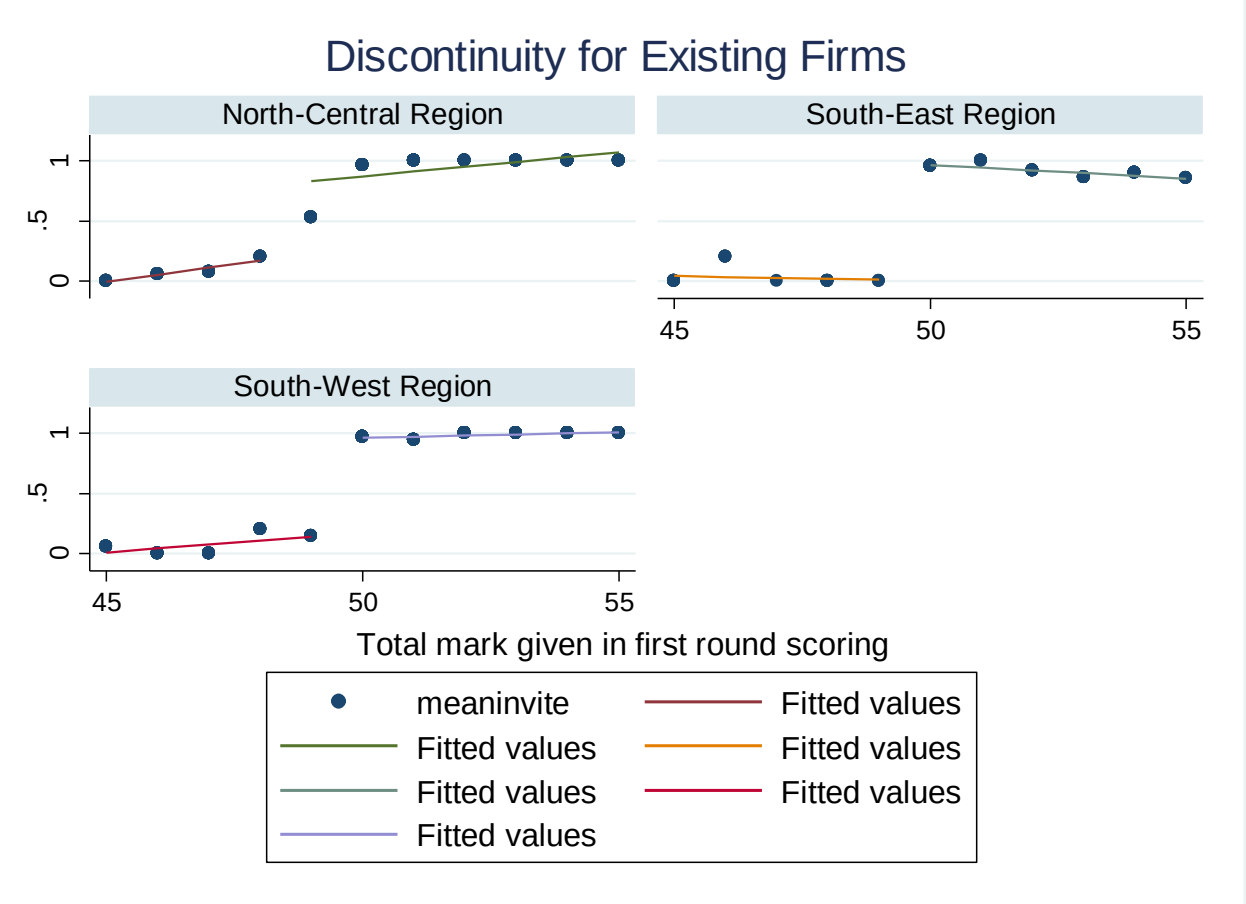
Regression-discontinuity analysis will be used to test for an effect of participating in the 4-day business training program on firm outcomes. This will be done by surveying individuals who had first-round application scores just above or just below the thresholds for being invited to training. The graphs below show how the likelihood of being invited to training jumps from 0 to 100% around a score of 52 for new business applicants, and a score of 50 for existing business applicants. Surveying will restrict this sample to firms in the North-Central, South-Eastern, and South-Western regions, since the other regions have few firms close to the cutoffs.

