Public works as means to push for poverty reduction? Short-term welfare effects of Rwanda's Vision 2020 *Umurenge* Programme

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Preliminary – please do not cite

Public works as anti-poverty intervention

- Revived interest of policy makers in public works programmes
- 'Double dividend': provide employment and construct physical infrastructure to enhance growth
- Confounding factors:
  - Crowding out of on-farm labour and agricultural investment
  - Reduced demand for precautionary savings (asset accumulation)

  (Deaton, 1989, 1991; Rosenzweig and Binswanger, 1993)
- Empirically there is some evidence that short-run effects are not very strong:
  - Gilligan et al. (2009); Berhane et al. (2011); Anderson et al. (2011)

Gist of the study

We use a two-round household panel to explore short-term welfare effects of the public works component of the VUP

- Food consumption,
- asset accumulation (livestock), and
- crop investment.

Findings:

- Public works targets relatively 'better off' households
- Increased consumption and investment in the short-run
- Qualitative evidence suggest that improvements are short-lived

The Vision 2020 *Umurenge* Programme (VUP)

- Flag-ship anti-poverty programme in Rwanda launched in 2008
- Key characteristics:
  - 3 components: Public works, direct support, financial services
  - Phased implementation: Started in poorest sector in each district, yearly expansion, nation wide coverage reached by 2016
  - Beneficiaries selected by communities
  - Beneficiary selection criteria:
    - Household is categorised in bottom 2 *Ubudehe* categories
    - Public works: At least one adult member able to work
  - Initial eligibility period: 12 months (now: re-targeting after 2 yrs.)
  - Public works:
    - Wage set locally
    - Wage transferred to beneficiary bank account on a two-weekly basis
    - 'Training' on productive use of transfers

Main infrastructure generated by public works

	Financial Year (FY) 2008	FY 2009	FY 2009/10	FY 2010/11	FY 2011/12
# of projects	38	35	123	187	229
Anti-erosive ditches (ha)	2,376	2,702	17,782	23,247	6,322
Radical terraces (ha)	318	280	5,446	3.875	4,450
Valley dams (#)	40	--	70	485	8
Ponds (#)	--	--	--	116	38
Marsh land rehabilitation (ha)	--	--	--	22	3
Roads (km)	166	72	131	485	749
Bridges (#)	--	--	88	6	1
Water infrastructure (km)	--	--	32	82	106
Electricity (km)	--	--	--	3	1,112
School classrooms & admin. (#)	--	--	43	78	154
School latrines (#)	--	--	--	24	54
Health centres (#)	--	--	2	4	10
Markets (#)	--	--	4	1	2

