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Georgia’s Input Subsidy Program
Exploring targeting possibilities

Phatima Mamardashvili, Irakli Kochlamazashvili, Salome Gelashvili and Ia Katsia
Input subsidy programs in developing countries

Overview of the program in Georgia

Assessing the effectiveness of the program (focus groups)

Targeting (marginal productivity of fertilizers)

Conclusion and outlook
Input subsidy programs in developing countries

Since the mid-2000s: Programs are back on policy agendas

"Smart subsidies":

(i) targeted to poor farmers who otherwise could not afford buying inputs

(ii) contribute to commercially viable input supply systems,

(iii) limited in time

1) Economic objective

2) Social objective

Killing two birds with one stone
The program in Georgia

- Total number of agricultural holding: 700,000
- Average farm size: 1.22 ha

Area of holdings by size:
- under 4.99 ha: 35%
- 5-9.99 ha: 60%
- 10 ha and over: 5%

Number of holdings by size:
- under 4.99 ha: 98%
- 5-9.99 ha: 1%
- 10 ha and over: 1%

Source: Geostat, Agricultural Census 2004
The program in Georgia

Agricultural Card Program (ACP)

• Started in Spring 2013
• Budget
  • 2013: 200 mln GEL*
  • 2014: 90 mln GEL
  • 2015: 50 mln GEL
  • 2016: 50 mln GEL

1. Plowing card
2. Agro card (for seeds, fertilizers, pesticides)

* 1 GEL = 0.44 USD

Total state budget for the Ministry of Agriculture:
260-280 mln GEL

Phatima Mamardashvili, ISET
The program in Georgia

Key statistics

Output of Georgian Agriculture
(in current mln GEL)

Source: Geostat, 2016

Main crop: Maize (62%)
The program in Georgia

Key statistics

Sown Areas in Georgia

(thousand ha)

Source: Geostat, 2016
The program in Georgia

Key statistics

Total Value of Imported Herbicides
(in current thousand USD)

Value of Imported Fertilizers
(thousand USD)

Source: Geostat, 2016
Assessing the effectiveness of the program

Method: Qualitative assessment of the program

Collection of data (March-April 2015)

- Focus Group Discussions with farmers
- Individual interviews with input suppliers and service providers

In 6 regions of Georgia: different agro-economic zones (e.g. irrigated arable lowland east, arable and fruit west, upland mixed crop and livestock including some close to input/output markets and others more distant from markets).
Assessing the effectiveness of the program

Results

- Overall: a positive feedback from farmers/input suppliers

- Program administration
  - Information about the land ownership: mostly informal
  - Some problems with timely delivery of vouchers
  - A lot of cases of returning plowing cards
Assessing the effectiveness of the program

Results

- **Access to machinery and inputs**
  - access to machinery and fertilizers increased
  - more input suppliers are available in the municipality centers
  - variety of inputs increased
  - access to quality seeds is still a problem

- **Plowed land, input use and output**
  - Increase in the amount of land plowed
  - Increase in the amount of fertilizers applied
  - No increase in outputs due to damages from droughts
Assessing the effectiveness of the program

Results

- **Input suppliers and input prices**
  - Increase in the turnover and revenues of input suppliers.
  - Threshold for maximum price was set by the government
  - Some increase in input prices (mostly because of the exchange rate)

- **Linkages**
  - New linkages
  - Strengthening of linkages
  - Sometime consultations are also provided
Assessing the effectiveness of the program

Results

General problems identified

- Some more important issues than plowing and input use
  - Absence of irrigation is a big problem in East Georgia
  - Remoteness to markets in a big issue in West Georgia
- No **targeting**, neither geographic (priorities for different regions) nor by poverty considerations
- No clear **exit strategy**
- No consideration of **farmers knowledge** (e.g., proper use of fertilizer and pesticides)
Assessing the effectiveness of the program

Main recommendations

- **Phasing out??** But 2016 is the election year in Georgia...
- Clear exit strategy
- Improving access of farmers to information about better agricultural practices
- Better **targeting**.

Targeting possibilities:

- Marginal productivity of inputs (e.g., fertilizers)
- Poverty scores
Targeting

Methodology

Translog output distance function is estimated

- Output: maize output
- Inputs: land, labor, capital and fertilizers

Estimated parameters for inputs are used to calculate marginal productivity of fertilizer use

Two ideal target groups are defined:

1. Ideal target group 1: 25% of “best” (in terms of highest marginal productivity) farms
2. Ideal target group 2: 10% of “best” (in terms of highest marginal productivity) farms
Targeting

Methodology

\[ G^{tg} = \frac{S_{11}}{F}, \quad G^{ntg} = \frac{S_{12}}{1-F}, \quad T = G^{tg} - G^{ntg} \]

F: the proportion of farmers in the respective target group

S_{11}: the proportion of all farmers that are in the target group and receive ACP

S_{12}: the proportion of all farmers that are not in the target group but receive ACP.