In total there are 4008 new enterprises and 652 existing enterprises that are within 5 points either side of the cutoff. 770 of these firms (329 existing, 441 new) are already included in the 2316 firms in our experimental plus winner sample. This leaves up to 3890 firms that we could add to the survey. Given budget constraints, we chose to add all 323 existing firms, and then a random sample of 500 of the new firms with scores around the threshold.

Here is the distribution of the proportion invited to training by application score among newenterprises, for scores in the range 47 to 57. We see that someone with a score of 49 has 0% chance of being invited to training, while someone with score 53 has 100% chance. The fuzzy cut-off varies by region, being either 51 or 52. So firms with very similar scores have different chances of getting training, which provides the scope for a (fuzzy) regression-discontinuity design.



The same is true for existing firms. There are 477 existing enterprises with scores in the range 45 to 55, with 50 the fuzzy cutoff in two regions, and 49 the fuzzy cutoff in one region.



Having a score just about the threshold has two impacts on firms – they are invited to training, and they have a chance of having their business plan selected as a winner. We will therefore conduct two sets of analysis:

A) The overall effect of being selected for the business plan training, which incorporates both these effects. This will use all firms in our sample that have application scores within 5 points of the cutoffs. The RD design is valid under the usual assumptions for this estimate.

B) The effect of getting the business plan training, but not being selected as a winner. This will exclude the winners from the sample. In order for the RD design to be valid here, we require a further assumption that being selected as a winner from among these marginal applicants is random conditional on observables.

we run the following regressions:
First-stage:
Linear control:
xi: reg invite abovethreshold totalmark i.region_n if existing==1 & totalmark>=45 & totalmark<=55, robust

Quadratic control:
xi: reg invite abovethreshold totalmark totalmark2 totalmark3 totalmark4 i.region_n if existing==1 & totalmark>=45 & totalmark<=55, robust

Impact of being above threshold on outcome:
Above regressions with outcome instead of invite.

2SLS:
xi: ivreg2 outcome (invite=abovethreshold) totalmark i.region_n if existing==1 & totalmark>=45 & totalmark<=55, robust

and similarly, with fourth-order polynomial.

The new firms will be estimated similarly.

6. Hypotheses to be tested and families of outcomes

We begin with setting out hypotheses and families of outcomes to examine for existing businesses, and then discuss the case of new businesses.

EXISTING BUSINESSES

The classification of existing business will be based on status at the time of application. Individuals who are verified as no longer running a business will have their business outcomes coded as zero (e.g. they are not formal, they have zero profits, and zero workers).

FAMILY A: CHANGES IN A, E, AND ACCESS TO K AND L

HYPOTHESIS A: Winning the YouWIN competition leads to positive increases in A, E, and access to K and L.

We will consider the following outcomes in this family:

1. **Entrepreneurial self-efficacy** – Measured as the number of business activities that the owner rates themselves as "very confident" in their ability to do (P12a-P12i). This is coded as 1 for each item if the owner answers 4 = very confident, and 0 if they answer 1 through 3, or 9 (not applicable or refuse).
2. **Formality –** we classify a firm as formal if it has a registered business name (B6a=1), municipal license (B6b=1), and income tax registration (B6c=1), and not formal if it does not answer yes to all these three questions.
3. **Mentoring** – firm has a business mentor (IN21=1)
4. **Network** – number of other business owners the owner discusses business matters with (IN22, top coded at 99th percentile of overall distribution).
5. **Participated in a training program**: IN23=1 and for individuals no longer running a business YE2=1 for any category.

