# Tackling Youth Unemployment:

# Evidence from a Labor Market Experiment in Uganda

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## Motivation

- youth unemployment and underemployment are key policy challenges in the developing world
- East Africa: majority of popn aged below 25, youth represent 60% of the unemployed
- factors driving youth unemployment [Freeman 1979, Becker 1994, Pissarides 1994]:
  - pre labor market: young workers lack skills/info
  - barriers to labor market entry
- **this paper:** labor market field experiment to study these issues

## This Paper: Two-Sided Market RCT Design

- workers: young entrants into the labor market
- firms: SMEs in eight sectors [manufacturing, services]
- two sided experimental design: T and C workers; T and C firms
- the RCT measures causal impacts **on workers and firms** of experimentally varying:
  - vocationally training workers before they enter the labor market [**VT**]
  - incentivising firms to hire and train workers on-the-job [**FT**]
  - matching
- sheds light on $L^S$, $L^D$ and matching elements of the labor market
- **context:** Uganda
  - skewed age distn, youth unemployment key policy issue

## Research Questions 1: Treatment Effects on Workers

- how do the impacts on workers of VT and FT differ?
  - contrasting supply- and demand-side policies
- **outcomes:** verified skills, employment, wages, productivity, earnings

## Research Questions 2: Mechanisms

- tracked workers for four years since baseline
- what are the steady **state impacts** of VT/FT on workers?
- structurally estimate a job ladder model of worker search
- **key outcomes**: job offer arrival rates (UJ, JJ), unemployment rates, earnings
- feed into IRR calculations

## Research Questions 3: Firm-Side Responses

- two sided experimental design: T and C workers; T and C firms
- firm side experiment allows us to measure:
  - whether returns to VT/FT reflect matching to differential firms
  - within-firm employment displacement
  - profit impacts and rent-sharing

## Innovations

- **separate returns** to vocational (classroom) and on-the-job training (apprenticeships)
  - mechanism differs: certification
- **methodological** innovation:
  - market experiment: joint analysis of both sides of labor market
- **long run** experimental study:
  - steady state impacts and mechanisms driving RF impacts
  - feed both aspects into IRR
- **policy relevant** comparison of interventions:
  - supply- versus demand-side policies to tackle youth unemployment

## Context: Workers

- oversubscription design used for intervention
- targeted to poorest/disadvantaged youth
  - not the kinds of individual that can self-finance VT or FT
  - many job training programs target youth [Card *et al.* 2011, Attanasio *et al.* 2012]
- **panel data:** 1714 workers tracked from baseline and three follow-ups
- [Table 1: C-group Worker Characteristics and Labor Market Outcomes]

# Table 1: Baseline Balance on Worker Labor Market Outcomes

**Means, robust standard errors from OLS regressions in parentheses**
**P-value on t-test of equality of means with control group in brackets**
**P-value on F-tests in braces**

| | Number of workers | Currently working | Has worked in the last month | Has done any wage employment in the last month | Any self employment in the last month | Has done any casual work in the last month | Total earnings in the last month [USD] |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| **All Workers** | 1714 | .360 | .383 | .130 | .046 | .257 | 5.93 |
| | | (.045) | (.044) | (.023) | (.013) | (.508) | (1.11) |

## Context: Firms

- urban labor markets throughout Uganda
- matched to nationally representative sample of 1500 SMEs
  - $L \in [1, 15]$, $\bar{L} = 3$, operating in eight sectors:
  - welding, motor mechanics, construction,..,hairdressing
- wage subsidy covering firm's screening/learning costs
  - employer learning [Farber and Gibbons 1996, Altonji and Pierret 2001]
  - apprenticeships as screening technologies [Autor 2001, Hardy and McCasland 2015]
- [Table 2: Vocational Training]
- [Table 3: On-the-Job Training]

# Table 2: The Mincerian Returns to Vocational Training

| | | Worker is skilled: self-reported VTI attendance | |
|---|---|---|---|
| | % workers skilled in sector | Coefficient and SE from worker wage regressions [USD] | Coefficient and SE from worker log(wage) regressions [USD] |
| **All Sectors** | **31.0%** | **26.2*** ** | **.515*** ** |
| | | (3.15) | (.045) |
| **Manufacturing** | | | |
| ***Welding*** | 24.9% | 34.5*** | .381*** |
| | | (6.40) | (.084) |
| ***Motor-mechanics*** | 23.5% | 16.1* | .294* |
| | | (9.41) | (.153) |
| ***Electrical wiring*** | 41.9% | 27.3*** | .486** |
| | | (7.60) | (.189) |
| ***Construction*** | 28.8% | 11.5 | .289* |
| | | (9.39) | (.170) |
| ***Plumbing*** | 49.1% | 60.9*** | .719** |
| | | (19.0) | (.281) |
| **Services** | | | |
| ***Hairdressing*** | 29.2% | 22.9*** | .444*** |
| | | (5.97) | (.069) |
| ***Tailoring*** | 41.6% | 15.9 | .898*** |
| | | (9.76) | (.182) |
| ***Catering*** | 40.2% | 26.8** | .330*** |
| | | (11.6) | (.109) |

