Agricultural Marketing and Financial Institutions in Ethiopia:Participation Decision, Impact, and Firm Performance

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Graduate School of Agricultural Science

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Dedication

I dedicate this dissertation for my mother (Nanye) and my wife, Helen Walle.

Acknowledgment

Above all, I am grateful to the Almighty God and His Mother St. Merry for bestowing health, courage, and protection during the study period.

My special gratitude goes to my supervisor Professor Hitoshi Kusakari, for his utmost kindness, support, and guidance since the first day – April 4, 2016 – we met in his office. I have been lucky to work under his supervision and have learned a lot both for my professional and personal development. I would also like to express my earnest gratitude to Dr. Masahiro Sumimoto for his continuous support throughout the study period. I have benefited a lot from his mentorship.

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Chapter 1 Introduction

1. Background

Since the early 1990s, the Ethiopian government has been implementing different development programs aimed at eradicating poverty and improving rural livelihood (Food and Agricultural Organization, 2014). However, despite the tremendous progress in agricultural production (Gabre-madhin, 2012) and poverty reduction (World Bank, 2015) over the last decades, nearly 25% (25 million) of the population lives below the nationally defined poverty line (Ethiopian National Planning Commission, 2017). In Ethiopia, poverty is non-spatial, and it is caused by multidimensional problems (Wolday, 2004). Among others, the lack of strong institutions is the primary reason for the persistent poverty in the country (Gabre-madhin, 2012; Gabre-Madhin and Goggin, 2005).

In the absence of well-functioning and strong institutions: (i) smallholder farmers are likely to have poor access to agricultural inputs and hence lower productivity (Abebaw and Haile, 2013; Debela et al., 2017); (ii) smallholders may be challenged by their comparative disadvantage in the market – i.e., they face proportionally higher transaction costs, hindering commercialization of their output (Bernard et al., 2008; Shiferaw et al., 2011); (iii) seasonality and volatility of food price will be higher, resulting in severe food insecurity of the poor[1)]; and (iv) poor farmers will face liquidity constraint which in turn deters investment on agricultural production and productivity. Altogether, the lack of strong institutions is a root cause for many problems leading to poverty.

The Ethiopian government has acknowledged the problem, and it is establishing and strengthening institutions as part of its effort towards eradicating poverty. In this regard, a renewed interest on the cooperative sector development, the establishment of the Ethiopian Commodity Exchange (ECX), and increasing support to provide credit service for the poor through Microfinance Institutions (MFIs) can be referred as good examples (Francesconi and Heerink, 2010; Gabre-madhin, 2012; Wolday, 2004). Despite the differences in their organizational activities, ultimately, the establishment of the cooperatives, ECX, and MFIs in Ethiopia aims to eradicate poverty and improve rural livelihood.

The primary purpose of agricultural cooperatives is to facilitate input and output market of smallholder farmers. By increasing (reducing) access to (cost of) agricultural inputs, cooperatives help farmers to improve their productivity and income (Abebaw and Haile, 2013; Debela et al., 2017; Getnet and Tsegaye, 2012). Agricultural cooperatives can also enhance the overall welfare of smallholder producers through commercialization of their output (Ahmed and Mesfin, 2017; Verhofstadt and Maertens, 2014). The ECX, for its part, provides warehouse service and price information to reduce transaction costs and increase market liquidity (Gabre-Madhin and Goggin, 2005). Moreover, the warehouse service of ECX can help to reduce price seasonality and hence the variation in intra-annual consumption of the poor. Providing microloan for the poor is an overriding objective of MFIs. Presumably, access to financial service reduces poverty by easing liquidity constraints, smoothening consumption, and financing adoption of agricultural technologies (Wolday, 2004). The overall motive of the dissertation is, therefore, to get an in-depth understanding of members' participation decision, the impact of membership on rural livelihood[2)] and the performance of institutions[3)].

2. Overview of Agricultural Cooperatives, ECX, and MFIs

The Ethiopian government has re-emphasized the role of agricultural cooperatives in transforming the agricultural sector and reducing rural poverty (Tefera et al., 2016). As part of the cooperative sector development, the government founded the Federal Cooperative Commission (the current Federal Cooperative Agency), in 2002, to further increase its outreach by establishing one cooperative per kebele[4)]. Broadly, there are two levels in the current structure of cooperatives in Ethiopia: primary and secondary levels. The primary level refers to cooperative societies with individuals as members, while the secondary level designates the cooperative unions with cooperatives societies as members. As presented in Figure 1.1, over the last decade, the number of primary cooperatives and cooperative unions have been increasing. Specifically, the number of cooperatives has increased from nearly seven thousand in 2008 to more than 15 thousand at the end of 2014. Similarly, cooperative unions have risen from 126 to 181 during the same period.

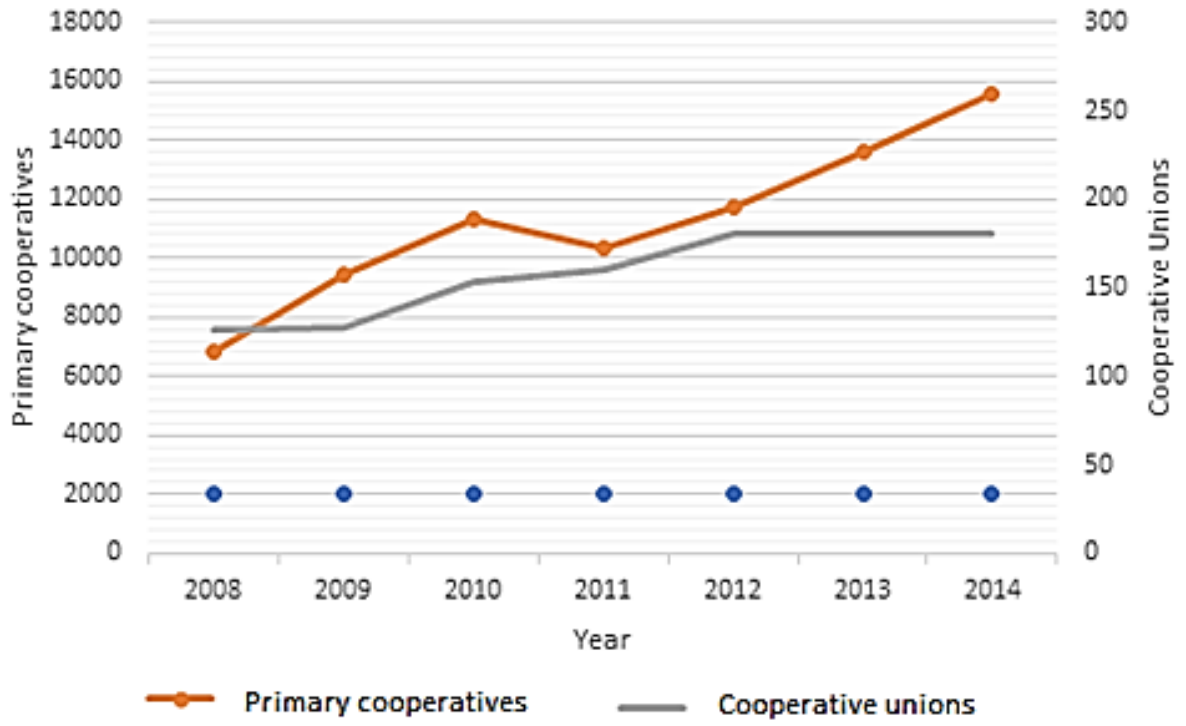

Figure 1.1 Agricultural cooperatives and unions in Ethiopia (2008-14)

Source: Federal Cooperative Agency (2015) data adopted from Tefera et al. (2016).

