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Would Market Sheds Improve Market Participation and Earnings of Small Ruminant Keepers? Evidence from Ethiopia

Fresenbet Zeleke, Girma T. Kassie, Jema Haji and Belaineh Legesse

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Abstract

Livestock markets and marketing are crucial components of the agricultural transformation agenda in Ethiopia. There is, however, little or no scientific evidence for the demand for livestock market facilities to guide the national effort. Using panel data, we estimate the effect of livestock market shed provision on market participation and revenue from small ruminants in Central Ethiopia. Experimental market sheds were constructed in nine markets, with baseline and follow-up surveys conducted with a sample of 50 marketers from each of 16 markets. We employ different formulations of a difference-in-differences (DiD) model, including a combined estimation with propensity score matching. Our results show that provision of market sheds significantly increase farmers’ earnings from small ruminant sales. DiD estimated with a matched sample also shows that market participation increased among smallholder farmers close to the markets with sheds. Our findings support the investment in market facilities in the central highlands and other comparable socio-economic settings in Ethiopia.

Key words: Difference-in-Differences; Ethiopia; Impact; Market sheds; Field experiment; Panel Data; Propensity score matching; Small ruminants; Market participation; Earnings

JEL Classifications: C23, O13, Q13

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1. Introduction

Transformation of agricultural production and marketing systems can hardly be achieved without timely and adequate investment in market facilities. The physical dimension of agricultural markets is still very important in Sub-Saharan Africa (SSA) and in rural Ethiopia in particular. This is especially important for livestock markets, where there are little or no facilities in these markets (Kassie et al., 2019). The lack of investment in livestock markets (or generally in the livestock sector in SSA) is mainly because there is insufficient information on the contribution of the sector for sustainable development and there is no evidence on the potential impact of these market services or facilities on rural livelihoods (UNSIC, 2014).

Generating scientific evidence to justify the impact of infrastructure of any kind is a challenge. Investment in public infrastructures is dictated by political rationalization as much as by economic and social justification. Yet, there is little or no investment in the facilities with the intention of increasing the accessibility and efficiency of the livestock markets. Experimentation is even more difficult with such interventions, not only in the developing world but also in the developed world.

We constructed experimental market sheds in nine randomly selected livestock markets and generated empirical evidence on the potential effects on market participation and performance for rural livestock farmers in Ethiopia.

Investment in market infrastructure could have a significant impact on returns for rural households (Mogues et al., 2012; Manggat et al., 2018). It could attract more participants in the markets, reduce transaction costs and increase returns from agricultural production. Improving market infrastructure could increase the efficiency of live animal marketing (Ismail, 2014).

A number of studies have made a strong case in favour of developing market facilities in the developing world (Little and McPeak, 2006; Kassie, 2007; Mogues et al., 2012; Manjunath and Kannan, 2012; Shilpi and Umali-Deininger, 2008; Ismail, 2014; Kassie et al., 2019). Based on an Indian Agricultural Marketing Survey, Shilpi and Umali-Deininger (2008) reported that the probability of selling at the market increases with an increase in the market access index that in turn improves due to an improvement of market facilities or due to a decrease in travel time to markets. In an international grain market setting in Tanzania, Ismail (2014) showed a positive relationship between maize market participation and availability of different market facilities.
including warehouses, weighing scales, driers, and parking lots. Another study in India by Manjunath and Kannan (2016) reported that market facilities differed in their effectiveness in encouraging marketing of different crops.

There is, however, limited information on the potential impact of the development of market facilities on market participation and earnings of smallholder farmers. We examine the potential economic effects of the provision of market facilities (small ruminant market sheds) on the level of market participation and income from small ruminants marketing. We use information generated from a field experiment with six markets where sheds were constructed and ten others where sheds were not constructed.

Numerous studies have characterized livestock markets (e.g., Solomon et al., 2003; Kassie, 2007; Negassa et al., 2012) and estimated demand functions based on hedonic and stated preference data (e.g., Kassie et al., 2009; Kassie et al., 2011; Terfa et al., 2013; Yitayew et al., 2019) in Africa, and elsewhere in the developing world. However, scientific information is yet to be generated, to the best of our knowledge, on the impact of market facilities such as market sheds, holding sheds, veterinary clinics, etc. in Sub-Saharan Africa.