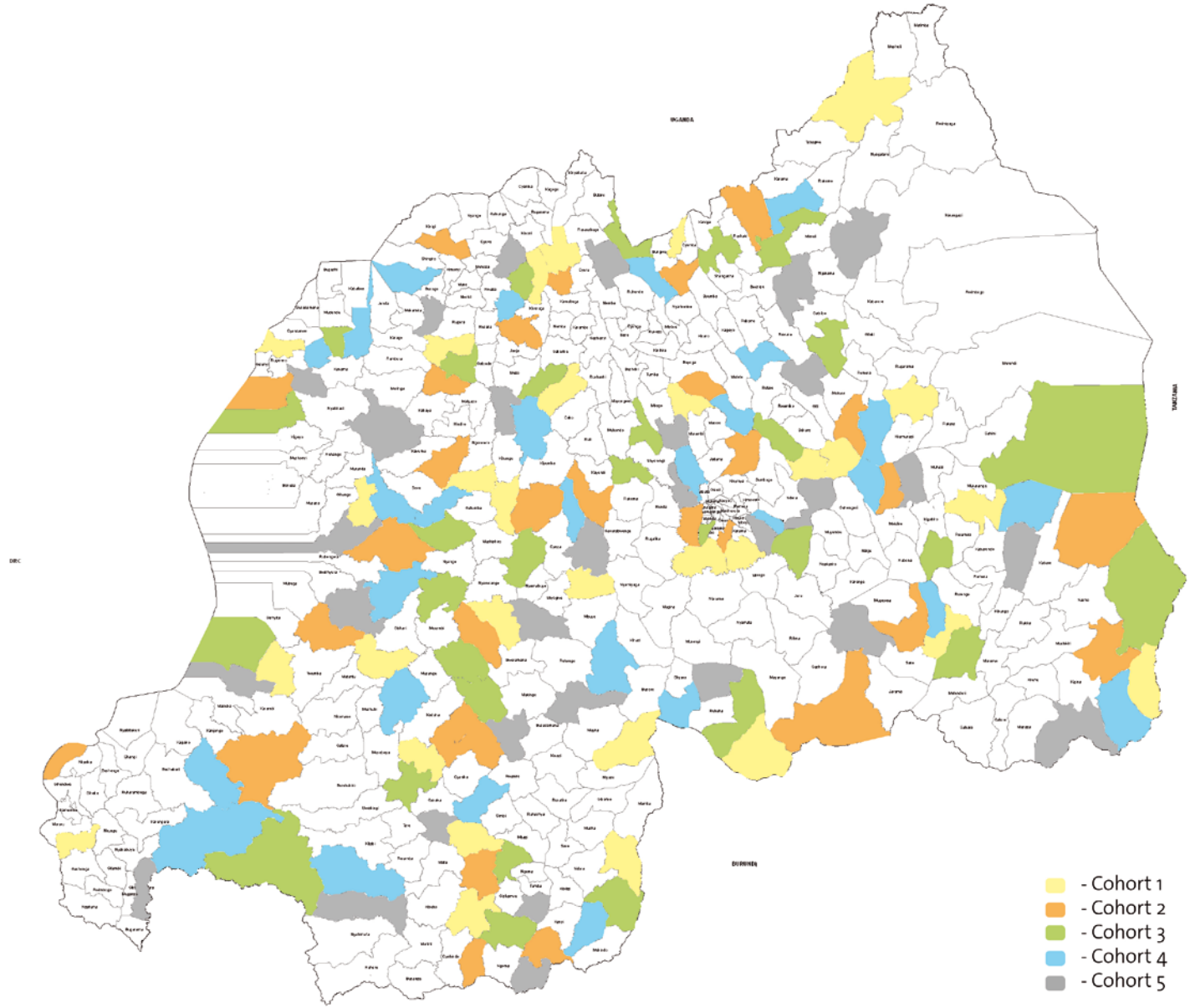
PW participation and income

	Financial Year (FY) 2008 [1)]	FY 2009 [1)]	FY 2009/10	FY 2010/11	FY 2011/12
# of eligible households (according to targeting list)	--	--	64,554	124,581	143,291
# of beneficiary households	18,304	17,886	61,335	103,557	94,427
% of female headed households	--	--	49	46	46
Average days worked per household	43	47	69	45	42
Average wage earned per household (RwF)	38,305	42,311	63,423	45,168	45,242
Average daily wage paid (RwF)	890	900	919	1,003	1,077
% of total PW cost spent on labour	88	86	88	45	47

Data

- 2009 VUP household poverty survey:
  - Conducted: Oct-Dec 2009 → *15 months after the launch of the programme*
  - Coverage: 2,771 households in 90 sectors
    - Cohort 1: 30 sectors where programme was launched in 2008
    - Cohort 2: 30 sectors where programme just started implementation
    - Cohort 3: 30 sectors where programme will be launched in 2010 → *Baseline*

- Follow-up survey in 2011:
  - Conducted: Aug-Dec 2011
  - Coverage: 4,449 households in 150 sectors
    - Panel of 2,567 households already sampled in 2009 (Attrition: 8%)
    - Additional sample of Cohorts 4 & 5
    - Cohort 3: Programme now operating for 12-15 months


- Cohort 1
- Cohort 2
- Cohort 3
- Cohort 4
- Cohort 5

Descriptives

- Public works households[+]:
  - Household head: 61% male; on average 43.5 yrs of age; 46% literate
  - Household: ~4 members; **1.5 members able to work**; live in single structure with earth floor (92%); 64% plot size below 0.25ha; 18% in *Ubudehe* 1, 45% in *Ubudehe* 2, **36% in *Ubudehe* 3 or higher**