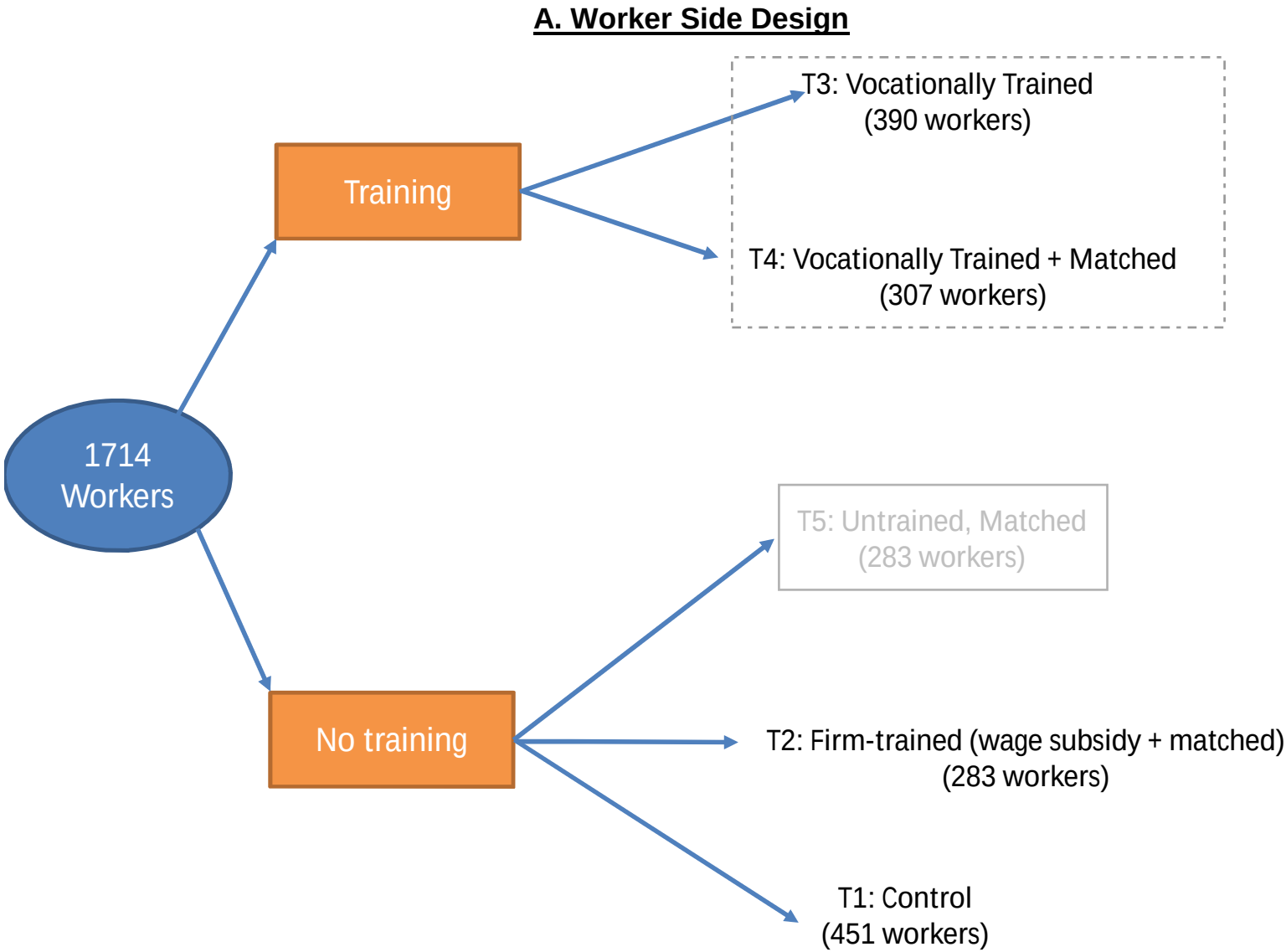
# Table 3: Characteristics of Apprenticeships

| | |
|---|---|
| ***A. Availability*** | |
| Worker received on-the-job training at the current firm | .498 |
| Duration of on-the-job training [months] | 10 |
| ***B. Payments*** | |
| ***In the first month of training, the worker:*** | |
| Was paid | .198 |
| Was unpaid | .515 |
| Was paying the firm owner | .288 |
| Earnings (conditional on > 0) [US$] (median) | 39.2 (40.1) |
| Amount worker was paying to owner (conditional on > 0) [US$] (median) | 51.9 (33.3) |
| ***C. Trainers*** | |
| ***Who was mainly involved in training the worker:*** | |
| Firm owner only | .457 |
| Other employees only | .091 |
| Firm owner as well as other employees | .452 |

# 2.Design

[Figure 1: Summary of Experimental Design]

# Figure 1: Experimental Design



## Vocational Training in VTIs [T3, T4]

- 6 months sector-specific training
- in T3 and T4, BRAC covered total cost $470 per trainee
  - VTI ($400) + worker's out-of-pocket costs ($70)

## Firm Training [T2]

- firm paid 120K UGX/month = $50 (for 6 months) to hire an untrained worker
- inflexible wage subsidy with designated split: $12.5 to owner, $38 to worker
- two anchors for this split:
- for those reporting to be an apprentice with a wage, mean wage is $39
- wages of all unskilled workers
  - subsidy rate for unskilled workers (subsidy/average wage): 63% [de Mel *et al.* 2010, SR=50%]

## Certification and Skills Composition

- certification:
  - VT workers can signal their skills to employers
  - value of certification [Pallais 2014, MacLeod *et al.* 2016, Bassi and Nansamba 2017]
  - SM evidence: UJ and JJ transitions
- incentives for firms to train workers depends on labor market imperfections [Acemoglu and Pischke 1998, 1999]
- VT workers more likely to be poached than FT $\longrightarrow$ tilts to balance towards latter having relatively more firm specific skills
  - RF evidence: skills, wages, productivity, firm profits
  - SM evidence: UJ and JJ transitions