We employ different formulations of a difference in differences (DiD) impact model, including combination with propensity score matching (PSM) to quantify the effect of providing market sheds in small ruminant markets on farmers’ market participation and earnings from small ruminants. We contribute to the existing literature in at least two ways. First, we present empirical evidence on the effects of investing in livestock market infrastructure in a developing country context, where livestock play a crucial role in rural livelihoods. Second, we present the results of a unique clustered randomized experiment where market sheds were constructed in randomly selected markets, allowing comparison with markets where no sheds were provided.

The rest of the paper is organized as follows. Section 2 discusses the context and description of the intervention. Section 3 presents the methodology used for the study. Section 4 presents and discusses the empirical results. Finally, conclusion and recommendations are presented in section 5.
2. Context and Description of the Intervention

Livestock play an important role in the agrarian economy of Ethiopia. The livestock sector contributes an estimated 17% of total and 39% of the agricultural GDP of the country (Shapiro et al., 2015). The sector also contributes to exports and, according to the National Bank of Ethiopia, the annual average revenue from livestock and livestock product exports in 2017/18 fiscal year was estimated to be 10.4% of the total annual national foreign exchange earnings (NBE, 2018). However, the livestock sector in Ethiopia is still semi-subsistence oriented and, hence, its contribution to the overall economy of the country is considerably below its potential (Negassa et al., 2012; Shapiro et al., 2015; Kassie et al., 2019).

Livestock markets in the country are very poorly equipped and inconvenient both for the animals and for humans. The markets in the central highlands of Ethiopia, in particular, are characterized by limited accessibility and poor physical infrastructure (Solomon et al., 2003; Jabbar and Ayele, 2004; Woldu and Dejen, 2009; Teferra et al., 2013). Lack of market infrastructure significantly undermines the market margins farmers generate from their agricultural products and increase the prices they pay for agricultural products when involved as buyers (World Bank, 2007; Diao et al., 2007; Barrett et al., 2017; Kassie et al., 2019). The transaction costs of markets in general and livestock markets in particular are also high due to, inter alia, lack of transport facilities that force marketers to trek their animals, lack of feed and watering services in and around the markets, lack of veterinary services around markets, lack of storage facilities, and lack of market information.

High transaction costs and lack of market information present challenges in coordination of supply chains that often lead to underinvestment in storage and handling facilities, undersupply of finance, and large intra- and inter-seasonal price fluctuations that undermine market participation and competitiveness of the chains. Inadequate market infrastructure constitutes a major impediment to trading and marketing activities, resulting in higher transaction costs for farmers and limiting the benefits from market participation (Shilpi and Umali-Deininger, 2008; Manjunath and Kannan, 2012).

Our study was conducted in five districts (Menz Gera, Menz Keya Gabriel, Menz Lallo, Menz Mama, and Gishe) of Menz-Gishe area in Central Ethiopia (Figure A1, on-line). The livestock markets in the area are marginal plots of land in the villages or rural towns with little or no physical infrastructure and facilities. The only market with a proper fence is in Mehal Meda town, the
capital of Menz Gera district. Otherwise, there were no market sheds, feeding lots or watering troughs, veterinary services, toilet facilities, feedlots, and loading/unloading ramps in any of the markets in the area.

Our experiment randomly identified nine small ruminant markets and constructed carefully designed sheds tailored to the volume of transaction per day in each of the markets. The sampled markets were clustered based on volume of transaction as large, medium and small markets.\(^2\) Large markets are those whose average supply is larger than 600 animals/market day while medium size markets are those with an average supply between 300 - 600 animals/market-day. Small markets are those with an average supply of less than 300 animals/market-day. The market sheds were constructed in 2015/16 in the nine markets across districts of Menz-Gishe area. However, three of the market sheds could not be used between 2016 and 2018, as the district level administrations failed to relocate the markets as per their initial plans.\(^3\) Therefore, we consider only six of the markets where the sheds have been used since their construction was finalized.\(^4\)