- The eligible non-participant households[+]:
  - Household head: 43% male; on average 47 yrs. of age; 39% literate
  - Household: ~4 members; **2 members able to work**; ~ more likely have a dependent elderly member; live in single structure with earth floor (94%); 70% plot size below 0.25ha

[+] Cohort 3, 2009 baseline characteristics

Selection

- Reasons why some households **don't** participate:
  - Distance to public works site too far
  - Work too hard
  - Wage too low
  - Unable to pre-finance 2 weeks expenses & bank account
  - Household responsibilities

- Reasons why some households **can't** participate:
  - Rationing/Rotation

- Reasons why some households **do** participate:
  - Project offers more positions that public works eligible

Econometric approach

- Matching:
  - Probit model of public works participation on covariates that influence decision to participate over the households in VUP sectors (Cohort 1)
  - Coefficients used to predict probability to participate in non-VUP sectors (Cohort 2 & 3)
  - Matching of participants in VUP sectors to hypothetical participants in non-VUP sectors → different algorithms
  - Sample split into participants, hypothetical participants and non-participants in VUP and control sectors
  - Difference in matched non-participants to account for regional differences

Econometric approach

- Double difference (cohort 3 only):

$$ATT = \mathbb{E}(Y_1 - Y_0 \mid T_1 = 1) - \mathbb{E}(Y_1 - Y_0 \mid T_1 = 0)$$

  - Within estimator

$$Y_{it} = \alpha_i + \theta^D \cdot 1(t = 2011) + \mu^D \cdot treated \times 1(t = 2011) + C'_{it}\delta^D + \varepsilon_{it}^D$$

α_1= Household fixed effects

C'_{it} = Vector of household characteristics

Determinants of public works participation

	Coefficients	Marginal effects
Male (=1)	0.244	0.045
Age	0.007	0.001
Handicapped (=1)	-0.201	-0.037
Literate (=1)	-0.360 ***	-0.067
# HH members	0.005	0.001
# HH members able to work	-0.027	-0.005
# elderly	-0.575 **	-0.107
# children	-0.041	-0.008
Distance to nearest transport (min.)	0.001 **	0.000
Distance to administration (min.)	-0.005 **	-0.001
Participation in social mapping (=1)	0.478 ***	0.089
Ubudehe category 1 (=1)	0.942 **	0.175
Ubudehe category 2 (=1)	1.246 ***	0.232
Ubudehe category 3 (=1)	0.760 *	0.142
Ubudehe category 4 (=1)	0.270	0.050
Pseudo R-squared	0.177	
N	793	

What matters?

- Household composition
- Distance
- **Participation in targeting exercise**
- Poverty category (**mistargeting**...)

Note: Robust standard errors clustered at the cell level. * p<0.10; ** p<0.05; *** p<0.01.

Balancing

Variable	PW	Hypothetical PW	P-value
Male (=1)	0.65	0.65	0.957
Age	46.26	45.91	0.827
Handicapped (=1)	0.38	0.36	0664
Literate (=1)	050	0.49	0.828
# HH members	4.83	4.78	0833
# HH members able to work	1.84	1.86	0.921
# elderly	0.16	0.14	0.653
# children	0.95	0.97	0.805
Distance to nearest transport (min.)	76.38	76.10	0.978
Distance to administration (min.)	33.27	32.05	0.677
Participation in social mapping (=1)	0.70	0.74	0.360
Ubudehe category 1 (=1)	0.13	0.11	0.586
Ubudehe category 2 (=1)	0.41	0.44	0.569
Ubudehe category 3 (=1)	0.36	0.36	0.555
Ubudehe category 4 (=1)	0.10	0.08	0.409
N	*141*	*507*	

Note: The p-values represent the result of the t-test on the equality of means.
* p<0.10; ** p<0.05; *** p<0.01.