6. **Participated in a training program other than YouWIN provided** (IN24_1=1 or IN24_2=1, or IN24_4=1 or IN24_5=1) and for individuals no longer running a business YE2=1 for categories other than YouWIN.
7. **Business has taken a formal loan in 2012** (FB5a=1 or FB5b=1 or FB5d=1 (loan from bank, microfinance or NGO)).
8. **Received a new investment from equity holder in 2012** (FB9=1).
9. **Standardized z-score index of these measures.**

FAMILY B: CHANGES IN BUSINESS INPUTS

HYPOTHESIS B: Treatment leads to increased use of business inputs.

We will consider the following outcomes in this family:

1. **Owner's labor hours:** measured as hours in the last week (EF1). This will be top-coded at the 99th percentile of the overall distribution.
2. **Consulting services:** number of hours of consulting services used in 2012 (IN20, top coded at 99th percentile of overall distribution); coded as 0 for those who don't use consulting services (IN18=2).
3. **Value of Inventories and Raw Materials** (BF2, top-coded at the 99th percentile of the overall distribution).
4. **Purchase of capital worth more than 100,000 Naira in 2012** (BF3=1)
5. **Total purchases of capital over 100,000 Naira** (BF4a + BF4b, top coded at 99th percentile, coded as 0 for those not making new capital investments).
6. **Standardized z-score index of these measures**

FAMILY C: BUSINESS PRACTICES AND INNOVATION

HYPOTHESIS C1: Winning the YouWIN competition leads to improvements in business practices

1. An **index of business practices** formed from section 8, aggregating the number of practices firms carry out, using the same coding as used by de Mel et al. with these questions in Sri Lanka.

HYPOTHESIS C2: Treatment leads firms to undertake more innovation

This will be measured by the following set of outcomes:

1. Firm introduced a **new product or service** in 2012 (IN1=1)
2. Firm significantly **improved an existing product or service** in 2012 (IN8=1)
3. Firm introduced a **new or improved process** in 2012 (IN9=1)
4. Firm introduced a **new design or packaging** (IN12a=1)
5. Firm introduced a **new channel for selling goods** (IN12b=1)

6. Firm introduced a **new method for pricing goods** (IN12c=1)
7. Firm introduced a **new way of advertising** (IN12d=1)
8. Firm **changed way work is organized** in the firm (IN12f=1)
9. Firm introduced **new quality control standards** (IN12g=1)
10. Firm licensed a **new technology** (IN13c=1)
11. Firm obtained a **new quality accreditation** (IN13f=1)
12. Firm **uses the internet** (IN15=1)
13. **Innovation index**: the average of 1-12.

FAMILY D: CHANGES IN BUSINESS SALES AND PROFITABILITY

HYPOTHESIS D1: Treatment leads to greater sales and profits in the medium term, but likely has no discernible impact in the first follow-up survey.

This will be measured as the following set of outcomes:

1. **Number of customers in a typical week** (B12). This will be top-coded at the 99th percentile of the overall distribution to account for outliers.
2. **Total sales in the last month with no truncation:** BF5. For businesses not answering the exact answer, but answer the range question, the midpoint of the range will be used. For firms in the top range, a value equal to the median of firms with sales in this top range will be used.
3. **Total sales in the last month truncated at the 99th percentile.** As in 2, except truncated at the top 99th percentile.
4. **Total sales in 2012 to date, truncated at the 99th percentile**. BF6 – measured as per 3.
5. **Sales are higher than one year ago.** BF7=3
6. **Total profits in the last month with no truncation:** BF9. For businesses not answering the exact answer, but answer the range question, the midpoint of the range will be used. For firms in the top range, a value equal to the median of firms with sales in this top range will be used.
7. **Total profits in the last month truncated at the 99th percentile.** As in 6, except truncated at the top 99th percentile.
8. **Total profits in the best month of the year, truncated at the 99th percentile.** BF10, measured as per 7.
9. **The inverse hyperbolic sine transformation** of total business profits in the past month $\log(y+(y^2+1)^{1/2})$ – which is similar to the log transformation, but can deal with zero profits. BF9. For businesses not answering the exact answer, but answer the range question, the midpoint of the range will be used. For firms in the top range, a value equal to the median of firms with sales in this top range will be used.
10. **Sales of main product in past month**. BF12b*BF12d
11. **Mark-up profit on main product in past month:** (BF12b-BF12c)*BF12d
12. A standardized **profits and sales** impact will be obtained by aggregating these different effects as described below in our methods section as a standardized z-score.