3. Methodology

3.1. Data and model specification

We collected two waves of data – in 2016 before the construction of the sheds was completed and in 2018 after the sheds had been used for two years – from randomly selected households close to the markets. The survey covered six markets with market sheds [in use] and ten others with no or

\(^2\) As part of a national research project on small ruminant value chain development, ICARDA and ILRI conducted a baseline survey in 2013/14 on selected value chains in the country. One of the issues identified as undermining the market participation and performance of small ruminant keepers was lack of market facilities. The site selection process for the baseline survey had already shown two sites – one in northern Ethiopian and another one in central highlands of Ethiopia – were the poorest of all sites surveyed. We selected the central highlands for proximity and cost-saving purposes and designed a project on controlled randomized trial of market facilities. We were able to solicit limited funding and therefore we focused only on market sheds. There were 16 markets in Menz-Gishe area [central highlands of Ethiopia] where sheep and goat played a crucial role in rural livelihoods. We clustered the markets based on their size [in terms of volume of daily transaction] and then we randomly selected three markets from each of the cluster to build the sheds. We constructed the sheds on existing markets or locations designated for livestock market in city/town plans. Only six of the sheds were functioning when we conducted the end line survey in 2018. This research was a collaborative effort by ICARDA, Haramaya University, Ethiopia, ILRI/Africa RISING and Livestock CRP, IFPRI/PIM CRP and Amhara regional agricultural research institute in Ethiopia.

\(^3\) The government of Ethiopia is the sole owner of land in the country. This includes the small plots of land where markets are established.

\(^4\) These markets are Mehal Meda in Menz Gera district, Zeret in Menz Keya Gabriel district, Girar Amba in Gishe district, and Molalle, Kollo Margefia and Shesho markets in Menz Mama district. The sheds were designed by a registered architect and were supposed to serve for three years without any maintenance.
unused sheds. We randomly selected 50 households from each of the Kebeles\(^5\) within which the market is located. Therefore, 800 households were selected for the baseline survey conducted in 2016 and analyzable data were generated from 784 of them. For the end line survey in 2018, we were able to collect data from 771 of the households – generating a matched panel of 771 households with only 1.7% attrition.

Structured questionnaires augmented by focus group discussions (FGDs) and key informant interviews (KIIs) were used to generate primary data for the study. The FGDs and KIIs were conducted using checklists and personal observations, which helped in the design of the structured questionnaire, identification, and stratification of the markets.

### 3.2. Econometric framework

Quantifying the impact of market sheds on farmers’ income from small ruminants and level of market participation entails comparing the observed outcome with the outcome that would have resulted had the smallholders sold the same animal(s) in markets without the facilities. Identification of the effect of the interventions on the outcome variables requires development of a meaningful counterfactual; i.e., the potential outcome of the smallholder had sold his/her animals in markets without facilities (Caliendo and Kopeinig, 2008; Gertler \textit{et al.}, 2016).

One of the most common analytical frameworks employed to identify cause and effect relationships in a panel data setting is difference-in-differences (DiD) (Gertler \textit{et al.}, 2016; Wing \textit{et al.}, 2018). A DiD model is an alternative estimation strategy to deal with possible selection bias by controlling time-invariant differences between treatment and control groups (Crown, 2014; Stuart \textit{et al.}, 2014; Chakrabarti \textit{et al.}, 2018). In addition, as it can be combined with some other procedures, such as Propensity Score Matching (PSM), the method is a more flexible form of causal inference than other non-experimental methods (Villa, 2016). We used the DiD approach to estimate the Average Treatment Effect on the Treated (ATT) on the level of market participation and revenue from selling small ruminants in markets with intervention.\(^6\)

\(^{5}\) Kebele is the smallest administrative unit in Ethiopia.

\(^{6}\) McKenzie (2012) concludes that analysis of covariance (ANCOVA) is more powerful than DiD, on the basis of correct identification of the covariance structure of the residuals within a cluster. However, our panel unit is the individual households and we have only two observations [before and after], so, in our case, there is no possibility to use ANCOVA rather than DiD.
DiD estimates the ATT based on the data collected from the treatment and control groups before and after the intervention. Since the method is based on the assumption that unobserved heterogeneity in participation is present but is constant over time, by differencing out the constant components, DiD resolves the problem of missing data (unobserved heterogeneities) and provides a robust estimate of the impact of treatment on participants (Ravallion, 2008; Wing et al., 2018).