## Timing of Treatments

- workers are observationally equivalent at point of application to VTI
- we present ITT estimates based on random assignment to each treatment at point of application
- selection into FT and match treatments also depends on firm's willingness to accept trainee
  - no such **supply-side selection** for vocational training
  - SM informative of productivity of firms employed at
- [Table A3: Take-Up]

# Table A3: Take-Up of Treatments

| | Vocational Training | | Matching and Firm Training | | | |
|---|---|---|---|---|---|---|
| **Sample of Workers:** | **All Workers** | **Offered Training** | **All Workers** | **Invited to interview** | **Met at least one Firm** | **Worker received a Job Offer** |
| **Outcome:** | **% Workers Offered Training** | **% Workers Trained** | **% Workers Invited to Interview** | **% Workers That Met at Least One Firm** | **% Workers Who Received a Job Offer** | **% Workers Hired** |
| | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** |
| **T3: Vocationally Trained** | **97.9** | 73.8 | - | - | - | - |
| **T4: Vocationally Trained + Matched** | **95.4** | 63.1 | **12.7** | 74.4 | 58.6 | 23.5 |
| **T2: Firm Trained** | - | - | **50.5** | 80.4 | 90.4 | 66.4 |
| **T5: Untrained, Matched** | - | - | **19.1** | 85.2 | 34.8 | 18.8 |

## Balance and Attrition

- **randomize individuals** to treatment within strata [region (C, N, E, W), gender, education]
- balance on characteristics and labor market outcomes
- 13% attrition rate by 36-month follow-up
- to correct for selective attrition:
  - weight ITT estimates using IPW
  - conditional Lee bounds [Lee 2009]

## Estimation

- observe worker $i$ in treatment group $d$ in strata $s$ in survey wave $t = 0, 1, 2, 3$
- estimate the following ANCOVA specification in survey waves $t = 1, 2, 3$:

$$y_{ist} = \sum_j \beta_j T_i + \gamma y_{i0} + \delta \mathbf{x}_{i0} + \lambda_s + \vartheta_t + u_{ist}$$

- worker $i$'s assigned treatment $T_i$ ($j$ treatments)
- $\lambda_s, \vartheta_t$: strata and survey wave fixed effects
- randomization at worker level ($i$): robust standard errors

## Spillovers

- labor market (sector-region): 156 employed workers, 40 firms (initial firm census)
- workers are geographically and sectorally mobile
- we matched an average of 8 workers per market
- **implications:**
  - do not expect C-group to be contaminated by treated workers in the same labor market $\longrightarrow$ SUTVA holds
  - but might be spillover effects onto workers *not* in our evaluation sample [GE effects]
- **firm side experiment:** *displacement effects* within firms that hire a treated worker

# 3. Treatment Effects on Skills, Employment

## Skills: Task Composition, Sector- and Firm-specific Skills

- firm-sponsored training
- conducted sectoral-specific skills test on workers (incl. $C$), administered at second and third follow-up
- try to measure firm-specific skills (third follow up)
- sectoral task lists by training type (O*NET)
- [Table 4: Skills]
- [Figure 3: Tasks]
- [Table 5: Employment (Extensive and Total Margins)]
- [Figure 4: Productivity Bounds]

# Table 4: Skills

**OLS regression coefficients, IPW estimates, robust standard errors in parentheses**

| | Firm-Provided Training | |
|---|---|---|
| | Received OTJ-T at First Employer | Position in First Job is "Trainee" |
| | (1) | (2) |
| **Firm Trained** | .144*** | .215*** |
| | (.052) | (.041) |
| **Vocationally Trained** | -.029 | -.019 |
| | (.042) | (.025) |
| **Mean (SD) Outcome in Control Group** | .404 | .092 |
| **Control for Baseline Value** | No | No |
| **P-values on tests of equality:** | | |
| **Firm Trained = Vocationally Trained** | [.000] | [.000] |
| **N. of observations** | 792 | 794 |