Balanced sample across all characteristics

Results

	PSM (2009 cross-section)	DID (2009 cross-section)	DID without matching (cohort 3 panel)	Matched DID (cohort 3 panel)
Per capita food cons. (RwF/day)	176.769	161.157	141.937 **	154.926 **
	(106.713)	(125.658)	(69.953)	(70.497)
Per capita food cons. (ln)	0.118	0.014	0.211 ***	0.221 ***
	(0.078)	(0.086)	(0.070)	(0.072)
Protein consumed (=1)	0.004	0.033	-0.002	0.008
	(0.043)	(0.044)	(0.037)	(0.038)
Non-financial asset index	0.139 **	0.167 **	---	---
	(0.069)	(0.067)		
Productive asset index	0.161 **	0.128 *	---	---
	(0.072)	(0.077)		
Livestock holding (TLU)	0.196 *	0.186 *	0.278 ***	0.296 ***
	(0.102)	(0.110)	(0.104)	(0.105)
Crop investment (=1)	0.145 ***	0.080	0.100 **	0.090 **
	(0.052)	(0.058)	(0.040)	(0.041)
Crop input (RwF/year)	1,086.2 ***	1,171.0	1,656.3 *	1,375.6
	(475.140)	(967.628)	(924.179)	(944.89)
Crop input (ln)	0.181	0.179	0.245	0.295
	(0.162)	(0.211)	(0.232)	(0.252)
Controls		Yes	Yes	Yes
N	141+507=658	2,349	1,451	1,294

Increase in food consumption by 22%

~ 60% of the transfer

Robust effect on livestock investment

Positive indication on crop investment

Discussion

- What drives the investment decisions?

  *'Because of **the mobilisation** from VUP about what we can buy, I bought a goat which reproduced and now I have five goats to get manure. I would like to buy a cow but the money was not enough.'*

  *'After **the training**, on my way from getting the money, I bought a goat. Later on I bought a pig which I sold for 9000 RwF and I bought another goat which produced three more goats that I still have now.'*

  *'At first I bought a pig but it died from a disease. I got the idea to buy the pig from **VUP mobilisation**.'*

Discussion

- Has the VUP improved household welfare?

'Before VUP, my family suffered from hunger. I used to beg or work for others and get 400 RwF/day. It was not enough to buy food and care about other problems like health services or the school material for my kids. With the money from VUP I bought food, the school material for the kids, and I saved and bought a sewing machine ***but I need training to start a business otherwise I soon just have to go back and work for others****.'*

'My family's ***living conditions improved****. Before VUP we used to beg and work for others in order to get food. I mean I was not paid but I shared the harvest with the farmer. After we graduated from VUP, so early,* ***I start to work like before****, for others and share with the farmers. Of course,* ***I am not as poor as the first time but I need help again****.'*

'After graduating from VUP ***I had to sell the rabbits I bought before to survive*** *again.'*

'When I used to work in terracing for VUP, my living conditions were improving. Before VUP I could not find nutritive food for my kids. With VUP I could buy meat or fish once a month. ***Since I am not benefiting from VUP anymore, there is nothing left at home from what I got with VUP****.'*

Outlook and conclusion

- Small sample size of actual beneficiary households does not allow to investigate heterogeneity in programme effects e.g. by gender
- 'Better-off' households participate in public works.
- Evidence that public works improves food consumption and agricultural investment in the short-term → *in line with programme objectives.*
- However, effects are likely to be only temporary. Beneficiaries demand ongoing support also on entrepreneurial skills.
- Obstacles to participation should be addressed.
- *Matching approach as option for rapid assessment when data is limited.*