HYPOTHESIS D2: Winning YOUWIN does not affect reporting errors.

A concern with any program involving business training or improvements in record-keeping is that it may lead to changes in the accuracy of the information being reported, even if the underlying business financial position does not change. If businesses systematically under- or over-state sales and profits, this will lead to a bias in the measured treatment effect.

We will test whether the treatment has affected the reporting of existing firms through estimating the treatment impact on the number of reporting errors made. The following will be deemed a reporting error, and our measure will be the total number of such errors:

a) Total sales in last month exceed total sales so far in 2012 (BF5>BF6)

b) Profits in last month exceed sales in last month (BF9>BF5)

c) Profits in best month are less than profits in last month (BF10<BF9)

d) Revenues in last month from main product exceed total revenues in last month (BF12b*BF12d >BF5)

FAMILY E : CHANGES IN EMPLOYMENT

HYPOTHESIS E: The YouWIN program leads to an increase in employment in existing businesses

We will measure the impact of the YouWIN program on employment as measured by the following set of outcomes:

1. **Business owner is employed** (in business or not) – measured by either SC = 1 (owns a business), or NB1<=5 (worked for pay in the last month).
2. **Business has survived** (SC=1)
3. **Current number of wage or salaried workers** (EF3_1a)
4. **Current number of casual or daily workers** (EF3_2a)
5. **Current number of unpaid workers** (EF3_4a)
6. **Workers hired in 2012** (EF4)
7. **Workers fired in 2012** (EF6)
8. **Employment Index** – this will be a standardized z-score average of 1-6.

NEW BUSINESSES

Firms are classified as new businesses if they applied as a new business to the YouWIN program.

FAMILY A: CHANGES IN A AND E

HYPOTHESIS A: Winning the YouWIN competition leads to positive increases in A, E, and access to K and L.

We will consider the following outcomes in this family:

1. **Entrepreneurial self-efficacy** – Measured as the number of business activities that the owner rates themselves as "very confident" in their ability to do (P12a-P12i). This is coded as 1 for each item if the owner answers 4 = very confident, and 0 if they answer 1 through 3, or 9 (not applicable or refuse).
2. **Participated in a training program:** YE2=1 for any category or PE2=1 for any category or YE15=1 or PE15A=1
3. **Participated in a training program other than YOUWIN:** YE2=1 for any category except YOUWIN or PE2=1 for any category except YOUWIN, or YE15=1 or PE15A=1

FAMILY B: STEPS TOWARDS OPENING A BUSINESS

HYPOTHESIS B: Treatment leads to individuals taking more steps towards starting a business.

We will consider the following outcomes (coded automatically as 1 if the owner has started a business)

1. **Interested in starting a business in next 12 months**. PN1=1
2. **Knows type of business they would like to start.** PN3 has an answer. Coded as zero if they don't want to start a business, coded as 1 if already started.
3. **Has identified specific location where they expect to start the business.** PN4=1. Coded as zero if they don't want to start a business, coded as 1 if already started.
4. **Has identified the costs of starting the business.** PN6 has an answer. Coded as zero if they don't want to start a business, coded as 1 if already started.
5. **Has gauged demand for new business.** PN7a=1.
6. **Has worked out money needed to start new business.** PN7b=1.
7. **Has visited competitors to see how they operate.** PN7d=1
8. **Has taken training course to get skills for new line of business.** PN7e=1
9. **Has identified sources of financing to pay for costs of new business.** PN7f==1
10. **Standardized Index: Number of Steps taken towards opening the business (**sum of 1-9).
11. **Standardized Index of Steps for Non-Business Owners:** Number of steps taken for firms which are not business owners. This codes as missing those owners who have started a business. This is for robustness only, since if treatment affects the likelihood of opening a business, or the selection as to who opens a business, this will involve conditioning on a selected sample.