## Table A5: Sector Skills Test for Motor Mechanics

<table>
<tr><th colspan="3">1. MOTOR-MECHANICS</th></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>1</td><td>multiple-choice<br>What are you advised to do when servicing the engine by changing oil?</td><td>A. Top up lubricating oil<br>B. Replace oil filter<br>C. Over hand engine<br>D. Over hand cylinder head<br>Correct Answer: B</td></tr>
<tr><td>2</td><td>multiple-choice<br>What immediate remedy can you give to a vehicle with a problem of excessive tyre wear in the center more than other parts?</td><td>A. Increase tyre pressure<br>B. Reduce tyre pressure<br>C. Inflate pressure<br>D. Remove the vehicle tire<br>Correct Answer: B</td></tr>
<tr><td>3</td><td>multiple-choice<br>If a customer reports to you that his/her vehicle charging system works at lower rate, how can you help him?</td><td>A. Replacing the charging system<br>B. Adjusting the alternator tension<br>C. Replacing alternator housing<br>D. Renewing wire insulator<br>Correct Answer: B</td></tr>
<tr><td>4</td><td>multiple-choice<br>Which of the following set of systems or component call for mechanical adjustment during general vehicle service?</td><td>A. Tyres, cooling system, master cylinder<br>B. Break shoes, alternator, and valve clearance<br>C. Distributor, radiator, propeller shaft<br>D. Tank, crank shaft, Turbo charger<br>Correct Answer: B</td></tr>
<tr><td>5</td><td>multiple-choice<br>What solution would you give a customer with a vehicle engine producing blue smoke?</td><td>A. Top up lubricant<br>B. Time the engine<br>C. Replace piston rings<br>D. Remove carbon deposits<br>Correct Answer: C</td></tr>
<tr><td>6</td><td>matching<br>What should you do to stop the following vehicle troubles?</td><td>
<table>
<tr><td>1</td><td>Battery over charging</td><td>A</td><td>Leaking fuel tank</td></tr>
<tr><td>2</td><td>Engine over heating</td><td>B</td><td>Renew regulator</td></tr>
<tr><td>3</td><td>Lubricant leakage</td><td>C</td><td>Reduce oil to the correct level</td></tr>
<tr><td>4</td><td>Smoke in exhaust</td><td>D</td><td>Renew piston rings</td></tr>
<tr><td>5</td><td>Engine fails to start</td><td>E</td><td>Charge the battery</td></tr>
</table>
Correct Answer: 1B, 2A, 3C, 4D, 5E
</td></tr>
<tr><td>7</td><td>order<br>When changing engine oil, in which order should you perform the following steps?</td><td>A. Drain oil through drain plug<br>B. Remove oil filter cup<br>C. Run engine to check leaks<br>D. Fill new oil through filler cup to level<br>E. Remove oil filter<br>F. Warm up the engine<br>Correct Answer: B, E, A, D, F, C</td></tr>
</table>

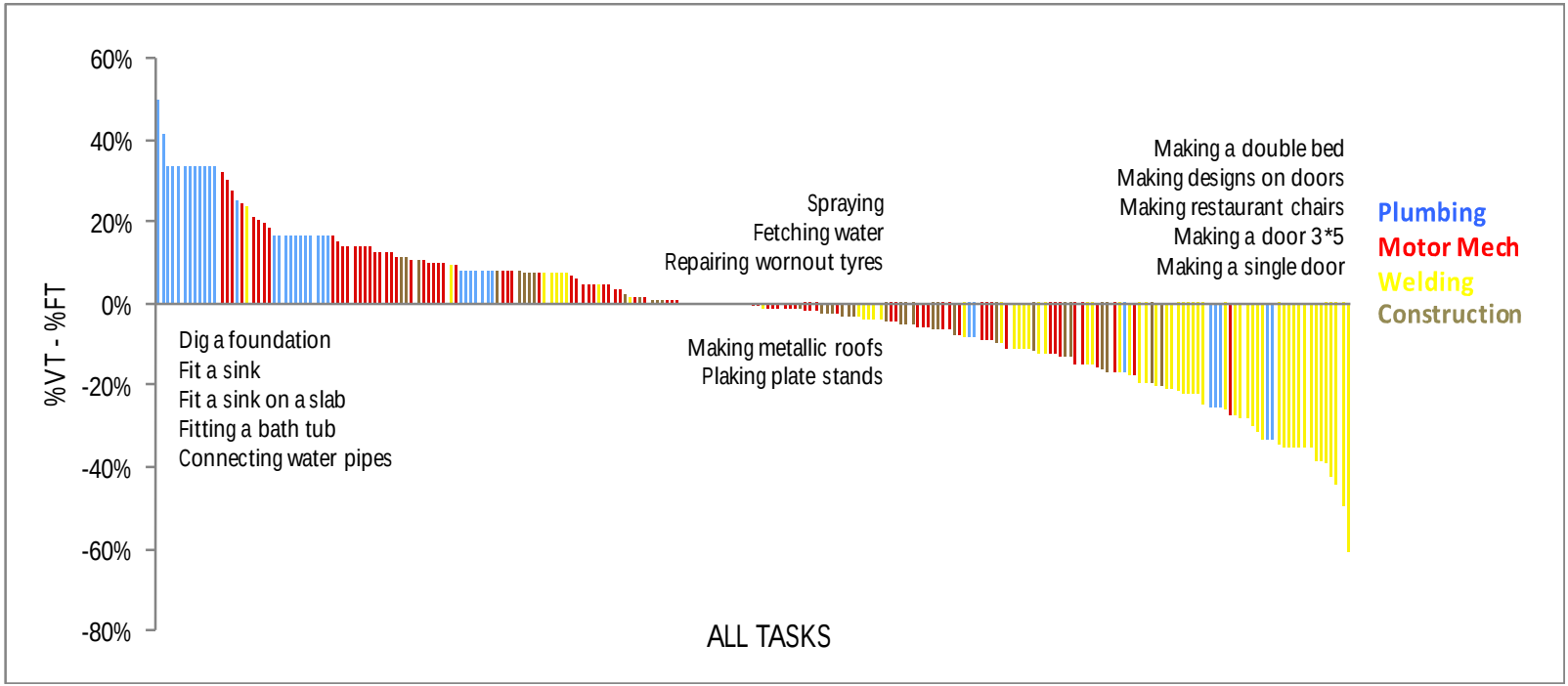
# Table 4: Skills

**OLS regression coefficients, IPW estimates, robust standard errors in parentheses**

| | Sector-Specific Skills Test | | | Firm-Specific Skills |
|---|---|---|---|---|
| | Report Some Skills | ITT | LATE: Offered Worker-Firm Match | Skills Transferability |
| | (3) | (4) | (5) | (6) |
| **Firm Trained** | .110*** | 2.13 | 4.49 | -.051 |
| | (.032) | (1.53) | (3.00) | (.109) |
| **Vocationally Trained** | .269*** | 6.96*** | 56.8*** | .150** |
| | (.023) | (1.20) | (15.5) | (.068) |
| **Mean (SD) Outcome in Control Group** | .596 | 30.1 (22.9) | 30.1 (22.9) | - |
| **Control for Baseline Value** | No | No | No | No |
| **P-values on tests of equality:** | | | | |
| **Firm Trained = Vocationally Trained** | [.000] | [.001] | [.000] | [.025] |
| **N. of observations** | 1,818 | 1,818 | 1,302 | 650 |