A typical smallholder farmer in Ethiopia has limited access to input and output markets. Therefore, agricultural cooperatives are expected to play a crucial role in linking smallholder farmers – who are producing more than 90% of the total grain produced in the country (Tefera, 2016) – to the commodity exchange system (Francesconi and Heerink, 2010). While it is beyond the scope of the dissertation, ECX could be argued to have either facilitating (positive) or substituting (negative) role on agricultural cooperatives. In one hand, cooperatives could use ECX as potential market and source of market information. Furthermore, it could also use the storage facility of the ECX to benefit most from the aggregation service. On the contrary, given that ECX provides (somehow) similar services with agricultural cooperatives – e.g., output aggregation and storage services – farmers may tend to be free riders and yet benefit from the positive externalities of ECX and cooperatives.

The ECX was established in 2008 as a response to the longstanding problem of 'thin markets' in Ethiopia – i.e., markets in which there are few purchases and sales. While building upon the

existing informal market, the ECX serves farmers and small traders by adding technology and systems to bring a transparent, effective, and more reliable trading platform to all concerned (Gabre-madhin, 2012). In this regard, the ECX installed price display boards and warehouses in different parts of the country to improve access to market information and storage services, and hence market efficiency. As shown in Figure 1.2, as of 2011, the ECX has warehouses and active price display sites in 17 and 28 districts, respectively. Furthermore, it has also a plan to expand price display sites to many other woredas of the country.

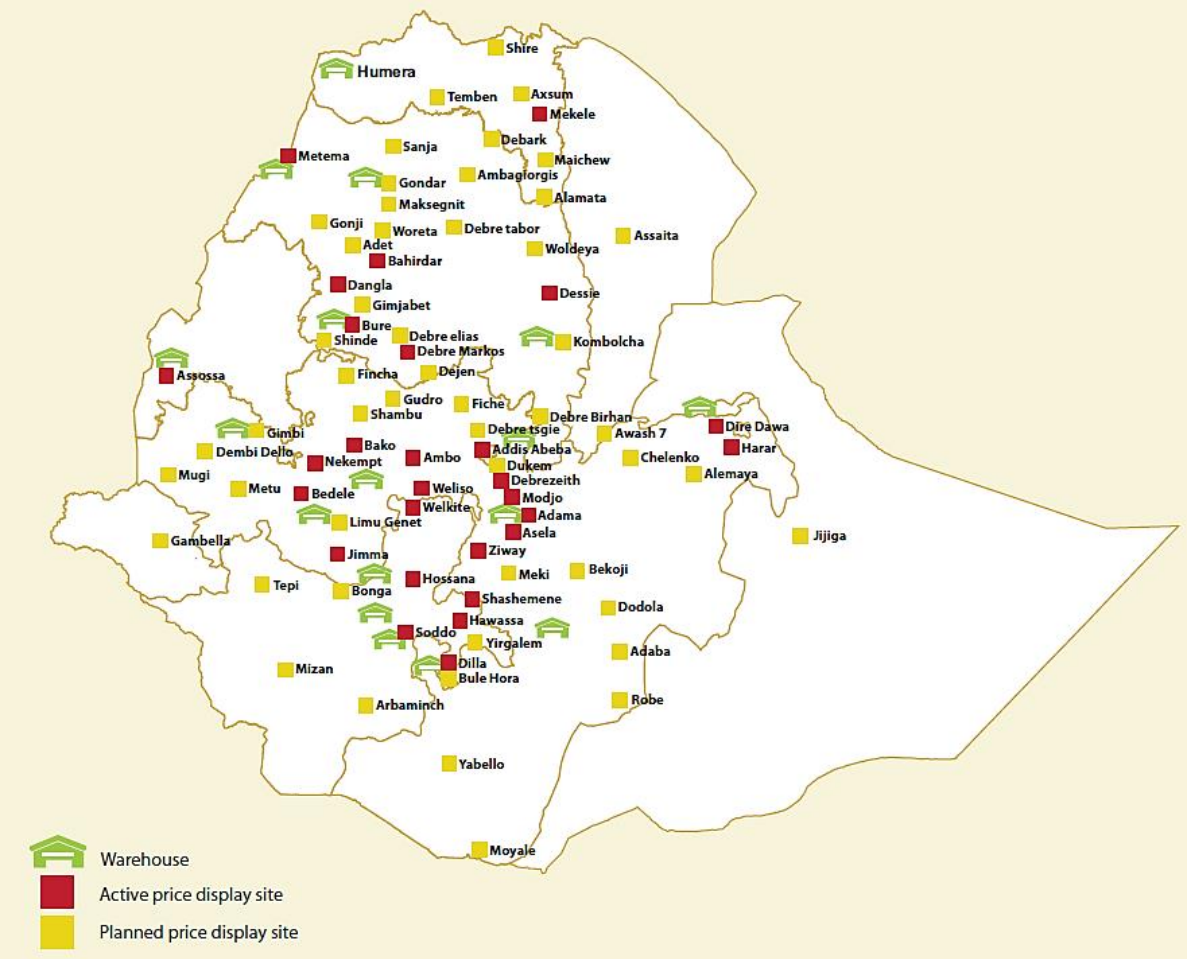

Figure 1.2 Distribution of warehouses and price display sites in Ethiopia

Source: Gabre-madhin (2012)

According to Gabre-Madhin and Goggin (2005), "First and foremost, it [the Warehouse service] is a system of financing, which is its primary purpose." More specifically, while storing their crops in reliable storage, smallholder farmers can use the receipt issued by ECX as loan collateral to

access finance. As such, a slightly related but a unique institution that provides financial services is microfinance. Even though its inception dates to 1970s, the Ethiopian government issued the first microfinance legislation in 1996. However, since then, there is an increasing focus from policymakers, development agents, and scholars (Tsegaye, 2009). The MFIs in Ethiopia provide micro-loans and micro-savings to the number of productive but resource-poor people cost-effectively and sustainably (Wolday, 2004). They are particularly helpful for the rural poor in Ethiopia because poverty is more severe in rural areas, but traditional banks are concentrated in urban areas (Demirguc-Kunt et al., 2018).

To sum up, agricultural cooperatives, ECX, and MFIs have some overlapping purposes. The ECX and cooperatives can potentially contribute to reducing transaction costs by facilitating marketing of output between smallholders and the private sector or traders (Gabre-Madhin and Goggin, 2005; Getnet and Tsegaye, 2012). Likewise, the credit access from MFIs and input supply service of cooperatives enhance technology adoption and hence productivity of smallholders. The ECX and MFIs have the purpose of relaxing liquidity constraint by promoting and providing financial services, respectively.