FAMILY C : CHANGES IN EMPLOYMENT IN NEW BUSINESSES

HYPOTHESIS C: The YouWIN program leads to an increase in employment in new businesses

We will measure the impact of the YouWIN program on employment as measured by the following set of outcomes:

1. **Business owner is employed** (in business or not) – measured by either SC = 1 (owns a business), or NB1<=5 (worked for pay in the last month).
2. **Owner has started a business** (SC=1)

3. **Current number of wage or salaried workers** (EF3_1a). Coded as zero for those without a business.
4. **Current number of casual or daily workers** (EF3_2a). Coded as zero for those without a business.
5. **Current number of unpaid workers** (EF3_4a). Coded as zero for those without a business.
6. **Workers hired in 2012** (EF4). Coded as zero for those without a business.
7. **Workers fired in 2012** (EF6). Coded as zero for those without a business.
8. **Employment Index** – this will be a standardized z-score average of 1-6.

FAMILY D: BUSINESS OUTCOMES FOR NEW BUSINESSES

HYPOTHESIS D: Treatment leads to greater sales and profits for the businesses started by new business applicants.

This will be measured as the following set of outcomes. Our pure experimental estimates will be unconditional, using zeros for individuals not operating businesses. For exploration purposes we will also examine conditional outcomes, conditional on operating a business. These will only be valid experimental estimates if the treatment does not affect the selection of who operates a firm.

1. **Number of customers in a typical week** (B12). This will be top-coded at the 99th percentile of the overall distribution to account for outliers.
2. **Total sales in the last month with no truncation:** BF5. For businesses not answering the exact answer, but answer the range question, the midpoint of the range will be used. For firms in the top range, a value equal to the median of firms with sales in this top range will be used.
3. **Total sales in the last month truncated at the 99th percentile.** As in 2, except truncated at the top 99th percentile.
4. **Total sales in 2012 to date, truncated at the 99th percentile**. BF6 – measured as per 3.
5. **Sales are higher than one year ago.** BF7=3
6. **Total profits in the last month with no truncation:** BF9. For businesses not answering the exact answer, but answer the range question, the midpoint of the range will be used. For firms in the top range, a value equal to the median of firms with sales in this top range will be used.
7. **Total profits in the last month truncated at the 99th percentile.** As in 6, except truncated at the top 99th percentile.
8. **Total profits in the best month of the year, truncated at the 99th percentile.** BF10, measured as per 7.
9. **The inverse hyperbolic sine transformation** of total business profits in the past month $\log(y+(y^2+1)^{1/2})$ – which is similar to the log transformation, but can deal with zero profits. BF9. For businesses not answering the exact answer, but answer the range question, the midpoint of the range will be used. For firms in the top range, a value equal to the median of firms with sales in this top range will be used.
10. **Sales of main product in past month**. BF12b*BF12d
11. **Mark-up profit on main product in past month:** (BF12b-BF12c)*BF12d

12. A standardized **profits and sales** impact will be obtained by aggregating these different effects as described below in our methods section as a standardized z-score.

7. Heterogeneity of Treatment Effect Outcomes

The analysis will separate the new and existing business applicants since some of the outcome measures will differ for these two groups, and the impacts of the program are likely different.

Within these two groups we will examine the heterogeneity in treatment effects with respect to the following key variables of policy interest:

1) **Business plan score:** The key question of interest here is whether the treatment effect is larger or smaller for those with higher business plan scores. This is important for thinking about targeting of the program. I will examine this in two different specifications:
   a) Linear specification: I will include a linear control for the business plan score, and then interact this with the treatment effect.
   b) Quartiles: I will include dummies for having a business plan score in the 2^{nd}, 3^{rd} and 4^{th} (top) quartiles among the experimental sample, and interactions of each of these quartiles for the business plan score with the treatment.
2) **Female:** Power may be low for this interaction given that only 16-17% of the sample is female, but we will examine whether there are significant differences by gender. This is one of the variables the randomization was stratified on.
3) **Region:** The randomization was stratified on six regions – we will include dummies for 5 of these regions and the interactions between region and treatment effect.