# Figure 3: Tasks Performed by Vocationally Trained and Firm Trained Workers

## Panel A: Manufacturing



# Table 5: Employment and Earnings

**OLS regression coefficients, IPW estimates, robust standard errors in parentheses**

| | Has done any work in the last month | Number of months worked in the last year | Hourly wage rate [USD] | Total earnings in the last month [USD] |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| **Firm Trained** | .063** | .518** | .028** | 5.80** |
| | (.025) | (.259) | (.012) | (2.53) |
| **Vocationally Trained** | .090*** | .879*** | .031*** | 9.75*** |
| | (.020) | (.207) | (.009) | (2.01) |
| **Mean Outcome in Control Group** | .438 | 4.52 | .074 | 28.7 |
| **Control for Baseline Value** | Yes | No | Yes | Yes |
| **P-values on tests of equality:** | | | | |
| **Firm Trained = Vocationally Trained** | [.255] | [.134] | [.799] | [.111] |
| **N. of observations** | 3,256 | 3,256 | 3,099 | 3,111 |

## Underlying Market Failure

- with such high returns from training, why do workers not self-invest in their HK?
- credit constraints likely bind in this sample
  - total cost: $470 per trainee split as VTI ($400) + out-of-pocket costs ($70)
- credit constraints also prevent workers paying for FT
- credit constraints on firms prevent them paying up front hiring/screening costs of employing youth
- worker beliefs:
  - imperfect information about returns to skills in low-income labor markets [Jensen 2009, Kaufmann 2014]
- [Table A6: Worker Beliefs]

# Table A6: Worker Expectations

**Means, standard deviations in parenthesis**
**All amounts in 2012 USD**

| | Expected probability of finding a job in the next 12 months | | Average expected monthly earnings (triangular distribution) | |
|---|---|---|---|---|
| | With current Skill Set (1) | If received VT (2) | With current Skill Set (3) | If received VT (4) |
| **All Workers (Baseline Interview)** | .567 | .867 | 57.8 | 118.3 |
| | (.288) | (.144) | (46.9) | (71.5) |
| **N. of observations** | 1,611 | 1,589 | 1,243 | 1,411 |

# 4.Job Ladder Model of Worker Search

## Value Added

- SM helps pinpoint mechanisms driving steady state impacts:
  - transition rates: UJ, JJ
  - certification and skills composition: transitions should be higher for vocational trainees
  - distribution of offered and accepted wages
  - steady state unemployment rates
- input estimated SS impacts into IRR calculations

## Auxiliary Assumptions

- standard job ladder model of worker search
- risk neutral workers
- homogenous workers apart from training ($t = 0, 1$) and employment status $(u, e)$
- workers are in steady state by November 2015 (two years since end of VT)
- firms post wage $w$ and make take-it-or-leave-it offers
- firms do not make wage offers to $u$ workers that would be refused

## Value Functions

- value function for an unemployed worker is:

$$V^n(t) = -\varphi(c) + \beta \left[ \begin{array}{c} \lambda_0(c,t) \max\{\int V(w,t)dF(w|t), V^n(t)\} \\ +(1-\lambda_0(c,t))V^n(t) \end{array} \right]$$

- value function for an employed worker with wage $w$ is:

$$V(w,t) = w - \varphi(c) + \beta \left[ \begin{array}{c} \delta V^n(t) + \lambda_1(c,t) \max\{\int V(w,t)dF(w|t), V(w,t)\} \\ +(1-\delta-\lambda_1(c,t)V(w,t) \end{array} \right]$$

## Treatments and Job Search

- training can affect worker behavior through two mechanisms:
  - the probabilities of receiving a job offer: ($\lambda_0(c,t)$, $\lambda_1(c,t)$)
  - the distribution of offered wages ($F(w|t)$)
- through these mechanisms training impacts endogenous choices:
  - search effort ($c$)
  - whether to accept or reject wage offers (reservation wage)
- [Table 6: Worker Beliefs and Search]

# Table 6: Worker Beliefs and Job Search

**OLS regression coefficients, IPW estimates, robust standard errors in parentheses**

| | Job Offer Probability | Offered Wages | Search Intensity |
|---|---|---|---|
| | Expected probability of finding a job in the next 6 months (0 to 10 scale) | Average expected monthly earnings (triangular distribution) [USD] | Has actively looked for a job in the last year |
| | (1) | (4) | (5) |
| **Firm Trained** | .593*** | .528 | .001 |
| | (.137) | (3.34) | (.025) |
| **Vocationally Trained** | 1.87*** | 19.4*** | .093*** |
| | (.108) | (2.75) | (.020) |
| **Mean Outcome in Control Group** | 2.81 | 72.6 | .509 |
| **Control for Baseline Value** | Yes | Yes | No |
| **P-values on tests of equality:** | | | |
| **Firm Trained = Vocationally Trained** | [.000] | [.000] | [.000] |
| **N. of observations** | 3,136 | 1,905 | 3,255 |