3. Objective and Structure of the Dissertation

The overall objective of the dissertation is to examine the member's participation decision in agricultural cooperatives, the impact of cooperative membership on rural livelihood, and the performance of institutions. Specifically, it investigates the following research questions in pursuit of its overall objective. (1) What are the factors that affect community-level participation rate in agricultural cooperatives? (2) Which factors drive smallholder's participation decision in agricultural cooperatives? Are cooperatives inclusive of the youth and small landholders? (3) Do agricultural cooperatives improve the agricultural performance, market orientation, and welfare of their members? (4) What is the characteristics and degree of staple food price seasonality in Ethiopia? (5) How and to what extent warehouse services affect the seasonality of food price in Ethiopia? (6) Which factors determine the social and financial performance of MFIs in Ethiopia? (7) Is there mission drift or are MFIs in Ethiopia systematically ignoring the poor in the pursuit of

profit?

As demonstrated in Figure 1.3, the dissertation is organized into five chapters. The **second chapter** addresses the first three research questions outlined above. Specifically, using the 2016 wheat growers survey data from Ethiopia, **chapter two** examines the participation in agricultural cooperatives and its impact on agricultural performance, market orientation, and welfare. The 4th and 5th research questions above are explored in the third chapter. Gabre-Madhin and Goggin (2005) argue that "… it [the Warehouse service] can have positive impacts on price stability by encouraging storage just after harvest, but this is not guaranteed". Hence, using monthly price panel data from Ethiopia, the **third chapter** demonstrates how and to what extent the warehouse service of ECX affects the seasonality of staple food prices. The last two research questions regarding the performance of and mission drift by the MFIs in Ethiopia are discussed in the fourth chapter. For this purpose, I used unbalanced panel data from the MIX (Microfinance Information Exchange) market database – the most extensive data source on the finances of MFIs in the world (Cull et al., 2011). Specifically, **chapter four** investigates the determinants of MFIs' social and financial performance in Ethiopia. Furthermore, it examines if and to what extent the MFIs drift from their initial mission of serving the poor. Finally, the last chapter concludes with implications.

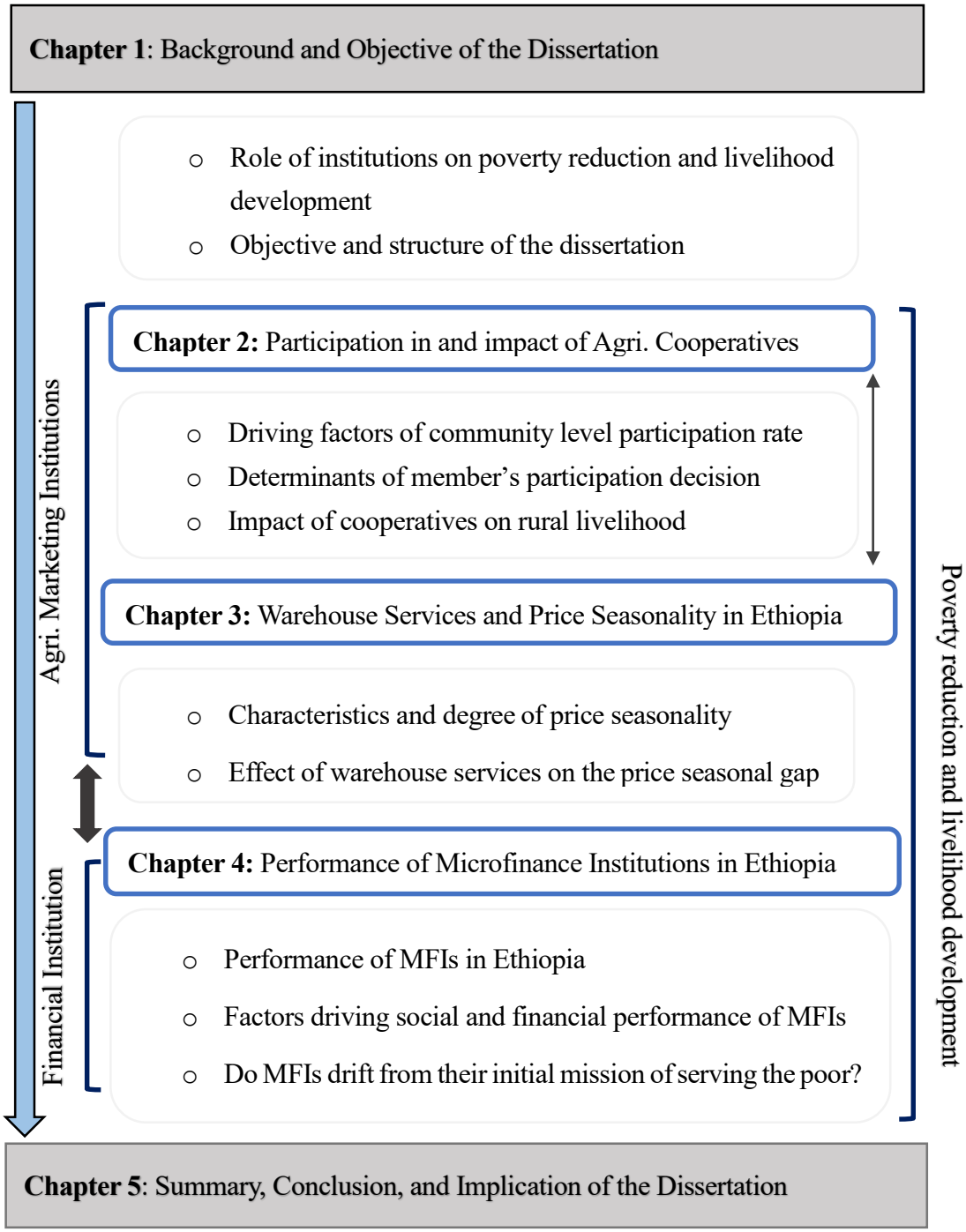

Figure 1.3 Organization of the dissertation

4. Significance of the Dissertation

The dissertation has important implications concerning members' participation decision and performance of institutions. Institutions in general and agricultural cooperatives, in particular, have the potential to enhance market opportunities for smallholder producers. However, collective action is a critical factor in realizing this potential (Shiferaw et al., 2011). Presumably,

the decision to participate in collective action is taken comparing the gain from collaboration and associated costs of complying with the collective rules and norms (Shiferaw et al., 2011). However, not all benefits and costs are measurable and available (Masten et al., 1991). Hence, the dissertation investigates factors driving community-level participation rate and household participation decision in agricultural cooperatives based on observed characteristics than the unobserved costs and benefits. These results can be used to identify intervention areas for improving participation in agricultural cooperatives.

The second contribution refers to performance evaluation. Measuring the performance of institutions is essential to make reforms, when necessary, to meet organizational goals. In this regard, the dissertation evaluates the performance of cooperatives, warehouse service of ECX, and MFIs with respect to rural livelihood, stabilizing market price seasonality, and providing credit to the poor, respectively. Furthermore, building on the current literature on agricultural marketing and financial institutions in Ethiopia, the dissertation contributes to the scarce literature on a comprehensive evaluation of institutions' performance in general and in Ethiopian context in particular.

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1) As consumption of the poor is price-sensitive, the higher is the price seasonality, the severe is the suffer from food insecurity (Sahn and Delgado, 1989).

2) According to Ellis (2000) “Livelihood comprises the assets (natural, physical, human, financial and social capital), the activities and the access to these (mediated by institutions and social relations) that together

determine the living gained by the household"

3) Organizational performance can be measured either using a goal-attainment perspective or a system approach (Pinz and Helmig, 2014). In the context of this paper, the success of a firm is measured by its effort to attain its organizational goal.

