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# Impact of membership in frankincense cooperative firms on rural income and poverty in Tigray, Northern Ethiopia

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## ABSTRACT

Rural households in northern Ethiopia had no access to frankincense production and trading. However, following the recent devolution of forest use-rights, rural communities in northern Ethiopia are getting access through organizing frankincense cooperatives. This study examines the effects of membership in the rural frankincense firms on income and poverty by applying instrumental variable, propensity score matching and Rosenbaum bounds methods on survey data from five rural villages in frankincense woodland areas of Northern Ethiopia. Results indicate that both membership and amount of households' investment in shares in the frankincense cooperative firms have statistically significant positive welfare impacts. The average treatment effect on the treated from matching methods for the welfare indicator variables (log-transformed household per adult equivalent income, poverty head count, poverty gap, and poverty severity) are robust against hidden bias arising from unobserved confounding variables that simultaneously affect assignment into frankincense forest cooperative firm membership and each of the welfare indicator variables.

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## 1. Introduction

Forests in developing countries play an important role in local livelihood and poverty alleviation (Angelsen et al., 2014) and provide ecosystem services (e.g. carbon sequestration and biodiversity) as global public goods. Owing to the importance of forests, many developing countries have been implementing a number of policy options including the devolution of forest use-rights to local levels with the aim of achieving sustainable livelihood and conservation outcomes (Persha et al., 2011).

Although institutionalized local participation through the devolution of forest-rights to communities has been widely considered as an instrument to improve rural livelihoods and manage forests sustainably (Larson and Soto, 2008), there are mixed empirical results related to impacts. In a meta-analysis of peer-reviewed case studies from Latin America, Asia and Africa, Porter-Bolland et al. (2011) found that annual deforestation rates were both lower and less variable in community-managed forests than in protected areas. Similarly, Nelson and Chomitz (2011) reported less forest fire prevalence in multiple-use protected areas than strict protected areas. Contrary to the above examples, a review of 100 case studies by Robinson et al. (2011) showed that deforestation rates were lower in state-owned protected forests relative

to private, community, and public land. Based on a systematic review of existing evidence on the effectiveness of community forest management, Bowler et al. (2012) reported that there is evidence of community forest being associated with greater tree density and basal area. However, they found no evidence in other indicators of global environmental benefits like reducing deforestation and maintaining biodiversity.

Existing case studies related to community forests and local livelihood outcomes are not suitable to meta-analysis for the fact that they suffer from problems related to poor study design, inconsistent reporting of study methodology or context, and lack of common welfare indicators (Bowler et al., 2012). A recent study by Jagger et al. (2014) reported higher forest income per household as well as per hectare from state-owned forests than private and community forests. A study by Persha et al. (2011) that looked into the impact of devolution of forest rights on local livelihoods and forest conservation outcomes found both positive and negative relationships. They also emphasized that results were context specific and joint positive outcomes were strongly associated with higher participation of local forest users in forest governance.

The above examples imply that livelihood and conservation outcomes of devolution of forest use-rights are mostly context specific, and suggest the need for more empirical study. This might be due to the heterogeneity in the designs of the devolution programmes (Sikor and Nguyen, 2007) and variation in effective implementation of the devolved rights (Somanathan et al., 2009). It could also be associated with the fact that most devolution of rights have targeted rather low-value

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forests than forests for commercial exploitation (Agrawal et al., 2008; Phelps et al., 2010).

Thus, this study aims at contributing to the scant evidence on the welfare impacts of membership in forest user groups of high value forests by taking a case of rural frankincense cooperatives firms in northern Ethiopia, which were established following the devolution of use-rights of the forest to local communities and the private sector. The study draws on rigorous econometric methods of impact evaluation and primarily assesses the impact of membership in rural frankincense cooperative firms on rural household income and poverty status. The remaining part of the paper is organized as follows. Section 2 describes some background about the frankincense forest and devolution of use-rights in the study area and draws up the study objective. Part 3 is the materials and methods and describes the study area and sampling procedure as well the conceptual and empirical methods of analysis and the empirical data. Section 4 presents the results followed by the last section that discusses the results and draws conclusions.