## Estimation

- follow two-step procedure in Bontemps *et al.* [2000]
  - $\lambda_0, \lambda_1$,$\delta$ are estimated, asymptotic se's calculated
- [Table 7, Panel A: Job Destruction and Job Offer Rates]
- [Table 7, Panel A: $u, \kappa_1$]
- [Table 7, Panel B: $F(.)$ and $G(.)$ Estimates]

# Table 7: Estimates of the Job Ladder Search Model

**Two-step estimation procedure in Bontemps, Robin and van den Berg [2000]**

| Panel A: Parameter Estimates | | Steady State: November 2015 (Data from Second and Third Follow-up) | | |
|---|---|---|---|---|
| | | Control | Firm Trained | Vocationally Trained |
| | | (1) | (2) | (3) |
| **Job destruction rate (monthly):** | $\delta$ | .0272 | .0259 | .0239 |
| | | (.0030) | (.0037) | (.0021) |
| **Arrival rate of job offers if UNEMPLOYED (monthly):** | $\lambda_0$ | .0189 | .0191 | .0237 |
| | | (.0019) | (.0024) | (.0019) |
| **Arrival rate of job offers if EMPLOYED (monthly):** | $\lambda_1$ | .0388 | .0376 | .0428 |
| | | (.0096) | (.0117) | (.0080) |
| **Interfirm competition for workers** | $\kappa_1$ | 1.426 | 1.452 | 1.791 |
| **Unemployment Rate** | $u$ | **.5892** | **.5755** | **.5024** |
| **% Impact:** | | | **2.3%** | **14.7%** |

# Table 7: Estimates of the Job Ladder Search Model

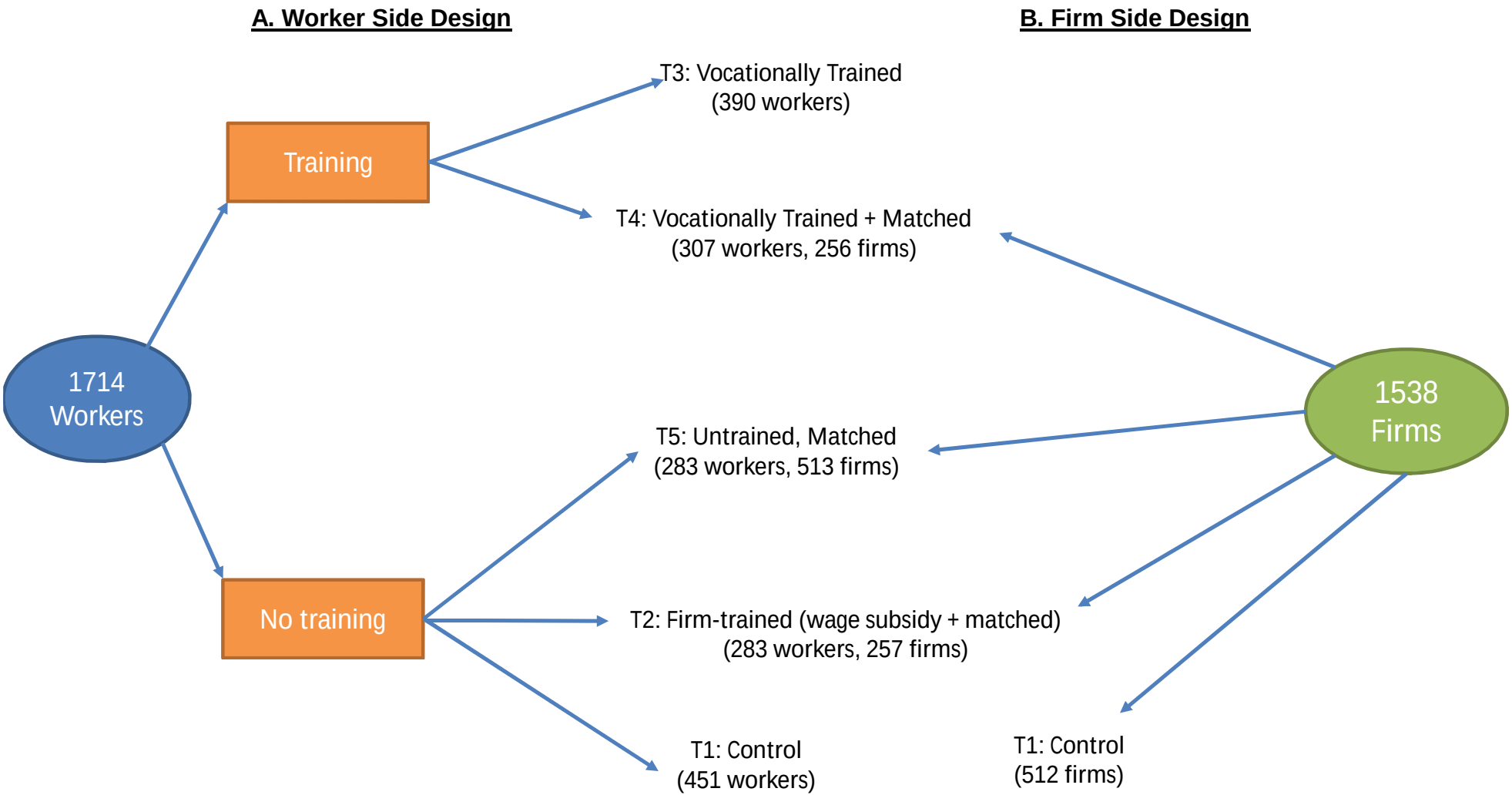
**Two-step estimation procedure in Bontemps, Robin and van den Berg [2000]**