4) Kebele is the smallest administrative unit in Ethiopia.

Chapter 2 Participation in and Impact of Agricultural Cooperatives

1. Introduction

In most developing countries, smallholder agriculture remains a crucial sector for attaining food security and economic development (Hazell et al., 2010). However, the success of smallholders is challenged by their relative disadvantage in the market – i.e., they face proportionally higher transaction costs (Bernard and Taffesse, 2012). Improving the performance of smallholder agriculture, in general, and market participation, in particular, needs institutional innovations (Verhofstadt and Maertens, 2014). Agricultural cooperatives have been promoted in many African countries to achieve increased market participation (Wanyama et al., 2008). Ethiopia is no exception, and the cooperative sector has got increasing support since its establishment in the early 1960s (Getnet and Tsegaye, 2012). As such a significant goal of the federal cooperative agency, founded in 2002, was to establish one cooperative per kebele. By 2010, approximately 70% of all kebeles had established a cooperative (Abebaw and Haile, 2013).

Considering the existing challenge to access well-functioning input and output markets in Ethiopia, collective action through agricultural cooperatives was thought to help smallholder farmers to minimize transaction costs, boost their bargaining power for both purchases of inputs and sales of crops, and operate on a larger scale for overall economies of scale benefits (Markelova et al., 2009). However, empirical evidence on the performance of agricultural cooperatives shows mixed results. While a large number of studies find a positive impact of agricultural cooperatives (Abate et al., 2014; Abebaw and Haile, 2013; Ahmed and Mesfin, 2017; Bernard and Taffesse, 2012; Fischer and Qaim, 2012; Francesconi and Heerink, 2010; Ito et al., 2012; Mojo et al., 2017; Verhofstadt and Maertens, 2014), there are also cases where evidence suggested that cooperatives did not improve farmers' livelihoods (Barrett, 2008; Bernard et al., 2008).

Moreover, the preliminary analysis shows that less than half of the sampled households participated in agricultural cooperatives. Similarly, the participation rate among sample kebeles was limited to 50.3%. The misconception about cooperatives, due to its poor performance in the former regimes (Bernard et al., 2008; Shiferaw et al., 2011), could partly explain the overall low participation rate. However, there is also a considerable variation in participation rate amongst

kebeles. Hence, it is interesting to study why some kebeles have a higher participation rate than others, despite the potential benefit from participation. This research was, therefore, motivated to understand why participation rates are low by explicitly examining participation in and impact of agricultural cooperatives in Ethiopia.

Examining the impact of agricultural cooperatives should consider their broader role in rural livelihood development. In this regard, with some exceptions (Debela et al., 2018; Getnet and Tsegaye, 2012), most prior studies (Abate et al., 2014; Abebaw and Haile, 2013; Ahmed and Mesfin, 2017; Bernard et al., 2008; Bernard and Taffesse, 2012; Francesconi and Heerink, 2010) in Ethiopia focus only on a few of the outcome variables considered in this study. Furthermore, most previous studies also did not account for the potential variation among cooperatives – e.g., a preliminary analysis shows that only 46% of cooperatives provide output aggregation service. This study adopts the working definition of Francesconi and Heerink (2010) and re-defines cooperatives that offer output aggregation service as marketing cooperatives. Thus, the current study explicitly evaluates the effectiveness of marketing cooperatives. More specifically, while accounting for the possible variation between agricultural cooperatives, this chapter evaluates the impact of agricultural cooperatives on agricultural performance (NPS adoption[1)] and yield), market orientation (marketed surplus, output price, the unit cost of fertilizer), and welfare (income) of smallholder farmers.

Impact evaluation has long been a central area of research (Abate et al., 2014; Abebaw and Haile, 2013; Ahmed and Mesfin, 2017; Bernard and Spielman, 2009; Bernard and Taffesse, 2012; Getnet and Tsegaye, 2012; Ito et al., 2012; Wossen et al., 2017). However, it is a challenging task to get experimental data in social science studies of this kind. As a result, most, if not all, prior studies use non-experimental data to examine the impact of agricultural cooperatives. Using non-experimental data in impact evaluation, however, faces several challenges (Caliendo and Kopeinig, 2008; Heckman et al., 1997) that include: (i) because membership in agricultural cooperatives is based on one's free will, members may be systematically different from nonmembers in their observed characteristics[2)] (ii) members and non-members of cooperatives may also vary in their unobserved characteristics[3)] and (iii) allocation of cooperatives could be endogenous and some kebeles may have better access to cooperatives than others.

While this study uses non-experimental data, all (potential) problems listed above are attempted to be accounted for using an Endogenous Switching Regression (ESR) model. The ESR model

employed in this chapter resolves the first two potential problems of using non-experimental data in impact evaluation. The model is briefly discussed in section 4. Fortunately, as there are cooperatives in all the kebeles under consideration, its endogenous allocation is of no concern to this study. Altogether, I have carefully considered the potential problems in examining the effectiveness of cooperatives using non-experimental data.

This study makes three main contributions to the current literature. First, while accounting for the collective behavior of cooperatives, this research contributes to the scarce literature on measuring the effectiveness of cooperatives in Ethiopia. Moreover, the study examines the factors affecting both community and household level participation decisions. Second, the study has adopted a unique methodology (ESR) for accounting unobservable bias in estimating the effectiveness of cooperatives. Third, extending this model further, the chapter examines the impact heterogeneity among members of marketing cooperatives – i.e., whether the treatment effects on agricultural performance, market orientation, and welfare vary within cooperative members or not.

The rest of the chapter is organized as follows: section two presents the conceptual framework that describes the role of cooperatives on rural livelihoods. Section three describes the data, and section four explains the methods used in this study. Results of the study are discussed in section five, and section six concludes.

2. Cooperatives in Ethiopia: History and Conceptual Framework

The cooperative sector has a long history in Ethiopia that can be thought of in three "phases" – i.e., the imperial period, the socialist period, and the current era of cooperatives (Getnet and Tsegaye, 2012). During the first phase (1960 - 1974), the main objective of establishing cooperatives was accelerating the growth of the agricultural sector and the rural economy. However, they were relatively limited in scope (Tefera et al., 2016). During the second phase (1974 - 1991), the establishment and operation of cooperatives were mainly state-driven. It was characterized by collective ownership and central planning, which aimed at accumulating capital and mobilizing human resources to sustain economic growth. Finally, the current era of cooperatives (since 1991) is generally characterized by the voluntary participation of members and market orientation (Federal Democratic Republic of Ethiopia, 1998). Specific to the current era of cooperatives in Ethiopia, its focus has been changing following the changes in the overall development strategy

and policies of the country. Accordingly, 1991-2005 was time for institutional renewal that included reforms regarding rules on voting and cooperative ownership. After 2005, the emphasis shifted towards supporting cooperatives to provide inputs and services that promote agricultural production. Finally, since 2010, cooperatives in Ethiopia focuses on market integration and value chain development (Tefera et al., 2016).

Cooperatives in Ethiopia are broadly classified as single-purpose and multipurpose cooperatives. The single-purpose cooperatives include commodity-specific marketing cooperatives (e.g., dairy, vegetable, sesame) and user cooperatives (e.g., irrigation). But this study refers to multipurpose cooperatives that provide a wide range of services including, but not limited to, output aggregation, the supply of agricultural inputs and consumer goods, credit, and training.