Given our two-period panel setting \((t = 0, 1)\), where \(t = 0\) refers to before the sheds or baseline and \(t = 1\) after the sheds or end line, and the outcome variable for participants (in markets with sheds) \(Y^p_t\) and non-participants (in markets without sheds) \(Y^n_t\) in time \(t\), the Average Treatment Effect (ATE) of the intervention \((T)\) using DiD can be estimated by:

\[
\delta = E(Y^p_{1t}|T_i = 1) - E(Y^n_{0t}|T_i = 0)
\]

where \(\delta\) denotes DiD, \(T_i\) is a treatment indicator equal to 1 if the household belongs to a treated group (use of markets with sheds) and 0 otherwise.

The DiD can also be estimated within a fixed effect (FE) regression framework. DiD makes a very similar assumption with FE model, but conditions on a group level instead of an individual level effect (Morgan and Winship, 2007; Angrist and Pischke, 2009). Based on Ravallion (2008) and Chakrabarti et al. (2018), the DiD model can be specified as a fixed effect linear regression model:

\[
Y_{it} = \alpha + \rho T_i + \gamma t + \beta T_i t + \epsilon_{it}
\]

where \(Y_{it}\) is an outcome measure of household \(i\) at time \(t\), \(\epsilon_{it}\) is the error term, which includes all unobserved determinants of \(Y_i\) not included in the model. \(\alpha\) is a constant term, \(\rho\) represents specific effect of treatment group (to account for the average unobserved difference between treated and non-treated groups which is constant over time), \(\gamma\) denotes the effect of time fixed effects. The coefficient \(\beta\) represents the effect of the interaction of treatment and time and gives the average DiD effect.

The fixed-effects model discussed above is robust to some forms of endogeneity arising from unobservable treatment-specific heterogeneity (Mora and Reggio, 2012). Specifically, fixed effects models permit covariates to be endogenous provided that they are correlated only with a time-invariant component of the error (Cameron and Trivedi, 2005). DiD, as a form of two way fixed effects model, has the ability to control both observed and unobserved time-invariant heterogeneities over a multiple-period setting that lends credibility to the assumption necessary to
estimate unbiased causal effects of a treatment (Strumpf et al., 2017). More specifically, the outcome variable $Y_{it}$ can be regressed on treatment status $T_{it}$, a range of time-varying covariates $X_{it}$, and unobserved time-invariant individual heterogeneity $\eta_i$ that may be correlated with both the treatment and other unobserved characteristics $\epsilon_{it}$. Hence, the fixed effects model of equation (2) can be revised as:

$$Y_{it} = \phi T_{it} + \delta X_{it} + \eta_i + \epsilon_{it}$$

(3)

Differencing both sides of equation (3) over time, one would obtain the following equation:

$$(Y_{it} - Y_{it-1}) = \phi (T_{it} - T_{it-1}) + \delta (X_{it} - X_{it-1}) + (\eta_i - \eta_i) + (\epsilon_{it} - \epsilon_{it-1})$$

(4)

$$\Delta Y_{it} = \phi \Delta T_{it} + \delta \Delta X_{it} + \Delta \epsilon_{it}$$

(5)

Since the source of endogeneity (the unobserved individual characteristics $\eta_i$) has dropped due to differencing, OLS can be used to estimate the unbiased effect of the intervention ($\phi$). With two time periods, $\phi$ is equivalent to the DiD estimate in equation (2) above.

For DiD to yield an unbiased estimate of causal impact, the key assumption of DiD, i.e., the parallel trend assumption, should hold (Dimick and Ryan, 2014; Chakrabarti et al., 2018). However, it is possible that the initial conditions of intervention and control areas are not similar in terms of some observed and unobserved characteristics in which the subsequent outcome changes might be a function of this difference, which may confound the result (Khandker et al., 2010; Stuart et al., 2014). The presence of time-varying heterogeneity associated with selection into the treatment groups may cause the parallel trend assumption to be violated and bias DiD estimates (Abadie, 2005; Ravallion, 2008; Winters et al., 2010; Michalek, 2012; Chakrabarti et al., 2018).