Given the sample size I will examine these interactions one at a time.

Treatment heterogeneity will be examined with respect to the following outcomes:

- Standardized profit and sales index
- Owner has started a business (new businesses), or owner has a surviving business (existing businesses)
- Employment index
- Current number of wage and salaried workers

For the first survey follow-up analysis, if there is no significant overall impact on any of these 4 measures, then I will also examine heterogeneity in response to intermediate measure indices to see whether steps are being made towards ultimate outcomes.

8. Additional information regarding use of testing and data

Dealing with Testing for Multiple Outcomes through Standardized Treatment Effects and Adjustments for Multiple Inference

To deal with multiple hypothesis testing we employ two approaches. First, we group our outcome measures into domains or families, based on the idea that items within a domain are measuring an underlying common factor. Then we sign the outcomes within each family so that the hypothesized effects go in the same direction, and take a standardized treatment effect within that domain. We follow Kling, Katz and Liebman in constructing this standardized treatment effect.

Secondly, to account for multiple inference within a domain we will compute and report the family-wise error rate adjusted p-values using the Dubey/Armitage-Parmar adjustment to the Bonferroni procedure which provides a correction for correlation among outcomes, as set out here:
http://blogs.worldbank.org/impactevaluations/tools-of-the-trade-a-quick-adjustment-for-multiple-hypothesis-testing

Inflation

Once multiple rounds of survey data are available, nominal values will be converted to real Naira using the Nigeria consumer price index from the Central Bank of Nigeria.

Procedures for Addressing Missing Data and Questions with Limited Variation

The following sections detail the procedures for addressing the cases of survey attrition, item non-response, and questions with limited variation.

Survey attrition

Depending on response rates and budget, the follow-up survey will potentially use more expensive methods to try and get a subsample of the individuals who can be obtained through the standard survey to respond. If this is done, all data will be probability-reweighted to reflect this.

Let A_i be an indicator of whether individual *i* attrits from the study by not responding to or being able to be contacted for a follow-up survey. We will first estimate whether attrition is related to treatment status by means of the following regression:

$$A_i = \beta_0 + \beta_1 T_i + X_s'\delta + \varepsilon_i$$

Where X_s are dummy variables for each randomization strata *s* (consisting of region*gender). Since randomization is at the individual-level, conditional on these strata, Huber-White standard errors will be used. We will test $\beta_1 = 0$ to determine whether attrition from the survey is related to treatment status or not.

If treatment status is found not to significantly affect attrition at the 5 percent significance level, then all estimation will proceed without any adjustment for attrition. If attrition is found to be related to treatment status, we postulate that attrition will be higher for the control group (although it is possible that the repeated requests for information that the treatment group has received may instead lower their willingness to participate). We will then employ two bounding approaches to test robustness to attrition:

(i) Lee bounds: the group with lower attrition will have either the top or the bottom tail of responses trimming following the Lee method. For continuous outcomes robustness to

assuming that the attrited observations were at the 95th, 90th, and 75th percentiles will be used for the lower bound, and 5th, 10th, 25th percentiles for the upper bound.

(ii) Behaghel et al bounds: we will use the number of attempts it took to contact respondents to form bounds following the approach set out in their paper.

Missing data from item non-response

No imputation for missing data from item non-response at follow-up will be performed. Missing data on baseline variables will be dummied out of the ANCOVA specifications. We will check whether item non-response is correlated with treatment status following the same procedures as for survey attrition, and if it is, construct bounds for our treatment estimates that are robust to this.

Questions with Limited Variation

In order to limit noise caused by variables with minimal variation, questions for which 95 percent of observations have the same value within the relevant sample will be omitted from the analysis and will not be included in any indicators or hypothesis tests. In the event that omission decisions result in the exclusion of all constituent variables for an indicator, the indicator will be not be calculated.

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