Impacts of improved roads on rural households

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In next 10 minutes I will try to show

Improved road network improves:

1. Households’ living conditions and project complementarity
2. Households’ economic outcomes and spending in human capital
3. Access to jobs and individual non-agricultural employment

By:

• Combing different econometric methods
• Combining different sets of data
  • household and village surveys
  • geospatial data,
  • administrative data
  • historical maps
Background

<table>
<thead>
<tr>
<th></th>
<th>Georgia</th>
<th>Armenia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>3.7 million</td>
<td>3 million</td>
</tr>
<tr>
<td>GDP</td>
<td>$14 bln.</td>
<td>$10.5 bln.</td>
</tr>
<tr>
<td>GDP per capita</td>
<td>$9,600</td>
<td>$8,400</td>
</tr>
<tr>
<td>Rural population</td>
<td>46%</td>
<td>37%</td>
</tr>
</tbody>
</table>

Note: In GEL for Georgia and in AMD for Armenia.
Background - Improved Roads in Georgia
1. Impact on household living conditions

Data

**GIS:**
Built-up grid, ASTER Elevation, USGS water cover, Settlement/city locations, OpenStreetMaps.

**Administrative:**
Census, Road list, paper based road rehabilitation projects.

**Surveys:**
Welfare Monitoring Survey (UNICEF), Village Infrastructure Survey.

Method - Optimal least cost path road network

**Figure:** Cost raster with least cost path spanning tree network. The rehabilitated roads and the cost tree network.
## Results – Complementarity and impacts on living conditions

<table>
<thead>
<tr>
<th>Access to Utilities</th>
<th>Facilities at home</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Gas</td>
<td>• Shower/bath</td>
</tr>
<tr>
<td>• Water</td>
<td>• Shower/bath inside</td>
</tr>
<tr>
<td>• Sewage</td>
<td>• Piped water</td>
</tr>
<tr>
<td>• Waste disp.</td>
<td>• Water inside</td>
</tr>
<tr>
<td>• Internet</td>
<td>• Hot water</td>
</tr>
<tr>
<td></td>
<td>• Electric/gas heater</td>
</tr>
</tbody>
</table>
2. Impact on household income and expenditure

Data

GIS:
OpenStreetMaps, Digitized road network, Settlement/city locations, OD Matrix.

Administrative:
Census, Road list, paper based road rehabilitation projects.

Surveys:

Method - Treatment & control settlements (diff-in-diff)

Figure: Pre-project comparisons: Population, Altitude, Rural settlement, Distances: to municipal center, to nearest health center, to nearest market, to nearest major road, to nearest secondary road, to nearest int. railway, Number of schools in the settlement.
Results - Impact on household income and expenditure

- Regular monthly income
- Total non-food expenditure
- Long-term expenditure
- Short-term expenditure
- Expenditure on education

<table>
<thead>
<tr>
<th>Table 4.6.2: Impact on rural households</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td>total exp</td>
</tr>
<tr>
<td>food exp</td>
</tr>
<tr>
<td>totfexp</td>
</tr>
<tr>
<td>lteexp</td>
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<tr>
<td>sftexp</td>
</tr>
<tr>
<td>edexp</td>
</tr>
<tr>
<td>hexp</td>
</tr>
<tr>
<td>income1</td>
</tr>
<tr>
<td>income2</td>
</tr>
</tbody>
</table>

- DfD
  - 0.060
  - (0.070)
- time
  - 0.222***
  - (0.070)
- HH controls
  - Yes
  - Yes
  - Yes
  - Yes
  - Yes
  - Yes
  - Yes
  - Yes

Observations 2,522
HH number 1,261
R-squared 0.179

Household controls include: family size, child, older, idp, hhead_age, hhead_vst, hhead_educ, livestock.

Robust standard errors in parentheses ***p<0.01, **p<0.05, *p<0.1.
3. What about road quality?

Figure (up): Integrated Living Conditions Survey data
Figure (left): World Bank Road quality data
3. Impact on rural employment

Method - Historical road network

**Figure:** Military-topographic map of Caucasus, 1903

**Figure:** Background - extract from the map. Digitized historical routes and modern road network.
**Results – Impact on jobs**

**Demographic and Health Survey (DHS)**
- Non-agricultural employment
  - Women: 5.8%
  - Men: 6.2%
- Skilled manual employment
  - Women: 2.7%
  - Men: 6.6%
- Seasonal employment
  - Women: 1%
  - Men: 10.7%
- Cash earnings
  - Women: 9.3%
  - Men: 1.6%

**Integrated Living Conditions Survey (ILCS)**
- Non-agricultural employment
- Seasonal employment
- Job outside village
Conclusions

Results

• Rural roads are good for improving access to utilities and living conditions of rural households
• Improved road network brings higher economic outcomes
• Better quality roads connects people to non-agricultural jobs

Methods

• Innovative ways to study impacts of road improvements
• Collecting wide range of secondary data is very important