Controlling for initial treatment specific conditions can be used to resolve the effect of time-varying factors that might bias the estimate. In our study, the treatment assignment is not correlated with the error terms of the model. However, the initial conditions may have a separate effect on the changes in outcome. We, therefore, combine PSM and DiD, not only to deal with endogeneity that might arise from omitted variables but also to control for all other sources of variation at the start of the study. The virtue of combining the two estimators stems from the fact that PSM is nonparametric, helps balance covariates, and creates a more focused causal inference (Ravallion, 2008; Takahashi et al., 2010; Michalek, 2012; Wing et al., 2018). Hence, using a two-period data of control and treatment groups, the propensity score was used to match participant and control
units in the base period, and then the treatment impact was calculated using DiD to the matched sample. Following Guo and Fraser (2015), with panel data over two time periods $t = \{0,1\}$, the DiD estimator for the mean difference in outcomes $Y_{it}$ for each treatment unit $i$ is given by:

$$\delta_i = (Y_{i1} - Y_{i0}) - \sum_{j \in c} w(i,j)(Y_{j1} - Y_{j0}) \quad (6)$$

where $\omega(i,j)$ is the weight (based on the propensity score) attached to each control unit $j$ matched to treatment unit $i$. Hence, to ensure the robustness of the ATE estimates, we have estimated both the linear fixed effect and DiD with PSM model.

4. Results and discussions

4.1. Sample households’ characteristics

The descriptive results are shown in Table 1. The majority of the farmers in the study area obtain extension support on sheep and goat breed selection, animal feeding, veterinary services and husbandry. Out of the total sample households, about 70% had contact (at least once in a month) with Kebele level extension workers, very similar in both the treatment and control sub-samples.

![Table 1 - Summary statistics of sample households by survey period and treatment status](image-url)

Note: Standard deviation in square brackets; ***, ** and * means significant at the 1%, 5% and 10% probability levels, respectively.
4.2. Summary statistics of outcome variables

The outcome variables are shown in Table 2. The mean small ruminant off-take by users in the intervention markets increased by 12% while it remained almost constant in the control markets, though the difference is not statistically significant. Revenues for farmers using intervention markets increased by 37.8% compared with an increase of 11.3% for those using control markets. This a statistically significant (p<0.01) difference.

Table 2 - Summary statistics of outcome variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Unit</th>
<th>Baseline</th>
<th>End line</th>
<th>Pooled</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of respondents</td>
<td>#</td>
<td>467</td>
<td>317</td>
<td>454</td>
</tr>
</tbody>
</table>

Note: Standard deviation in square brackets. ETB stands for Ethiopian Birr.

4.3. Econometric Results

This section presents the results of the DiD estimates using fixed-effect regression (equation 3) and a combination of PSM with DiD (equation 6). In addition to the simple DiD estimator, we report models where we introduced time invariant and time variant covariates interacted with time indicator with the assumption that covariates have time varying effect on the pre-treatment outcome (Daw and Hatfield, 2018; Zeldow and Hatfield 2018). The outcome variables - farmers’ earnings from selling small ruminants and level of participation (in terms of the quantity sold) in the small ruminant market - were logarithmically transformed. The DiD model results presented in Table 3 show that the impact of market sheds in the markets on earnings from small ruminant was positive and significant. The results show that farmers who sell their animals in the markets with sheds have increased their income from small ruminant sales on average by 20% compared to farmers that use markets without sheds. The market participation effect, however, is not statistically significant in this model (Table 3).
We estimated the DiD model with selected covariates to address confounding issues if any. The variables we considered are sex of respondent, age of respondent, literacy in years of education of the respondent, household size in adult equivalent, distance to the closest market in walking minutes, total farm land size, and indicator of extension contact. Sex of the respondent was interacted with time dummy. Inclusion of covariates can help adjust for problems in assessing impact but does not bias estimates (Abadie, 2005; Winters et al., 2010).