Figure 2.1 provides a conceptual framework that describes the role of agricultural cooperatives on rural livelihoods. Input supply service of cooperatives is expected to improve adoption and intensity of agricultural input use and subsequent productivity (Abate et al., 2014; Abebaw and Haile, 2013; Wossen et al., 2017). Furthermore, cooperatives enable farmers to get inputs at a relatively lower unit cost (Getnet and Tsegaye, 2012). The aggregation services of cooperatives increase smallholder farmers' bargaining power and help them reach central markets directly (Bernard and Taffesse, 2012; Francesconi and Heerink, 2010).

Credit is another valued service of cooperatives. Cooperatives offer credit service in different forms – e.g., they provide agricultural inputs for farmers with cash constraints – which, in turn, could improve the adoption of agricultural technologies. Training farmers on production and marketing activities can also facilitate technology adoption and active participation of members (Bernard and Taffesse 2012). Generally, cooperatives improve rural livelihoods by increasing production, productivity, and income of smallholder farmers (Abate et al., 2014; Ahmed and Mesfin, 2017; Debela et al., 2018; Getnet and Tsegaye, 2012).

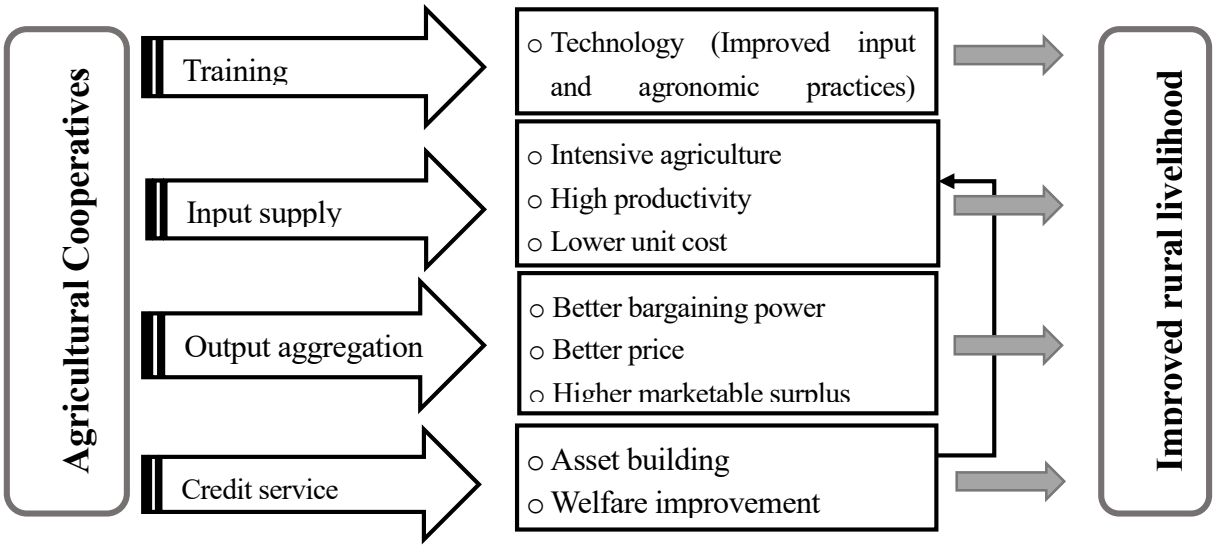

Figure 2.1 – Conceptual framework of cooperatives' role in the rural livelihood

3. Data and Descriptive Statistics

(1) The data

The results of this study are based on the 2016 Ethiopian wheat growers survey data collected by IFPRI. The survey comprised both household and community level cross-sectional data. The household survey questionnaire covers a wide range of topics, including household characteristics, asset holding, land use, wheat production and utilization, wheat sales, cooperatives, and household risk preferences. The community questionnaire also includes topics such as access to infrastructure and rural institutions. The data was collected from four wheat-producing woredas/districts (Digelu ena tijo, Hetosa, Agarfa, and Gasera) of Oromia region. The region contributes to 58% of the total wheat production in the country. Moreover, 45% of grain producers in the country are also from Oromia region (CSA, 2017). Overall, the region takes the largest share in the country both in terms of population and wheat production.

A two-stage stratified random sampling method was implemented to select sample households. In the first stage, 10-14 kebeles were selected from each woreda based on their wheat production potential. In the second stage, 8-12 households per kebele were chosen randomly using wheat growers' lists maintained by the kebele administrations as a sampling frame. As wheat producer areas of the region were purposively selected, most households in the kebeles grow wheat during the study period. Accordingly, proportional to the number of kebeles, the actual sample of this study consists of 116, 140, 116 and 92 households from Digelu ena tijo, Agarfa, Hetosa, and Gasera

woredas, respectively. Eventually, I dropped six observations with missing data on the outcome and explanatory variables. Hence, the results of this study are based on 458 sample households out of which 219 (48%) are cooperative members. On the other hand, kebele is the unit of the analysis for community-level participation rate. Accordingly, results regarding the factors affecting community level participation rate are based on a total of 121 kebeles.

(2) Outcome variables, covariates, and hypotheses

The outcome variables in this study are derived from the functional relationship between cooperatives and rural livelihoods shown in Figure 2.1. As input supply is a principal function of cooperatives, its impact on NPS adoption is direct and intuitive. Cooperatives are also expected to improve yield through input supply (e.g., seed and fertilizer) and credit services. Improvement in marketed surplus could be associated with the expected higher productivity. Moreover, as cooperatives provide services to their members and distribute the profit according to patronage or proportional to their sale contribution (Soboh et al., 2011), members may have the incentive to increase their marketed surplus. The expected benefit of cooperatives from higher output price and lower unit cost of fertilizer can be due to their strong bargaining power and economies of scale (lower marginal transaction cost). Finally, of course, the overall effects of higher output price and increased marketable surplus (quantity of output to be sold) improves welfare. This study does not use the common welfare indicators (e.g., total consumption expenditure or total income) due to the limitation on the available data to calculate these outcome variables. However, as wheat takes a dominant share (77%) of households' total grain production, wheat income can be considered as a reasonable welfare indicator.

Selection of covariates used in this study are mainly guided by prior researches in Ethiopia and elsewhere (Abate et al., 2014; Ahmed and Mesfin, 2017; Bernard et al., 2008; Debela et al., 2018; Francesconi and Heerink, 2010; Ito et al., 2012; Nugusse et al., 2013; Verhofstadt and Maertens, 2014). Generally, household-specific variables are hypothesized to have a positive, negative, and indeterminate effect on members' participation decisions (Table A2.1). Specifically, the age of the household head can have either positive (Abate et al., 2014; Abebaw and Haile, 2013; Bernard et al., 2008) or negative (Debela et al., 2018; Ito et al., 2012) effect on their participation decision. Hence, in this study, the age of the household head is hypothesized to have a significant but indeterminate impact on participation decision. Family size and education level of the household

are expected to increase the probability to participate in agricultural cooperatives (Debela et al., 2018; Nugusse et al., 2013).

