Poverty Alleviation in Rwanda: the Impact of the Vision 2020 Umurenge Program

Thierry Kalisa $^1$ and Paul Brimble $^2$

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$^1$ Working in the Rwandan Ministry of Finance and Economic Planning (MINECOFIN) for GIZ, German Development Cooperation.

$^2$ Rwandan Ministry of Finance and Economic Planning (MINECOFIN, Macroeconomic Policy Division)
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Objectives

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- Use of Matching Estimators to evaluate VUP or other Government programs is also relatively new in the literature in Rwanda:
The use of panel data makes it possible to take into account unobserved heterogeneity in the modeling of behaviours. Heterogeneity bias: when some unobserved characteristics may be correlated with some observed individual characteristics.
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### Panel Approach (1) - Heterogeneity

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- These intercepts can be fixed or random.
Panel Approach (2) - Random Effects Ordered Probit

\[ y_{it} = \begin{cases} 
1 & \text{if } y_{it}^* \leq k_1 \text{ or Non poor} \\
2 & \text{if } k_1 < y_{it}^* \leq k_2 \text{ or Poor} \\
3 & \text{if } y_{it}^* > k_2 \text{ or Extremely poor} 
\end{cases} \]

\( y_{it} \) is the level of consumption and \( k_1 \) and \( k_2 \) the poverty lines.

\[ y_{it}^* = x_{it} \beta + v_i + \varepsilon_{it} \]

\( \varepsilon_{it} \) is the error term, \( x_{it} \) the independent variables used.
The parameter of interest is the average treatment effect on the treated (ATET)

\[ E[Y_1 - Y_0|D = 1] = E[Y_1|D = 1] - E[Y_0|D = 0] \]

This can be estimated using the outcome of those not treated:

\[ E[Y_1|D = 1] - E[Y_0|D = 0] = E[Y_1 - Y_0|D = 1] - (E[Y_0|D = 1] - E[Y_0|D = 0]) \]

This gives the ATET and a bias term due to selection which is expected in observational studies.
Instead, we assume that assignment is random conditional on a set of variables:

$$E[Y_0|D, X] = E[Y_0|X]$$

This means that we can estimate the ATT as follows:

$$E[Y_1 - Y_0|D = 1] =$$

$$E(E[Y_1|X, D = 1] - E[Y_0|X, D = 0]|D = 1)$$

Therefore, matching estimators can be used to compare treated households to control households that are similar.

The ATT is a weighted average of different comparisons at each value of X.

We use nearest neighbour matching and propensity score matching estimators.
Matching Approach (3) - VUP Impact Interpretation

- There are problems comparing current and previous VUP beneficiaries
- Instead, we are interested in the impact of additional years of VUP on household consumption
- We examine three impacts:
  1. From 0 to 1 year of VUP
  2. From 1 to 2 years of VUP
  3. From 1 to 2+ year of VUP
### Panel Data (1) - Summary Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>EICV 3 Mean</th>
<th>EICV 4 Mean</th>
</tr>
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<tbody>
<tr>
<td>hsize</td>
<td>4.768</td>
<td>4.763</td>
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<tr>
<td>urban</td>
<td>0.239</td>
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<td>female</td>
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<td>disabled</td>
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<td>insurance</td>
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<tr>
<td>rooms</td>
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<tr>
<td>floorql</td>
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<tr>
<td>roofql</td>
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<td>0.996</td>
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<tr>
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<td>0.572</td>
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<tr>
<td>vup</td>
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<td>0.041</td>
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<tr>
<td>vupds</td>
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<td>0.015</td>
</tr>
<tr>
<td>vuppw</td>
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</tr>
<tr>
<td>vuploan</td>
<td>0.0052</td>
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### Panel Data(2) - Poverty and Location

<table>
<thead>
<tr>
<th></th>
<th>Non Poverty</th>
<th></th>
<th></th>
<th></th>
<th></th>
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<tr>
<td></td>
<td>EICV 3</td>
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<td>Urban</td>
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<td>8.50</td>
<td>4.98</td>
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</tr>
<tr>
<td>Kigali</td>
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<td>81.01</td>
<td>7.26</td>
<td>8.94</td>
<td>5.03</td>
<td>10.06</td>
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</tr>
<tr>
<td>South</td>
<td>49.35</td>
<td>69.05</td>
<td>22.51</td>
<td>20.78</td>
<td>28.14</td>
<td>10.17</td>
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</tr>
<tr>
<td>West</td>
<td>58.82</td>
<td>64.71</td>
<td>20.34</td>
<td>20.10</td>
<td>20.83</td>
<td>15.20</td>
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<tr>
<td>North</td>
<td>58.01</td>
<td>59.79</td>
<td>20.64</td>
<td>24.56</td>
<td>21.35</td>
<td>15.66</td>
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<tr>
<td>East</td>
<td>65.21</td>
<td>68.61</td>
<td>19.95</td>
<td>19.95</td>
<td>14.84</td>
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<tr>
<td>All Households</td>
<td>63.18</td>
<td>68.91</td>
<td>18.39</td>
<td>18.80</td>
<td>18.44</td>
<td>12.29</td>
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</table>
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<table>
<thead>
<tr>
<th>Location</th>
<th>Non Poverty</th>
<th>Poverty</th>
<th>Extreme Poverty</th>
</tr>
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<tbody>
<tr>
<td></td>
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EICV4 VUP Sample
All households in the list are supposed to be VUP beneficiaries
This controls for most characteristics used to select VUP beneficiaries
There were four groups of households:
- Current VUP beneficiaries (1493)
- Previous VUP beneficiaries (587)
- Future VUP beneficiaries (145)
- Others (235)
From current VUP beneficiaries:
- Component breakdown:
  830 for DS, 364 for PW and 378 for FS
- First benefit year breakdown:
  561 for 2013/14, 503 for 2012, 182 for 2011, 188 for 2010
VUP Sample (2) - Matching Variables