The fixed effects - with covariates (Table 4) - reinforce the results from the simple DiD model showing that revenues for farmers using the intervention markets improved by 19.6% compared with those using the control markets. As with the restricted model (Table 3), this specification did not show any statistically significant effect of market sheds on market participation. Improvement in farmers’ revenue might reflect an improvement in price as a result of the improved market facilities.
Table 4 - DiD with basic fixed effects specification with covariates

<table>
<thead>
<tr>
<th></th>
<th>Log of sales revenue from small ruminant</th>
<th>Log of participation in the small ruminant market</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment dummy (1 = shed)</td>
<td>0.06</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>(0.26)</td>
<td>(0.20)</td>
</tr>
<tr>
<td>Year dummy (1 = 2018)</td>
<td>0.27**</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td>(0.13)</td>
<td>(0.07)</td>
</tr>
<tr>
<td>Treatment by year interaction</td>
<td>0.20**</td>
<td>0.07</td>
</tr>
<tr>
<td></td>
<td>(0.09)</td>
<td>(0.07)</td>
</tr>
<tr>
<td>Sex by year interaction</td>
<td>0.19</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td>(0.16)</td>
<td>(0.10)</td>
</tr>
<tr>
<td>Age (year)</td>
<td>-0.01</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>Literacy (year)</td>
<td>-0.01</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>(0.02)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>Family size (AE)</td>
<td>-0.04</td>
<td>-0.01</td>
</tr>
<tr>
<td></td>
<td>(0.04)</td>
<td>(0.03)</td>
</tr>
<tr>
<td>Ln of distance to market</td>
<td>-0.05</td>
<td>0.035</td>
</tr>
<tr>
<td></td>
<td>(0.07)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>Extension service (1=accessed)</td>
<td>-0.04</td>
<td>0.08</td>
</tr>
<tr>
<td></td>
<td>(0.09)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>Land size (ha)</td>
<td>0.21</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>(0.13)</td>
<td>(0.10)</td>
</tr>
<tr>
<td>Constant</td>
<td>8.12***</td>
<td>0.63**</td>
</tr>
<tr>
<td></td>
<td>(0.44)</td>
<td>(0.28)</td>
</tr>
</tbody>
</table>

| N                                              | 1090                                    | 1470                                             |
| N_clust                                        | 646.00                                  | 741.00                                           |
| LL                                             | -567.74                                 | -799.70                                          |
| AIC                                            | 1157.49                                 | 1621.40                                          |
| BIC                                            | 1212.42                                 | 1679.62                                          |

Notes: ***, **, and * denote significance at 1%, 5%, and 10%, respectively

The statistical insignificance of the impact on market participation is not unexpected for two reasons. One, given the nature of the industry, supply response can hardly happen in two years, especially when farmers have little or no information on price advantages which appear to be associated with the sheds. Second, farmers are poor and they are not market oriented. So, even if they notice that they are receiving higher prices than those who go to the markets without sheds, farmers cannot reorient their small ruminant production system to take advantage of the improved prices. The sheds do not increase the number of market days in these areas as markets set only once a week. Rather, they allow farmers to stay longer in the markets and hence bargain better and avoid rushed selling.
Treatment effect estimates can be improved through combined specification of DiD and propensity score matching (PSM) based on pre-treatment variables (Takahashi et al., 2010; Wing et al., 2018). By combining PSM and DiD, in addition to the unobservable time-invariant characteristics, the observable heterogeneity in the initial conditions can also be controlled (Ravallion, 2008; Michalek, 2012).

Application of PSM with DiD could help in checking the robustness of the impacts observed in the fixed effects models. However, given the nature of our experiment we did not expect so much difference between this estimator and the ones reported above.

The DiD estimator with propensity score weighting suggests that market sheds have improved farmers’ income from small ruminants by 40% (Table 5). Similarly, unlike the FE estimates above, the result from combination of PSM with DiD shows a highly significant (p<0.01) increase (14.2%) in farmers’ market participation due to the market sheds. As we indicated above we did not expect the farmers to increase their market participation due to the market sheds constructed in their markets. However, controlling for time varying and time invariant factors seems to have a result contrary to our expectation. In fact, Shilpi and Umali-Deininger (2008) and Ismail (2014) have reported comparative results indicating that improvement in market facilities is likely to attract smallholder farmers to participate in the market.