## 2. Devolution of frankincense forest use-right in Ethiopia

Ethiopia is one of the African countries endowed with natural gum and resin bearing tree species, namely *Acacia*, *Boswellia*, and *Commiphora* species, which are the main sources of Gum Arabic, Frankincense, and Myrrh respectively (Lemenih et al., 2003). Frankincense from *Boswellia papyrifera* has a number of industrial and local uses. The essential oil extract from frankincense has wide applications in traditional medicine, as flavours in food and beverage industries (Tucker, 1986), as input in the pharmaceutical industries (Schillaci et al., 2008), and as ingredient in the cosmetic industries (Tucker, 1986). The frankincense is also used for rituals in different religions and during coffee ceremonies in Ethiopia. According to data from the Central Statistical Agency, over the period from 1992–2012 the country exported 2445 tons/year of natural gums and resins with a value of 5.34 million USD/year to more than 32 countries, with China, United Arab Emirates, Germany, France, Greece, and Tunisia as major importers. At the country level, natural gum, resin, and frankincense tapping and collection activities create seasonal employment opportunities for 20,000 to 30,000 people (Shackleton and Gumbo, 2010), who are mainly poor young migrant workers from the highland areas. Resident rural households in the lowland *Boswellia* forest areas have not been benefiting from such seasonal employment opportunities due to a number of constraints. Some of the major constraints include cultural influence that considers the job as inferior and culturally unacceptable, unattractiveness of the wage rate relative to income from agriculture and lack of the skill of tapping frankincense (Lemenih et al., 2007). Moreover, owing to the fact that land is state property in Ethiopia, the extraction and marketing of frankincense and other natural gums from dryland forests of the country has been in the monopoly of the state owned Ethiopian Natural Gums Processing and Marketing Enterprise (ENGPME) until the change of government in 1991. The country's property tenure and government policy prohibits individual household level ownership of *Boswellia* forestland as well as incense production for sale. Therefore, resident rural households have not been benefiting for long either from the seasonal employment or the rent from marketing the product. Improving the welfare level of resident rural households in *Boswellia* woodland areas of the country requires among other things providing people with access to the *B. papyrifera* forest resource for income generation and poverty reduction.

In the early 2000s, the regional government of Tigray in northern Ethiopia started to provide frankincense forestlands to communities of rural households through formally organized rural cooperative firms. The initiative was motivated partly by the introduction of Participatory Forest Management initiatives in the country through donor support projects with the aim of devolving forest use-rights to local communities and for addressing the lack of forest management capacity by the state (Lemenih and Bekele, 2008). The Forest Development Conservation and Utilization Proclamation No. 542/2007 of the Federal Democratic

Republic of Ethiopia later supported the initiative. According to the proclamation, state forests that could be developed on concession shall be given to community, associations or investors on concession so that they conserve and utilize them in accordance with government directives. Following the policy changes, first a number of private firms and later rural cooperatives entered into the sector. According to data from the Tigray Bureau of Agriculture and Natural Resources, there have been 89 registered firms engaged in frankincense production and trading in the region, of which 25 were rural community based cooperatives until 2009. These cooperatives leased *B. papyrifera* forestlands from the local government on concession and pay royalty. They undertake the collection of frankincense by directly employing tappers and sell their harvest to exporting companies through auctioning or direct sales based on market prices. Entry to a rural frankincense cooperative firm was as a founding member and there was no secondary market to sell shares for exit. Rural household members of the cooperatives get income in the form of dividend from the profit that their cooperatives make. The contribution of share capital by each member forms the basis of sharing out the profits that accrue from the cooperative business.

Thus, this study aims to assess the income and poverty effects of membership in rural frankincense cooperatives, which were established following the devolution of the forests' use rights to rural communities.

## 3. Materials and methods

### 3.1. Study area and sampling

This study was based on a household survey conducted in March 2010 in frankincense-producing districts of central and western Tigray, in northern Ethiopia. Much of the *B. papyrifera* forest resource in Tigray is found in western zones of the region (Gebrehiwot et al., 2002; Lemenih and Kassa, 2011). Gebrehiwot et al. (2002) reported that the total *Boswellia* forest area in Tigray in 2000s was 332,562 ha of which 98.5% was in six districts (Kafta Humera, Tahtay Adiabo, Welkayt, Tselemiti, Tsegede, and Asegede Tsimbila) of the western zones whereas the remaining small proportion was in central Tigray. According to the data of 2009 from Tigray Bureau of Agriculture and Rural Development, about 74% of the 89 registered firms engaged in frankincense production and trading in the region were located in Kafta Humera, Tahtay Adiabo, and Kafta Humera districts, of which 19 were rural frankincense cooperative firms.

To assess the welfare impacts of membership in rural frankincense cooperative firms, which were established following the devolution of forest use rights, five rural communities were selected on the bases of availability of frankincense forest and/or rural frankincense cooperative firms. Each of the three villages is from the districts of Tahtay Adiabo, Kafta Humera, and Welkayit whereas the other two villages are located in Abergelle district of Central Tigray (Fig. 1). Prior to the main survey, focus group discussion and interviews with key informants was conducted in each village and lists of household heads were obtained from the village administrations for sampling purpose. According to the information, about 30.6% of the households in the study villages were users of the forest as either shareholders in local frankincense cooperative firms and/or as frankincense tappers. With this, the sampling frame was stratified into users and non-users of the resource. The stratification as users and non-users was made for the purpose of achieving the objectives this study and our recently published study on rural households' demand for conservation of the resource (Tilahun et al., 2013). Next, a random selection of households from each stratum was made, which ended up with a total sample of 520 households of which 159 were users (120 as shareholders in cooperative members + 39 as frankincense tappers). The distribution of frankincense cooperative member and non-member sample households by village is 32 member and 79 non-members from Adiaber, 57 members and 124 non-members from Adigoshu, 31 members and 42 non-members from Mogu'u, and 79 and 76 from the other two villages as non-members.

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