| | | Steady State: November 2015 (Data from Second and Third Follow-up) | | |
|---|---|---|---|---|
| **Panel B: Function and Income Estimates** | | | | |
| **Average (sd) monthly OFFERED wage [USD]** | ***F(.)*** | 44.8 | 47.0 | 46.3 |
| | | (37.4) | (43.6) | (41.9) |
| **Average (sd) monthly ACCEPTED wage [USD]** | ***G(.)*** | 63.7 | 68.9 | 70.6 |
| | | (45.5) | (54.5) | (54.4) |
| **Treatment Effect Impact on Annual Income [USD]** | | | **37.0** | **107.6** |
| **% Impact:** | | | **11.8%** | **34.3%** |

# 5.Firm Side Impacts

[Figure 1: Summary of Experimental Design]

# Figure 1: Experimental Design



## Firm Selection

- large difference in SS returns between VT and FT workers: $107 versus $37
- use RF methods to see differential characteristics of firms that *initially* express an interest in matching with workers
  - reveals firms induced to match with workers with wage subsidies are low productivity
- extend job ladder model to back out distribution of firm productivity that each group of workers matches to *in steady state*
- [Table 8: Firm Side Selection]
- [Table 7, Panel C: Estimates of the Job Ladder Model]

# Table 8: Firm-Side Selection in Initial Worker-Firm Matches

**OLS regression coefficients, standard errors clustered by sector-branch in parenthesis**

| | Firm was Interested in Meeting a Matched Worker | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| **Matched to Untrained Worker, Wage Subsidy Offer** | .308*** | .304*** | .720*** |
| | (.047) | (.046) | (.202) |
| **Firm size** | | .021 | .033 |
| | | (.018) | (.020) |
| **Log profits per worker** | | -.067 | .004 |
| | | (.049) | (.056) |
| **Log capital per worker** | | .074** | .056 |
| | | (.037) | (.045) |
| **Matched to Untrained Worker, Wage Subsidy Offer x Firm Size** | | | -.034 |
| | | | (.027) |
| **Matched to Untrained Worker, Wage Subsidy Offer x Log profits per worker** | | | -.259** |
| | | | (.112) |
| **Matched to Untrained Worker, Wage Subsidy Offer x Log capital per worker** | | | .056 |
| | | | (.087) |
| **Mean outcome in T5: Untrained, Matched group** | | .085 | |
| **Number of observations (firms)** | | 602 | |

# Table 7: Estimates of the Job Ladder Search Model

**Two-step estimation procedure in Bontemps, Robin and van den Berg [2000]**

| | | Steady State: November 2015 (Data from Second and Third Follow-up) | | |
|---|---|---|---|---|
| **Panel C: Firm Productivity Distribution** | | | | |
| **Average (sd) firm productivity** | ***P(.)*** | 174.8 | 122.9 | 271.8 |
| | | (610.7) | (452.9) | (1117.4) |
| **% Impact:** | | | **-30%** | **55%** |

## Within Firm Employment Displacement

- large reductions in unemployment rates:
  - FT: 2.3%
  - VT: 14.7%
- *if* no displacement $\Rightarrow$ more effective job creation than easing $L^d$ constraints on firm
- can use firm side experiment to shed light on within-firm displacement effects
- [Table 9: Firm Side Outcomes]

# Table 9: Firm Side Outcomes, LATE Estimates

**OLS IPW regression coefficients, standard errors clustered by sector-branch in parenthesis**

| | At Least One Worker Hired and Retained | Number of Employees | Log (Average Monthly Profits) | Log (Net Investment) |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| **Matched to Untrained Worker, Wage Subsidy Offer** | .088*** | -.055 | .114** | .032 |
| | (.017) | (.186) | (.053) | (.112) |
| **Mean of outcome in T1 Control group** | .000 | 2.34 | 191 | 60.8 |
| **Controls for baseline value of outcome** | No | Yes | Yes | No |
| **Number of firms** | 657 | 657 | 591 | 651 |

## Profits

- LATE profit impact (.114 x 191 = $21.1/month)
- can use the post-intervention window to back out how surplus generated by firm-trained worker is shared
- LATE wage impacts: $12.4/month
- rent sharing: **36%** of the surplus generated by FT goes to the worker