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7 The common support plot for our PSM is shown in Figure A2, on-line appendix.
Table 5. Treatment effect estimated using DiD with PSM

<table>
<thead>
<tr>
<th></th>
<th>Log of sales revenue from small ruminant</th>
<th>Log of participation in the small ruminant market</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment by year interaction</td>
<td>0.40***</td>
<td>0.14***</td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>Gender (male = 1)</td>
<td>0.16</td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td>(0.15)</td>
<td>(0.09)</td>
</tr>
<tr>
<td>Age (year)</td>
<td>-0.00</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>Literacy (year)</td>
<td>-0.01</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>(0.02)</td>
<td>(0.01)</td>
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<tr>
<td>Family size (AE)</td>
<td>-0.05</td>
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</tr>
<tr>
<td></td>
<td>(0.04)</td>
<td>(0.03)</td>
</tr>
<tr>
<td>Land size (ha)</td>
<td>0.02</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>(0.05)</td>
<td>(0.04)</td>
</tr>
<tr>
<td>Extension service (1=accessed)</td>
<td>-0.11</td>
<td>0.07</td>
</tr>
<tr>
<td></td>
<td>(0.09)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>Constant</td>
<td>8.22***</td>
<td>0.80***</td>
</tr>
<tr>
<td></td>
<td>(0.35)</td>
<td>(0.22)</td>
</tr>
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| N                              | 1090                                  | 1475                                          |
| N_clust                        | 646.00                                | 741.00                                        |
| LL                             | -589.35                               | -811.19                                       |
| AIC                            | 1192.69                               | 1636.37                                       |
| BIC                            | 1227.65                               | 1673.45                                       |

Notes: ***, **, and * denote significance at 1%, 5%, and 10% statistical error, respectively.

5. Conclusion and Recommendations

Livestock in general and small ruminants in particular play a crucial role in the livelihoods of the rural communities in Menz-Gishe area of central highlands in Ethiopia. However, farmers’ benefits from livestock production in Ethiopia is very low. Previous studies also indicate that there is a great scope for increasing the contribution of livestock farming by improving the marketing
system. This requires, *inter alia*, improvement of the infrastructure for livestock marketing. However, there is a lack of empirical evidence on how such investment in market facilities might benefit farmers.

We used a field experiment of building markets sheds in a random selection of markets in the Ethiopian central highlands to identify the effects. We used different specifications of a difference-in-difference (DiD) model to identify the effects of the sheds on participation of farmers in small ruminant markets and their earnings from small ruminant sales. In all our specifications of the DiD, the results consistently showed that farmers using small ruminant markets with sheds have significantly higher earnings per small ruminant Using propensity score matching (PSM), the DiD model also suggests that market sheds have a significant and positive effect on farmers’ market participation, which is not significant without PSM.

Livestock markets [in fact agricultural markets in general] in rural Ethiopia are a plot of marginal land in or close the towns or administrative capitals. Farmers have to walk for hours and trek their animals to these markets on market days. In the rainy season, if they manage to cross the rivers along the way, they will not be able to protect themselves or the animals from the rain. In the dry season, without any market sheds, farmers’ animals struggle with thirst and rapidly lose condition, so rural livestock markets are set for only an hour or so. Provision of sheds changed this dynamic substantially. Because farmers and the animals were not subject to the rain or sun, they were able to achieve better sales, without being obliged to sell at the first offer. They were able to come more often despite harsh weather conditions. These are the main reasons for the improved market performance and participation by the farm households.

Since this study considers the impact of accessing and using market sheds on the level of market participation and earning of farmers from small ruminant markets in Menz-Gishe area, analysis of the impact of other facilities and their relative importance in different farming systems is indicated for more robust policy implications. Analysis of market facilities for different types of livestock is also needed.
6. References


Would Market Sheds Improve Market Participation and Earnings of Small Ruminant Keepers? Evidence from Ethiopia

Fresenbet Zeleke, Girma T. Kassie, Jema Haji and Belaineh Legesse

On-Line Appendix

Figure A1. Location of the study
Figure A2. PSM Common Support Plot