Previous studies have shown that landholdings do have a nonlinear relationship with cooperative membership (Ito *et al.,* 2012). Accordingly, this study considered both linear and quadratic forms of landholding with a priori expectation of increasing but at a decreasing rate on the probability to participate. Livestock ownership, which is a proxy for asset-holdings, increases the likelihood to be a member of agricultural cooperatives (Bernard et al., 2008; Nugusse et al., 2013; Verhofstadt and Maertens, 2014). Previous studies showed that distance to the district affects participation either positively (Abebaw and Haile, 2013; Ahmed and Mesfin, 2017) or negatively (Abate *et al.,* 2014, Verhofstadt and Maertens 2014, Debela *et al.,* 2017). As extension agents are primary sources of information at the grass-root level, their availability may increase the likelihood of participation. Following previous studies (Nugusse et al., 2013; Verhofstadt and Maertens, 2015), social capital is expected to have a positive effect on participation decision. In this study, participation in informal institutions (e.g. "*idir" and "equib"*[4]) – which are established and administered by the local people based on trust and cultural values – is used as a proxy to measure social capital. Participation in these institutions shows their ability to network and overall social skills.

Cooperatives in Ethiopia are somewhat heterogeneous in the offering of their services. Hence, the services they provide are included as dummy variables[5] to capture the variation among the cooperatives. Accordingly, the study assumes that the likelihood to participate increases if the cooperative in the kebele provides output aggregation and credit services. Likewise, to account for variation in access to alternative service providers (substitutes), availability of traders and input suppliers are included with a priori negative hypotheses (Table A2.1). The study also considers access to road and infrastructure, asset holding, and information access variables to evaluate the factors affecting community level participation rate in agricultural cooperatives (Table A2.2).

(3) Descriptive statistics

In this study, the designation marketing cooperatives refers to those cooperatives that commercialize members' output. Table 2.1 summarizes the characteristics of the cooperative[6] members, marketing cooperative members, and nonmembers. The results show that 55% of cooperative members and an even higher proportion (62%) of marketing cooperative members adopt NPS fertilizer. Conversely, members and nonmembers of cooperatives are not statistically

different in all other outcome variables. On the other hand, members of marketing cooperatives get significantly higher output price compared to nonmembers. However, these results could be due to other confounding factors and, hence, cannot be used to infer the impact of membership. As reported in Table 2.1, members and nonmembers are statistically different in most of the household and location/kebele specific covariates. The analysis indicates that while members of the cooperatives are significantly older than their counterparts, they do not have a detectable difference in their education level and distance to the district. Furthermore, cooperative members and nonmembers vary in their asset (labor, land, and livestock) ownership and social capital.

As presented in Table A2.2, the average participation rate of households in the sampled kebeles was calculated to be 50.3%, with high standard deviation (31.85) suggesting that there is a wide range in the participation rate amongst kebeles. Specifically, the distribution of participation rate[7)] ranges from nearly 1 to 100%, implying that all households in the kebele are members of the cooperatives in the latter case. Given cooperatives' wide range of services (e.g., output aggregation, the supply of agricultural inputs and consumption goods) and lack of other options to get similar services in some kebeles, the full participation rate is possible. It is intuitive that the availability of cooperatives increases the likelihood of participation and hence, a participation rate. Indeed, the majority (90%) of the sampled kebeles do have cooperatives. However, households in other kebeles also tend to be members of the nearby cooperatives implying that there are cooperatives that serve multiple kebeles.

Table 2.1 – Summary of outcome and explanatory variables

Variables	Non-member	Members		Pooled sample
		All cooperatives	Marketing cooperatives	
Outcome variables				
NPS adoption	0.42(0.03)	0.55(0.03) ***	0.65(0.04) ***	0.48(0.50)
Yield	26.64(0.88)	26.17(0.91)	25.58(1.27)	26.38(13.43)
Marketed surplus	0.34(0.02)	0.32(0.02)	0.36(0.02)	0.33(0.27)
Price	7.78(0.04)	7.85(0.04)	7.95(0.06) **	7.84(0.61)
Unit cost of fertilizer	14.32(0.22)	14.60(0.23)	14.47(0.19)	14.46(3.31)
Income	13781(936)	14563(960)	15279(1208)	14162(13127)
Explanatory variables				
Age	46.18 (0.9)	49.09(0.99) **	47.96(1.35)	47.57(14.79)
Family size	6.30(0.16)	7.08(0.17) ***	7.11(0.22) ***	6.67(2.49)
Education	2.52(0.06)	2.59(0.06)	2.59(0.08)	2.55(0.88)
Land size	2.33(0.11)	2.68(0.12) **	2.88(0.17) ***	2.50(1.74)
Land size^2	8.93(1.02)	9.73(1.06)	11.26(1.62)	9.31(15.89)
Livestock	8.38(0.38)	10.69(0.4) ***	10.83(0.57) ***	4.94(6.08)
Social capital	0.70(0.03)	0.77(0.03) *	0.81(0.04) **	0.76(0.43)
Extension agents	2.11(0.05)	2.11(0.06)	2.17(0.07)	2.11(0.84)
Distance to district	10.90(0.51)	11.99(0.54)	12.89(0.71) **	11.41(7.88)
Output aggregation	0.41(0.03)	0.51(0.03) **	-	0.46(0.49)
Credit service	0.22(0.03)	0.35(0.03) ***	0.48(0.04) ***	0.28(0.45)
Traders	5.66(0.69)	5.40(0.74)	9.24(1.15) ***	5.54(10.67)
Input suppliers	0.56(0.03)	0.58(0.03)	0.84(0.05) ***	0.56(0.49)
Observations	239	219	116	458

Notes: 1) ***, ** and * refer to 1%, 5%, and 10% significance level compared to non-members, respectively.

2) Values in the parenthesis are standard errors (standard deviation for pooled sample).

4. Estimation Strategy

(1) Participation model

This study uses a binary Logit model to identify the determinants of participation in agricultural cooperatives. The dependent variable is a dummy variable equal to 1 if the household is a cooperative member and 0 otherwise. Following Gujarati (2004), the Logit model to analyze

participation in agricultural cooperatives is specified as:

$$L_i = \ln\left(\frac{P_i}{1-P_i}\right) = \beta_0 + \sum_{j=1}^{n} \beta_j Z_{ji} + u_i \qquad (1)$$

where L_i (the Logit) is the odds ratio in favor of being a member – i.e., the ratio of the probability[8] that a household will be a member of the cooperative to the likelihood that s/he will not be a member; Z_j are socio-demographic, asset holding, social capital, and location-specific explanatory variables (Table A2.1) selected based mostly on previous studies; i refers to the ith individual; $j = 1, 2, \ldots n$ indexes explanatory variables; β_0 and β_j are parameters to be estimated using maximum likelihood estimation, and u_i is an error term.

The study also analyzes the factors affecting the community level participation rate in agricultural cooperatives using a Tobit model (Green 2008: p.872). The dependent variable in this analysis is the community-level participation rate in agricultural cooperatives – i.e., the percentage of members out of the total population in the kebele. I acknowledge that some of the explanatory variables (e.g., information access) may be endogenous due to omitted variables, but since there are no appropriate instruments to treat endogeneity, I use them as they are.

