THE INFLUENCE OF AGRICULTURAL ASSOCIATIONS ON MAIZE COMMERCIALIZATION IN MOZAMBIQUE

Ivan Manhique*
Tania Fafetine◊

*FGI Stats and LSE
◊Eduardo Mondlane University
Aim and Motivation

• This research aims to find the impact of agricultural associations on maize commercialisation.
• Despite the country's potential to produce maize, most of the production is still for subsistence.
• Diagnostic studies in Mozambique (e.g. Tschirley, Abdula and Weber, 2006) indicate that factors such as the dispersed and small-scale production structures and restricted access to market information condition the commercialisation of maize at the national level.
• Agricultural commercialisation is part of the government's strategies to increase households’ income. The Mozambique’s Commodity Exchange Market (BMM) is part of the government’s efforts to reach this goal.
• Associativism is an accessible alternative to overcome some of these constraints.
The literature has shown that Associativism is associated with several benefits such as

- Increased production (Verhofstadt and Maertens, 2014)
- Higher selling prices (Bernard, Taffesse and Gabre-Madhin, 2008)
- Reduction of the risk of individual production (Bachke, 2009; Sitoe and Sitole, 2019)
The Model – A Diagram – Framework (1)

- Farmers
- Market Participation Decision Stage
  - Sell
  - Do not sell

Sample Primarily observed

Outcome
Methods – Framework (2)

• The study uses a Heckman model to quantify the impact of agriculture associations on commercialisation

• The use of this method is motivated by the potential selection into market participation
  • Farmers participating in the market commercialisation may be systematically different from those not participating
  • Conventional methods such as the OLS may be biased in the presence of selection bias
  • Commercialisation is only observed for farmers participating

• Heckman (1979) resolves the potential bias resulting from selection as if it were a problem of specification failure.
Methods - Econometric Strategy – The model

• 1st Step: a Probit for the probability of participating
  • Given a $Z^*_i = W\gamma + \mu_i$
  • $P(\text{PM}_i = 1) = \Phi(W\gamma)$

• 2nd Step: The Outcome equation – commercialisation
  • $IC_i = X\beta + \varepsilon_i$
    • $IC_i = \frac{QS_i}{Q_i}$ is the index of commercialization measuring the participation intensity for aggregate $i$,
    • $\varepsilon_i \sim N(0, \sigma)$

  • $corr(\varepsilon_i, \mu_i) = \rho$

• In addition to a plain Heckman model as specified above, an Heckman in which the production is instrumented is estimated.
  • Instrument: Number of Meals per day during the lean season
  • Relevance: Explains the production through labour
  • Exogeneity: Its effect is only through production
Data

• The study used the Integrated Agrarian Surveys (IAI) for the years 2017 and 2020
• The IAI is an annual survey conducted by the Directorate for Planning and International Cooperation
• Our analysis sample is composed only of maize producers as our crop of interest – Maize
• The data here is mostly composed by smallholder farmers
• Because the sample in each of these years is different,
## Descriptive Statistics 2020

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Sign.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Affiliated</td>
<td>Unaffiliated</td>
<td>Affili</td>
<td>Affiliate</td>
</tr>
<tr>
<td>Affiliated to agricultural associations (AA)</td>
<td>0.25</td>
<td>0.20</td>
<td>0.43</td>
<td>0.40</td>
</tr>
<tr>
<td>Market Particiaption (PM)</td>
<td>0.25</td>
<td>0.20</td>
<td>0.43</td>
<td>0.40</td>
</tr>
<tr>
<td>Gender of the head of the household(genchaf)</td>
<td>0.72</td>
<td>0.66</td>
<td>0.45</td>
<td>0.47</td>
</tr>
<tr>
<td>Uses irrigation in the crop(irrig)</td>
<td>0.13</td>
<td>0.09</td>
<td>0.34</td>
<td>0.28</td>
</tr>
<tr>
<td>Access to extension services(acesext)</td>
<td>0.34</td>
<td>0.07</td>
<td>0.47</td>
<td>0.25</td>
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<tr>
<td>Access to credit (acescred)</td>
<td>0.04</td>
<td>0.01</td>
<td>0.19</td>
<td>0.07</td>
</tr>
<tr>
<td># of members in non-agricultural activities(rendnagr)</td>
<td>0.87</td>
<td>0.73</td>
<td>0.93</td>
<td>0.88</td>
</tr>
<tr>
<td>Commercialization Index(IC)</td>
<td>0.11</td>
<td>0.08</td>
<td>0.24</td>
<td>0.19</td>
</tr>
<tr>
<td>Age of the head of the household(idachaf)</td>
<td>47.20</td>
<td>42.02</td>
<td>14.39</td>
<td>15.29</td>
</tr>
<tr>
<td>Years of schooling of the household(eschaf)</td>
<td>4.45</td>
<td>3.77</td>
<td>3.48</td>
<td>3.49</td>
</tr>
<tr>
<td>Dependency ratio(rdaf)</td>
<td>0.45</td>
<td>0.42</td>
<td>0.23</td>
<td>0.26</td>
</tr>
<tr>
<td>Total size of acreage(ha) (tarea)</td>
<td>1.96</td>
<td>1.43</td>
<td>2.04</td>
<td>1.46</td>
</tr>
<tr>
<td>Total number of employees(ftrab)</td>
<td>3.18</td>
<td>1.26</td>
<td>16.51</td>
<td>5.86</td>
</tr>
<tr>
<td>Quantity produced(Q) (kg)</td>
<td>789.90</td>
<td>487.58</td>
<td>1263.87</td>
<td>921.78</td>
</tr>
</tbody>
</table>