T = 1: perfectly targeted to the farmers in the ideal target group

T = -1: fully reach farmers not in the ideal target group

T = 0: no targeting at all
Targeting

Data

Sample Survey of Agricultural Holdings in Georgia (GeoStat): 5,000 representative farms

- Subsample of maize farmers who cultivate up to 5 ha of arable land
- Years: 2007-2014
- N=15,724

Main figures of the subsample

<table>
<thead>
<tr>
<th></th>
<th>Average</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land cultivated (ha)</td>
<td>0.36</td>
<td>0.25</td>
</tr>
<tr>
<td>Maize produced per ha (in tons)</td>
<td>1.7</td>
<td>1</td>
</tr>
</tbody>
</table>
## Results

### Production technology

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimated coefficient</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>$x_l$ (land)</td>
<td>-0.212 ***</td>
<td>0.042</td>
</tr>
<tr>
<td>$x_w$ (labor)</td>
<td>-0.040 n.s.</td>
<td>0.084</td>
</tr>
<tr>
<td>$x_c$ (capital)</td>
<td>-0.024 n.s.</td>
<td>0.037</td>
</tr>
<tr>
<td>$x_f$ (fertilizers)</td>
<td>-0.402 ***</td>
<td>0.039</td>
</tr>
<tr>
<td>$t$ (time)</td>
<td>-0.083 ***</td>
<td>0.035</td>
</tr>
<tr>
<td>$t_t$</td>
<td>0.024 ***</td>
<td>0.008</td>
</tr>
</tbody>
</table>

*significant at 1% = ***, significant at 5% = **, significant at 10% = *, not significant = n. s.*

### Technical efficiency

<table>
<thead>
<tr>
<th></th>
<th>Technical Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.87</td>
</tr>
<tr>
<td>SD</td>
<td>0.08</td>
</tr>
<tr>
<td>Range</td>
<td>0.68-1.00</td>
</tr>
<tr>
<td>5(^{th}) percentile</td>
<td>0.72</td>
</tr>
<tr>
<td>10(^{th}) percentile</td>
<td>0.73</td>
</tr>
<tr>
<td>25(^{th}) percentile (lower quartile)</td>
<td>0.82</td>
</tr>
<tr>
<td>50(^{th}) percentile (median)</td>
<td>0.90</td>
</tr>
</tbody>
</table>

### Marginal effect of fertilizers

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Median</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.98</td>
<td>1.00</td>
<td>8.40</td>
</tr>
</tbody>
</table>
Targeting

Results

Targeting performance for the target group 1 (25% of “best farms”)

\[ G^{tg} = \frac{s_{11}}{F} \] (the proportion of farmers in the ideal target group that receive ACP) 0.896

\[ G^{ntg} = \frac{s_{12}}{1-F} \] (the proportion of farmers not in the ideal target group that receive ACP) 0.313

\[ T = G^{tg} - G^{ntg} \] (targeting differential) \(0.583\)

Targeting performance for the target group 2 (10% of “best farms”)

\[ G^{tg} = \frac{s_{11}}{F} \] (the proportion of farmers in the ideal target group that receive ACP) 0.880

\[ G^{ntg} = \frac{s_{12}}{1-F} \] (the proportion of farmers not in the ideal target group that receive ACP) 0.868

\[ T = G^{tg} - G^{ntg} \] (targeting differential) \(0.012\)
Targeting

Conclusion

Low targeting performance in terms of fertilizer productivity.

But there are other objectives of the program such as

- Developing value chain linkages
- Social objectives.

Also,

- targeting would increase administration costs
- elite capturing might impair benefits of targeting

Outlook

- Estimating possible costs of not-targeting
- Calculating possible administration costs for targeting
- Analyze data from Agricultural Input Survey 2014 (N=4000); follow up survey is planned in spring 2017
References

• APMA, 2016. Agricultural Projects Management Agency (APMA) of the Ministry of Agriculture of Georgia. www.apma.ge


Thank you!

Questions

Agricultural Policy Research Center
at ISET Policy Institute

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Annexes
Agriculture statistics of Georgia

Total Value of Imported Herbicides
(in current thousand USD)

Value of Imported Fertilizers
(in current thousand USD)

Source: Geostat, 2016
Agriculture statistics of Georgia

Productivity of Maize
(tons per ha)

Source: Geostat, 2016
Translog output distance function

\[-\ln y_i = \alpha_0 + \sum_{k=1}^{K} \alpha_k \ln x_{ki} + \frac{1}{2} \sum_{k=1}^{K} \sum_{l=1}^{K} \alpha_{kl} \ln x_{ki} \ln x_{li} + u_i + \nu_i\]

- \(u_i \sim \text{i.i.d.} \ N^+(0, \sigma_u^2)\)
- \(\nu_i \sim \text{i.i.d.} \ N(0, \sigma_v^2)\)
- both, \(u\) und \(v\) are heteroscedastic and their variance could be explained with several exogenous variables \(\sigma^2 v_i = f(z_{it}, \delta), \ \sigma^2 u_i = f(z_{it}, \delta)\)
## Parameter estimates