(2) Impact model

The most straightforward approach to investigate the impact of cooperatives is to include a dummy variable of membership and estimate using ordinary least squares. However, this approach assumes that participation in cooperatives is exogenously determined, while it is potentially endogenous. Hence, most previous studies (Abate et al., 2014; Abebaw and Haile, 2013; Bernard et al., 2008; Bernard and Taffesse, 2012; Debela et al., 2018; Francesconi and Heerink, 2010; Getnet and Tsegaye, 2012; Ito et al., 2012; Verhofstadt and Maertens, 2014) have used Propensity Score Matching (PSM) method which accounts for variation in observed characteristics. However, PSM does not account for any potential unobservable bias. This study, therefore, adopts an ESR model that accounts for possible bias due to observable and unobservable characteristics. Specific to this study, the null hypothesis that unobservable bias is not different from zero was rejected. Hence, it is appropriate to use the ESR model (for details see the second subtopic of section 5 in this chapter).

Following previous studies (Di Falco et al., 2011; Lokshin and Sajaia, 2004; Shiferaw et al.,

2014), the decision to participate in agricultural cooperatives, and its implication on agricultural performance, market orientation, and welfare of cooperative members, can be modeled in a two-stage treatment framework. The first stage is the selection model in which the i^{th} household faces a decision to be or not to be a member of the cooperative. Suppose U_m and U_{nm} are the benefits of a farmer from being a member and nonmember, respectively. The farmer will decide to join the cooperative if $I_i^* = U_m - U_{nm} > 0$. The net benefit from participation in agricultural cooperatives (I_i^*) is a latent variable determined by observed characteristics (Z_i) and the error term (η_i) as:

$$I_i^* = Z_i\alpha + \eta_i \text{ with } I_i = \begin{cases} 1 \text{ if } I_i^* > 0 \\ 0 \text{ otherwise} \end{cases} \quad (2)$$

where I_i is equal to 1 if the farmer is a member of the cooperative and 0 otherwise, Z_i refers to factors that affect expected benefits of participation in cooperatives and hence the participation decision, and α is a vector of influence parameters to be estimated.

The second stage estimates the impact of cooperative membership on agricultural performance, market orientation, and welfare. The ESR model can be evaluated efficiently using the full information maximum likelihood (FIML) estimation (Lokshin and Sajaia, 2004). For the ESR model to be identified, this study used selection instruments, besides automatically generated nonlinearities. It is essential that the selected instrument is correlated with the decision to participate in cooperatives but have no direct effect on outcome variables (Di Falco et al., 2011). Accordingly, availability of regular input traders and number of wholesalers in the kebele are considered as selection instruments with a priori assumption that these variables negatively affect the participation decision but have no direct effect on outcome variables. These variables are beyond the household's own choice and hence are exogenous.

Presumably, the availability of alternative service providers (i.e., input and output traders) affect a farmer's decision to participate in cooperatives. However, output traders do not have a direct effect on NPS adoption, yield, and unit cost of fertilizer, hence, it is used as a selection instrument for these outcome variables. Likewise, the availability of input traders is used as a selection instrument for output price, marketed surplus, and income outcome variables. More importantly, following previous studies (Di Falco et al., 2011; Mojo et al., 2017; Shiferaw et al., 2014), admissibility of the selection instruments was tested using falsification tests. The results show that the selection instruments are statistically significant in the participation models but not

in the outcome models (Table A2.3).

The outcome functions where a farmer faces two regimes (i) to participate, and (ii) not to participate, can be represented as follows:

$$\text{Regime 1: } y_{1i} = X_{1i}\beta_1 + \varepsilon_{1i} \text{ if } I_i = 1 \quad (3a)$$

$$\text{Regime 2: } y_{2i} = X_{2i}\beta_2 + \varepsilon_{2i} \text{ if } I_i = 0 \quad (3b)$$

where y_{1i} and y_{2i} are outcome variables, representing NPS adoption, yield, marketed surplus, output price, the unit cost of fertilizer, and income for members and nonmembers of the cooperatives, respectively; X represents a vector of covariates included in Z; β is a vector of parameters to be estimated; and ε is the error term.

The error terms in equations (2) and (3) are assumed to have a trivariate normal distribution with mean zero and covariance matrix specified as:

$$\text{Cov}(\varepsilon, \eta_1, \eta_2) = \begin{bmatrix} \sigma_\mu^2 & \sigma_{1\mu} & \sigma_{2\mu} \\ \sigma_{1\mu} & \sigma_1^2 & . \\ \sigma_{2\mu} & . & \sigma_2^2 \end{bmatrix} \quad (4)$$

where σ_μ^2 is the variance of the error term in the selection equation (2), σ_1^2 and σ_2^2 are the variances of the error terms in equations (3a) and (3b), respectively, $\sigma_{1\mu}$ is a covariance of η_i and ε_{1i}, $\sigma_{2\mu}$ is a covariance of η_i and ε_{2i}. The covariance between η_1 and η_2 is not defined (represented by a dot in the matrix) as y_1 and y_2 are not observed simultaneously. Refer Di Falco *et al.* (2011) for details on the expected values of the error terms in Equation 3 and full information maximum likelihood estimation.

The above framework of ESR model can be used to estimate the average treatment effect on the treated (ATT) by comparing the expected values of outcome variables for members in actual and counterfactual scenarios (Shiferaw *et al.,* 2014). Accordingly, the following two equations estimate the conditional expectations of (a) actual members observed in the sample (b) members had they been nonmembers.

$$\text{E}(y_{1i}|I_i = 1; X) = X_{1i}\beta_1 + \sigma_{1\eta}\lambda_{1i} \quad (5a)$$

$$\text{E}(y_{2i}|I_i = 1; X) = X_{1i}\beta_2 + \sigma_{2\eta}\lambda_{1i} \quad (5b)$$

where λ_{1i} is the Inverse Mills Ratio for farmer i that is computed from the selection equation.

And it is included in Equations 3a and 3b to correct for selection bias in the second stage of the ESR model.

Finally, given the above conditional expectations, the ATT is estimated as follow.

$$\text{ATT} = (5a) - (5b) = \text{E}(y_{1i}|I_i = 1; X) - \text{E}(y_{2i}|I_i = 1; X) \quad (6)$$

where ATT measures the impact of agricultural cooperatives on NPS adoption, yield, marketed surplus, output price, the unit cost of fertilizer, and income of cooperative members.

5. Result and Discussion

(1) Participation in agricultural cooperatives

To account for possible variation among cooperatives, the participation model is estimated for the following two cases, independently. First, the study examines determinants of participation decision in agricultural cooperatives accounting for their collective behavior using a dummy variable – i.e., =1 if the cooperative provides output aggregation service. Next, the participation model for marketing cooperatives is re-estimated independently.

As shown in Table 2.2, educated farmers do have a higher probability of participation in agricultural cooperatives. The positive effect of education on the likelihood of being a member is intuitive and in line with previous studies (Debela et al., 2018; Mojo et al., 2017; Nugusse et al., 2013). Land size has a nonlinear concave relationship with the likelihood of participation. The lower likelihood of small landowners' membership could be partly because of their expected lower marketable surplus and input demand, which in turn makes the benefit from membership only marginal. On the other hand, the lower participation of relatively larger landowners could be because they can buy inputs and sell their output directly by themselves. Overall, these results show that small and large landholders have less motive for cooperation. Such "middle-class effects" are also observed in Ethiopia (Bernard et al., 2008) and elsewhere (Fischer and Qaim, 2012; Ito et al., 2012).