Notes: Aggregate-level figures (2020)

*** P (> t) =5%; ** P (T > t) = 10%. Probabilities of t-stats adjusted for different sample variances where necessary.
Main Results

- Rho significant – indicating selection

- number of meals highly significant – instrument relevant

- AA not significant for commercialization

- Comparable estimates between instrumented and non-instrumented Heckman

<table>
<thead>
<tr>
<th></th>
<th>(1)†</th>
<th></th>
<th>(2)†</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PM - Probit</td>
<td>Ln(IC) - 1st Stage - Heckman</td>
<td>Ln(Q) - PM - Probit Stage 1 - Heckman</td>
</tr>
<tr>
<td></td>
<td>2nd Stage</td>
<td>IV</td>
<td>2nd Stage</td>
</tr>
<tr>
<td>AA</td>
<td>-0.052</td>
<td>0.099 (0.107)</td>
<td>0.174* (0.095)</td>
</tr>
<tr>
<td>ln_q</td>
<td>-0.045* (0.027)</td>
<td>0.593*** (0.042)</td>
<td>-0.040 (0.045)</td>
</tr>
<tr>
<td>n_refeições</td>
<td></td>
<td>0.181*** (0.029)</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>24129</td>
<td>4441</td>
<td>20884</td>
</tr>
<tr>
<td>ρ</td>
<td>0.155***</td>
<td></td>
<td>0.154***</td>
</tr>
<tr>
<td>ρ - VI</td>
<td></td>
<td>-0.081</td>
<td>-0.015</td>
</tr>
<tr>
<td>E.M. AA</td>
<td>-0.011</td>
<td></td>
<td></td>
</tr>
<tr>
<td>District FE</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Time FE</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Controls</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Standard Errors in Parentheses

IV - Instrumental Variables

E.M. - Marginal Effects; Significance Stars Applicable to Reported AA E.M

† Estimates are Heckman's Maximum Likelihood

* p<0.10, ** p<0.05, *** p<0.01
Robustness Checks

1. Use of the quantity sold as an alternative to the commercialisation index used in this study.
   - Other studies, such as Reyes et al. (2012), use this variable.
   - No changes in the results

2. Exclude district fixed effects to see how sensitive our coefficients are to factors inherent to each district
   - The exclusion of fixed effects seems to make the coefficients stronger, suggesting a potential overestimation in their absence
   - The differences are moderate

3. Exclusion of the 4th quartile from the production volume
   - The magnitude of the coefficients decreases slightly and the coefficient for AA, although still not significant for both Heckman steps for all models, now presents a positive impact direction in the participation equation.
   - The differences are moderate
Conclusions and Discussion

• Filiation to associations does not have a significant impact on the marketing participation decision or participation intensity.
• The Impact directions indicated that filiation had a negative association with the decision to participate, at the same time as it had a positive association in the intensive margin.
• Farmers can benefit from association different ways, such as social safety nets, especially in rural areas.
• Some associations do not have commercial goals in their core (Bernard and Taffesse, 2012)
Limitations and Recommendations

• Despite the non-significant effect, the literature indicates that these organisations can benefit farmers.
  • Nonetheless, membership remains still low for maize farmers in the country.
  • About 4% in 2020
  • We do not have any information on the type of the associations
  • This may have limited the ability of our models to detect any significant effect.

• Overall, promotions for associativism still seem a cheap alternative for improving the well-being of farmers, especially in rural areas.