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimated coefficient</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>xl (land)</td>
<td>-0.212 ***</td>
<td>0.042</td>
</tr>
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<td>-0.040 n.s.</td>
<td>0.084</td>
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<tr>
<td>xc (capital)</td>
<td>-0.024 n.s.</td>
<td>0.037</td>
</tr>
<tr>
<td>xf (fertilizers)</td>
<td>-0.402 ***</td>
<td>0.039</td>
</tr>
<tr>
<td>t (time)</td>
<td>-0.083 ***</td>
<td>0.035</td>
</tr>
<tr>
<td>tt</td>
<td>0.024 ***</td>
<td>0.008</td>
</tr>
<tr>
<td>xlt</td>
<td>0.011 n.s.</td>
<td>0.009</td>
</tr>
<tr>
<td>xwt</td>
<td>0.024 n.s.</td>
<td>0.018</td>
</tr>
<tr>
<td>xkt</td>
<td>0.002 n.s.</td>
<td>0.001</td>
</tr>
<tr>
<td>xft</td>
<td>0.013 n.s.</td>
<td>0.009</td>
</tr>
<tr>
<td>xll</td>
<td>0.191 ***</td>
<td>0.034</td>
</tr>
<tr>
<td>xww</td>
<td>0.470 **</td>
<td>0.229</td>
</tr>
<tr>
<td>xkk</td>
<td>0.004 n.s.</td>
<td>0.006</td>
</tr>
<tr>
<td>xff</td>
<td>0.079 ***</td>
<td>0.021</td>
</tr>
<tr>
<td>xlw</td>
<td>0.097 n.s.</td>
<td>0.106</td>
</tr>
<tr>
<td>xlk</td>
<td>0.014 *</td>
<td>0.008</td>
</tr>
<tr>
<td>xlf</td>
<td>-0.065 n.s.</td>
<td>0.047</td>
</tr>
<tr>
<td>xwk</td>
<td>0.011 n.s.</td>
<td>0.017</td>
</tr>
<tr>
<td>xwf</td>
<td>-0.115 n.s.</td>
<td>0.100</td>
</tr>
<tr>
<td>xkf</td>
<td>0.031 ***</td>
<td>0.007</td>
</tr>
<tr>
<td>_cons</td>
<td>-0.020 n.s.</td>
<td>0.115</td>
</tr>
</tbody>
</table>

**Heteroscedas. in u**

| Parcel quantity | -1.107 *** | 0.233 |

**Heteroscedas. in v**

| Parcel quantity | 0.161 *** | 0.001 |
| Age             | 0.008 *** | 0.001 |

Note 1: significant at 1% = ***, significant at 5% = **, significant at 10% = *, not significant = n. s.

Note 2: negative sign of coefficient estimate for heteroscedasticity in u indicate negative influence on inefficiency (u) and thus positive influence on efficiency.
# Targeting differential

## Ideal target group 1: 25% of “best” (in terms of highest marginal productivity) farms

<table>
<thead>
<tr>
<th></th>
<th>Formula</th>
<th>Calculation</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>$F$ (the proportion of farmers in the respective target group)</td>
<td>$\frac{4076}{15724}$</td>
<td>0.259</td>
<td></td>
</tr>
<tr>
<td>$S_{11}$ (the proportion of all farmers that are in the target group and receive ACP)</td>
<td>$\frac{3641}{15724}$</td>
<td>0.232</td>
<td></td>
</tr>
<tr>
<td>$S_{12}$ (the proportion of all farmers that are not in the target group but receive ACP)</td>
<td>$\frac{10019}{15724}$</td>
<td>0.232</td>
<td></td>
</tr>
<tr>
<td>$G^{tg} = \frac{S_{11}}{F}$ (the proportion of farmers in the ideal target group that receive ACP)</td>
<td>$0.896$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$G^{ntg} = \frac{S_{12}}{1-F}$ (the proportion of farmers not in the ideal target group that receive ACP)</td>
<td>$0.313$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$T = G^{tg} - G^{ntg}$ (targeting differential)</td>
<td>$0.583$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Ideal target group 2: 10% of “best” (in terms of highest marginal productivity) farms

<table>
<thead>
<tr>
<th></th>
<th>Formula</th>
<th>Calculation</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>$F$ (the proportion of farmers in the respective target group)</td>
<td>$\frac{1570}{15724}$</td>
<td>0.100</td>
<td></td>
</tr>
<tr>
<td>$S_{11}$ (the proportion of all farmers that are in the target group and receive ACP)</td>
<td>$\frac{1378}{15724}$</td>
<td>0.088</td>
<td></td>
</tr>
<tr>
<td>$S_{12}$ (the proportion of all farmers that are not in the target group but receive ACP)</td>
<td>$\frac{12282}{15724}$</td>
<td>0.781</td>
<td></td>
</tr>
<tr>
<td>$G^{tg} = \frac{S_{11}}{F}$ (the proportion of farmers in the ideal target group that receive ACP)</td>
<td>$0.88$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$G^{ntg} = \frac{S_{12}}{1-F}$ (the proportion of farmers not in the ideal target group that receive ACP)</td>
<td>$0.868$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$T = G^{tg} - G^{ntg}$ (targeting differential)</td>
<td>$0.012$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>