- Demographic matching variables:
  - Male (for household head)
  - Urban

- Factors that determine VUP benefits:
  - Household size
  - Household workers (total)
  - Household disable (binary if one household member is disabled)
  - Household elder (binary if one household member is elderly)

- These factors ensure comparisons between appropriate households

- VUP benefits differ for DS, PW and FS
## Panel Approach

<table>
<thead>
<tr>
<th>Variable</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
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<tbody>
<tr>
<td>hsize</td>
<td>0.26***</td>
<td>0.26***</td>
<td>0.26***</td>
<td>0.26***</td>
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<tr>
<td>urban</td>
<td>−0.34***</td>
<td>−0.34***</td>
<td>−0.35***</td>
<td>−0.35***</td>
</tr>
<tr>
<td>north</td>
<td>0.08</td>
<td>0.08</td>
<td>0.08</td>
<td>0.08</td>
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<tr>
<td>east</td>
<td>−0.25**</td>
<td>−0.24*</td>
<td>−0.24*</td>
<td>−0.25**</td>
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<tr>
<td>west</td>
<td>0.003</td>
<td>0.011</td>
<td>0.006</td>
<td>0.008</td>
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<tr>
<td>south</td>
<td>0.023</td>
<td>0.029</td>
<td>0.025</td>
<td>0.023</td>
</tr>
<tr>
<td>female</td>
<td>0.22***</td>
<td>0.22***</td>
<td>0.22***</td>
<td>0.22***</td>
</tr>
<tr>
<td>disabled</td>
<td>0.33***</td>
<td>0.33***</td>
<td>0.33***</td>
<td>0.34***</td>
</tr>
<tr>
<td>insurance</td>
<td>−0.28***</td>
<td>−0.28***</td>
<td>−0.28***</td>
<td>−0.28***</td>
</tr>
<tr>
<td>age</td>
<td>0.035***</td>
<td>0.035***</td>
<td>0.035***</td>
<td>0.035***</td>
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<tr>
<td>agesq</td>
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<td>−0.0004***</td>
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<td>−0.046***</td>
<td>−0.046***</td>
<td>−0.046***</td>
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<tr>
<td>electricity</td>
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<td>−0.80***</td>
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</tr>
<tr>
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<td>−0.22***</td>
</tr>
<tr>
<td>floorql</td>
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<td>−0.86***</td>
<td>−0.86***</td>
<td>−0.87***</td>
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<tr>
<td>roofql</td>
<td>−0.35*</td>
<td>−0.35*</td>
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<td>−0.34*</td>
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<tr>
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<td>vuppw</td>
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<td>vuploan</td>
<td></td>
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<td></td>
<td>−0.26</td>
</tr>
</tbody>
</table>
## Matching Approach (1)

### VUP Impact on Log Consumption

<table>
<thead>
<tr>
<th></th>
<th>0 to 1</th>
<th></th>
<th>1 to 2</th>
<th></th>
<th>1 to 2+</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nearest Neighbour</td>
<td>Propensity Score</td>
<td>Nearest Neighbour</td>
<td>Propensity Score</td>
<td>Nearest Neighbour</td>
<td>Propensity Score</td>
</tr>
<tr>
<td>VUP</td>
<td>0.156** (0.072)</td>
<td>0.170*** (0.058)</td>
<td>−0.032 (0.049)</td>
<td>−0.028 (0.048)</td>
<td>0.041 (0.042)</td>
<td>0.039 (0.041)</td>
</tr>
<tr>
<td>Direct Support</td>
<td>0.211** (0.097)</td>
<td>0.076 (0.119)</td>
<td>0.034 (0.062)</td>
<td>0.039 (0.073)</td>
<td>0.111* (0.057)</td>
<td>0.166** (0.065)</td>
</tr>
<tr>
<td>Public Works</td>
<td>0.104 (0.093)</td>
<td>0.167 (0.108)</td>
<td>−0.116 (0.154)</td>
<td>−0.147 (0.147)</td>
<td>−0.018 (0.105)</td>
<td>−0.075 (0.106)</td>
</tr>
<tr>
<td>Financial Services</td>
<td>0.043 (0.102)</td>
<td>0.112 (0.128)</td>
<td>−0.022 (0.090)</td>
<td>−0.047 (0.090)</td>
<td>−0.002 (0.088)</td>
<td>0.049 (0.086)</td>
</tr>
</tbody>
</table>

Independent variable = \( \ln(\text{consumption}) \). Binary matching variables: urban, household head male, household disabled and household elder. Discrete matching variables: household size and number of household workers. Standard errors are in parentheses. Significance level: * (0.10), ** (0.05) and *** (0.01).
Matching Approach (2) - Main Results

- VUP benefits are positive and significant from 0 to 1
  This shows that there is an immediate short term effect

- VUP benefits are insignificant from 1 to 2 and from 1 to 2+
  This shows that there are no medium term and long term effects on consumption
  There may be additional benefits such as economic stability (ability to accommodate shocks)

- VUP DS benefits are positive and significant from 1 to 2+
  This shows that there may be long term effects for direct support
Policy Recommendations

- Direct support should be extended and cover more people than just those unable to work.
- Public works challenge: lack of available work, it could be more efficient to redirect people to direct support in such sectors.
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