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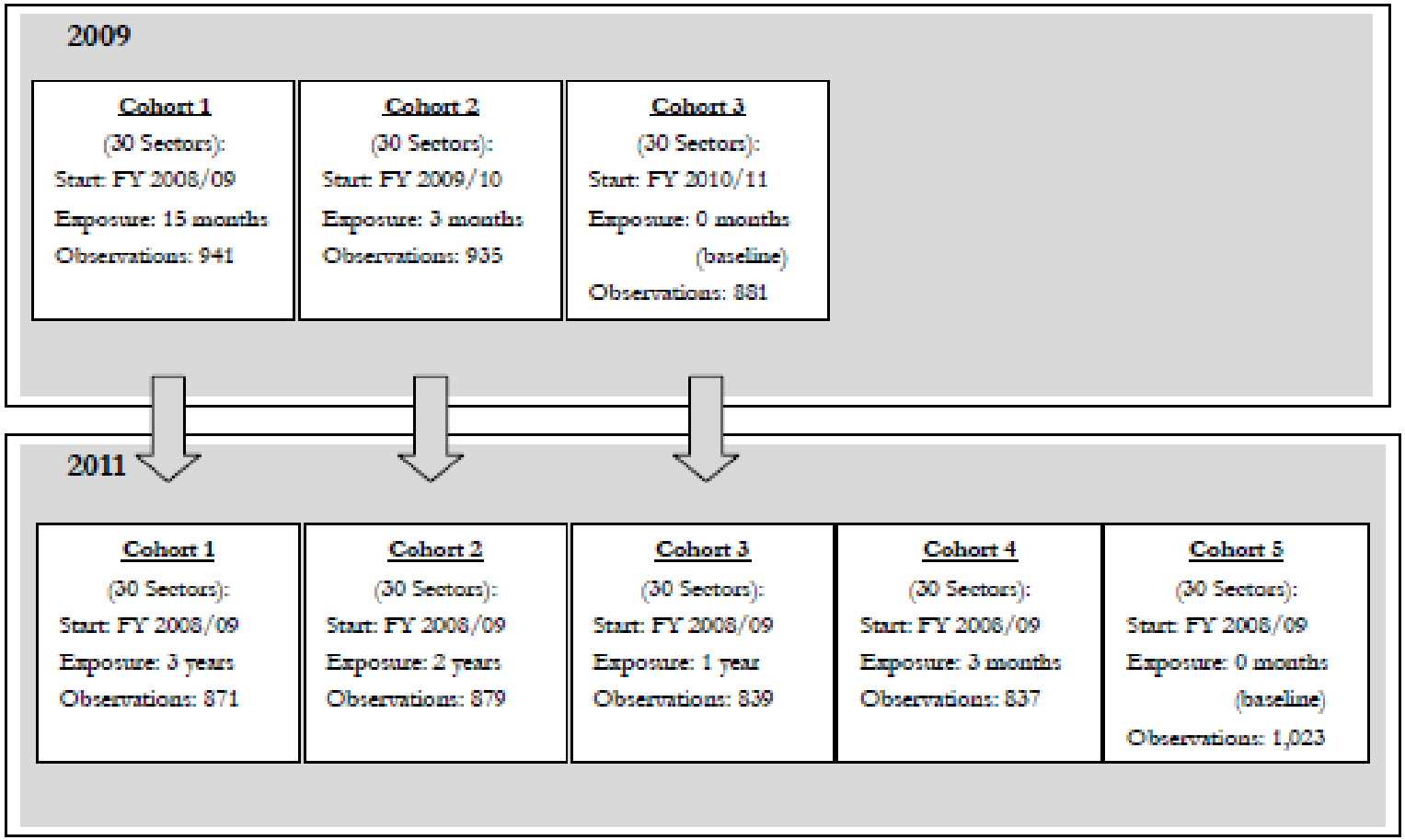