# 6.Discussion

IRR, External Validity

## IRR

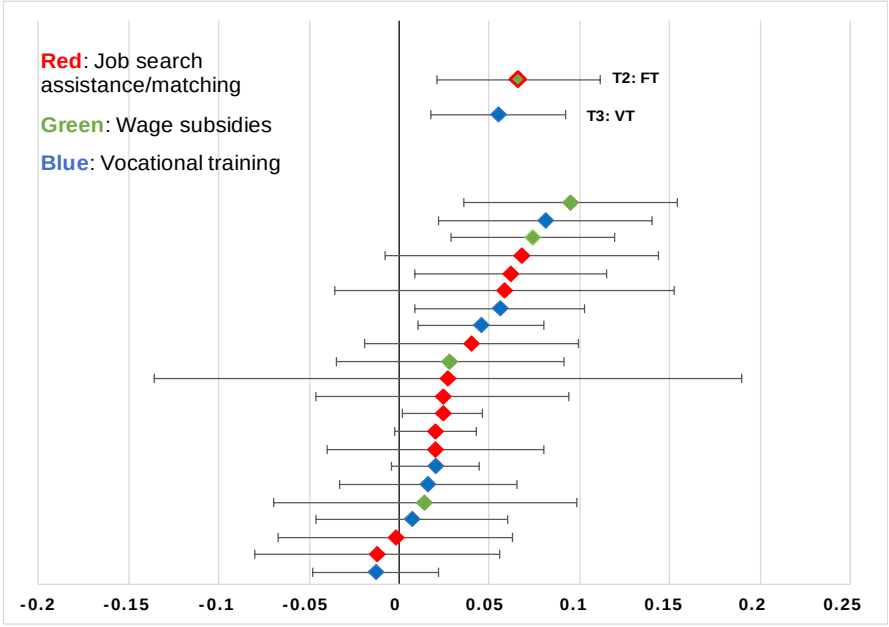
- IRR challenge versus capital/cash transfers in low-income settings [Blattman and Ralston 2015]
- VT cost: $470 per trainee split as VTI ($400) + out-of-pocket costs ($70)
- FT cost: $50.3 x 6 months = $302 per trainee
- SS earnings impact 3 times larger for vocational training: $107 versus $37
- opportunity costs: foregone earnings while being trained
- [Table 10: IRR]
- [Figure 7: McKenzie 2017 Meta-analysis]

# Table 10: Internal Rate of Return

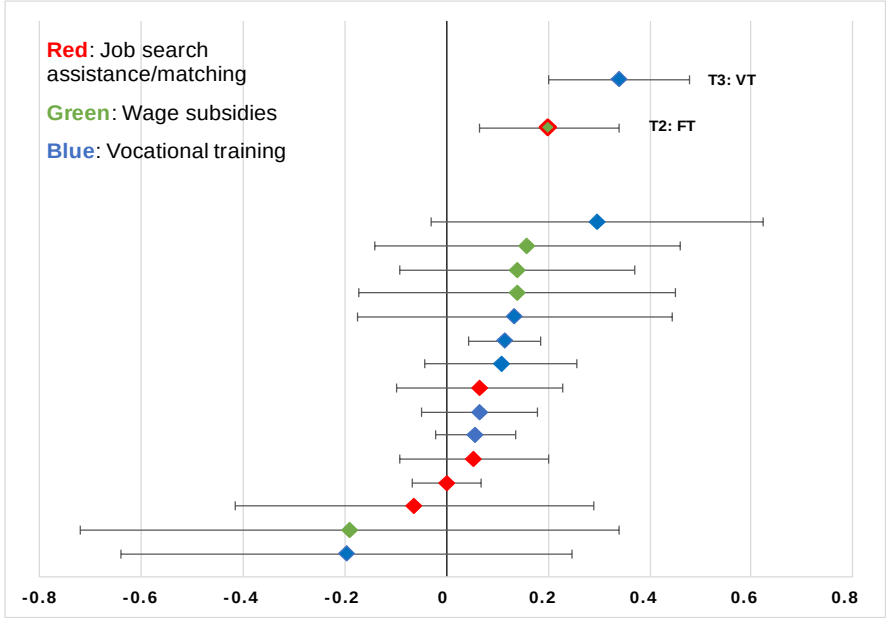
| | Firm Trained | Vocationally Trained |
|---|---|---|
| | (1) | (2) |
| Social discount rate = 5% | | |
| Remaining expected productive life of beneficiaries | 38 years | 38 years |
| **Panel A. External parameters** | | |
| Total cost per individual at year 0 [USD]: | **368** | **510** |
| (i) Training costs (for 6 months) | 302 | 470 |
| (ii) Program overheads costs | 31 | 4 |
| (iii) Foregone earnings (for 6 months) - average at baseline | 36 | 36 |
| **Panel B. Estimated total earnings benefits** | | |
| **2 Benefits/cost ratio** | **1.69** | **3.56** |
| *Social discount rate = 10%* | 0.98 | 2.06 |
| **3 Internal Rate of Return (IRR)** | **0.098** | **0.211** |
| **Panel C. Sensitivity** | | |
| *Sensitivity to different expected remaining productive life of beneficiaries* | | |
| *Remaining expected productive life = 10 years* | **0.001** | **0.166** |
| **Panel D. Programme Costs for IRR to equate social discount rate** | | |
| **5 Total cost per individual at year 0 [USD]** | **624** | **1814** |

## Figure 7: Comparison of Treatment Impacts to Meta-analysis by McKenzie [2017]

### Panel A: Employment impacts




### Panel B: Earnings impacts



## External Validity

- we have documented large impacts of training relative to studies in middle- and high-income countries: **why?**
- our effect sizes are large relative to literature
- ranking of treatments similar to earlier studies (VT $>$ match)
  - sectoral focus: reduced mismatch
  - worker selection into evaluation sample, low attrition
  - treatment intensity
  - VTI quality (interacting with imperfect information of workers)

## Motivation

- youth unemployment and underemployment are key policy challenges in the developing world
- factors driving youth unemployment:
  - pre labor market: young workers lack skills/info
  - barriers to labor market entry
- **this paper:** labor market field experiment to study these issues
  - both workers and firms constrained
  - returns to VT dominate FT
  - role of VTI sector and certification