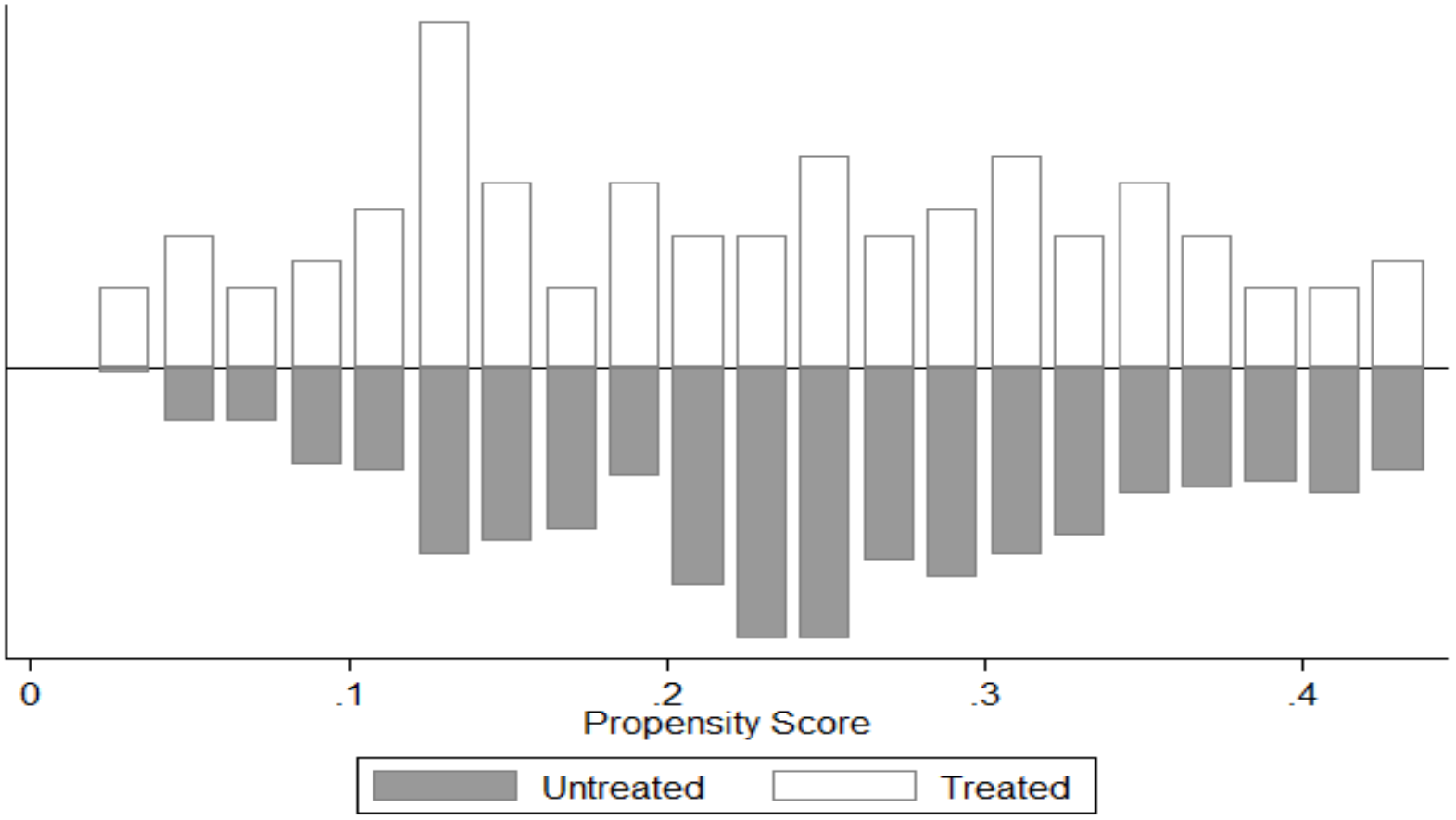
Brief Background - Rwanda

- One of the fastest growing economies in Africa: 2000-2012 average growth rate of 8.2%

  (mostly driven by services and agriculture)
- Large declines in poverty: 12% reduction from 2005/6-2011/12
- Strong supporting policies for the rural poor
  - Vision 2020 *Umurenge* Programme (VUP)
  - *Mutuelles de Santé*
  - *Grinka* – One Cow, One Family Programme
- But still very poor:
  - In 2011, 45% of population BPL, GDP/capita under $ 600
  - 70% of population engaged in agriculture
  - Very small plot size (55% <0.75ha)


2009
Cohort 1
(30 Sectors):
Start: FY 2008/09
Exposure: 15 months
Observations: 941
Cohort 2
(30 Sectors):
Start: FY 2009/10
Exposure: 3 months
Observations: 935
Cohort 3
(30 Sectors):
Start: FY 2010/11
Exposure: 0 months
(baseline)
Observations: 881
2011
Cohort 1
(30 Sectors):
Start: FY 2008/09
Exposure: 3 years
Observations: 871
Cohort 2
(30 Sectors):
Start: FY 2008/09
Exposure: 2 years
Observations: 879
Cohort 3
(30 Sectors):
Start: FY 2008/09
Exposure: 1 year
Observations: 839
Cohort 4
(30 Sectors):
Start: FY 2008/09
Exposure: 3 months
Observations: 837
Cohort 5
(30 Sectors):
Start: FY 2008/09
Exposure: 0 months
(baseline)
Observations: 1,023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Propensity Score
Untreated
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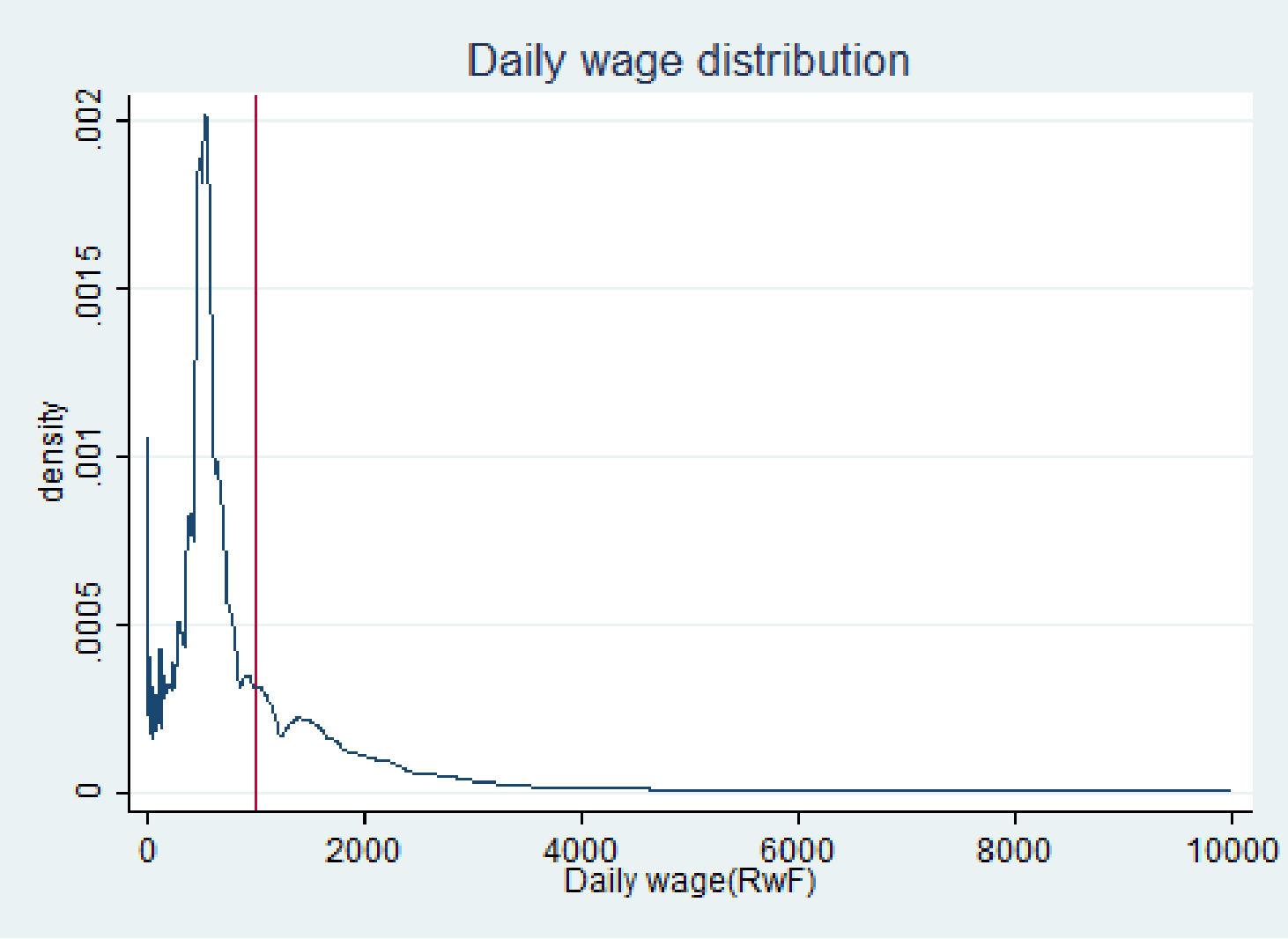
Daily wage distribution
density
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.001
.0015
.002
0
2000
4000
6000
8000
10000
Daily wage(RwF)