Table 2.2 – Factors affecting membership in agricultural cooperatives

Variables	All cooperatives		Marketing cooperatives	
	Coef.	Std. Err	Coef.	Std. Err
Age	0.02	0.01	0.02	0.01
Family size	0.04	0.05	0.05	0.06
Education	0.30 *	0.16	0.30 *	0.18
Land size	0.86 ***	0.22	0.73 ***	0.24
Land size^2	-0.09 ***	0.03	-0.07 ***	0.03
Livestock	0.03	0.02	0.04	0.03
Social capital	0.36	0.28	0.30	0.31
Extension agents	-0.06	0.16	-0.17	0.18
Distance to district	0.07 ***	0.02	0.07 ***	0.02
Output aggregation	0.99 ***	0.28	-	-
Credit service	0.85 **	0.36	1.74 ***	0.41
Traders	-0.04 ***	0.01	-0.02 *	0.01
Input suppliers	-2.29 ***	0.31	-1.42 ***	0.35
Constant	-2.81 ***	0.97	-3.22 ***	1.16
LR chi^2 (16)	181.9 ***		116.03 ***	
Observations	446		366	

Notes: 1) ***, ** and * refer to 1%, 5%, and 10% significance level respectively;

2) District fixed effect is accounted in the estimation but not reported for brevity.

The other significant group of variables that affect participation decision includes distance to the district, output aggregation, credit service, traders, and availability of input suppliers. In general, a household head will have a higher tendency to participate or depend on cooperatives if s/he has fewer options to get marketing services, *ceteris paribus*. The results show that distance to the district, where the nearby central market is located, has a positive relationship with the likelihood of being a member. A possible explanation for this can be because farmers located far away from the nearby central market face higher transaction costs and hence have a higher incentive to be members. This result is consistent with previous studies (Abebaw and Haile, 2013; Ahmed and Mesfin, 2017). The availability of input suppliers and the number of traders have a negative and

significant effect on the likelihood to participate. The results further show that, in line with the prior expectation, farmers who live in kebeles where cooperatives provide output aggregation and credit services are more likely to be members.

Overall, the results suggest that while cooperatives are equally open for young and old farmers, they are less inclusive of illiterate and land-poor households. A potential explanation may be because the benefit of land-poor households is only marginal, and illiterate farmers tend to be more pessimistic, changing their mind about the past adverse history of cooperatives in Ethiopia. During the former "*Derg"* regime, Ethiopian cooperatives were forced to adopt a socialist ideology against their desire, resulting in poor performance (Bernard et al., 2010; Getnet and Tsegaye, 2012).

This study also investigates factors affecting the community-level participation rate in agricultural cooperatives, using woreda/district level fixed effect to control for unobserved heterogeneity. Furthermore, standard errors were also clustered by woreda. Table 2.3 presents results of Tobit regression, showing that kebeles without access to the paved road do have a higher participation rate than otherwise. A potential reason for this can be the associated higher transaction cost of getting marketing services in kebeles with no access to the road. Participation in agricultural cooperatives pays off more when such transaction costs are high, as there will be an incentive to collaborate (Markelova et al., 2009). Abebaw and Haile (2013) also revealed that the likelihood of participation in agricultural cooperatives increases with distance.

As shown in Table 2.3, access to information has a positive and significant effect on community-level participation rate in agricultural cooperatives. In one hand, access to information could help to know the potential benefit from collective action, on the other hand, it helps to change farmers' misconception about cooperatives, mainly due to its poor performance in the previous era of cooperatives (Bernard et al., 2008). Previous research also found similar results (Nugusse et al., 2013). The average landholding per household has a positive and significant effect on the community-level participation rate. The lower participation rate of small landowners may be because they have limited marketable surplus and input demand. However, others (Bernard *et al.,* 2008; Fischer and Qaim, 2012; Abate *et al.,* 2014) found a nonlinear (inverted U shape) relation between landholding and participation in agricultural cooperatives.

Table 2.3 Factors affecting community level participation rate

Variable	Dependent variable: Participation rate (%)	
	Coefficients	Standard Error
Paved road	-7.66 *	4.27
Asphalt road	2.86	4.56
Distance from the district	-0.01	0.25
Transport service	0.87	0.94
Extension service	-1.39	3.20
Information access	0.25 **	0.16
Landholding	21.1 ***	6.36
Landholding square	-1.01	1.7
Constant	41.7 ***	11.5
Woreda Dummy	Yes	
Observations	121	

Notes: 1) ***, ** and * indicate 1%, 5% and 10% significant levels, respectively;
2) Standard errors are adjusted for 11 clusters by woreda.

(2) Impact of agricultural cooperatives

Two statistical tests are performed to evaluate the impact of cooperatives on agricultural performance, market orientation, and the welfare of smallholder farmers. First, accounting for different services of cooperatives, the study estimates the impact of membership on a set of outcome variables (Table 2.4). Second, to explicitly evaluate the impact of membership in marketing cooperatives, especially on output price and marketed surplus outcome variables, their effectiveness was re-estimate independently (Table 2.5).

Accordingly, Table 2.4 reports the impact of agricultural cooperatives, accounting for their heterogeneity using dummy variables – i.e., services they provide. Before discussing the impact of membership in agricultural cooperatives, it is necessary to highlight that the likelihood-ratio tests for joint independence of the three equations (Equations 2, 3a and 3b) justifies using ESR model. In particular, the likelihood-ratio tests for yield (LR χ^2 =4.68, p=0.03), marketed surplus (LR χ^2 =5.04, p=0.02), and income (LR χ^2 =72.6, p=0.00) show that the error terms in these equations are correlated and ignoring them may lead to biased estimates (Mojo *et al.,* 2017).

Overall, as can be seen from the last column of Table 2.4, cooperatives do have a significant impact on members' yield, unit cost of fertilizer, and income. Explicitly, actual members of the cooperatives would have received 1.37 quintal/hectare (nearly 5%) yield reduction and 1804 *Birr* (about 13%) less income if they had not joined cooperatives. Likewise, members of the cooperatives would have cost 22 *Birr*/quintal (about 1.5%) more for fertilizer if they had not been members. However, the results show that there is no detectable difference between members and nonmembers of cooperatives in terms of NPS fertilizer adoption, output price, and marketed surplus. These results suggest that cooperatives are only partly effective in terms of improving agricultural performance and market orientation of farmers.

To this end, results of this study are consistent with previous studies that support cooperative effectiveness (Ito *et al.,* 2012; Abate *et al.,* 2014; Verhofstadt and Maertens, 2014; Debela *et al.,* 2017; Mojo *et al.,* 2017) but in contrast to others (Bernard *et al.,* 2008; Abebaw and Haile, 2013). Briefly, studies done on maize producers in Rwanda and banana growers in Kenya showed that cooperatives do have a positive and significant impact on household income. Another empirical research done in Nigeria found a positive and significant effect of cooperatives on technology adoption and household welfare (Wossen et al., 2017). Micro-level studies in China also show that producer cooperatives have significantly helped members producing watermelon and apple to increase their yield, income, labor productivity, and price (Ito et al., 2012; Ma and Abdulai, 2016). Another strand of the literature, comparing cooperatives with individual owned firms, indicates that, on average, cooperatives have a stronger financial position (Soboh et al., 2011, 2012).

Table 2.4 – The impact of membership in cooperatives

Outcome	Decision stage for members		Average treatment effect on members
	To be a member	Not to be a member	
NPS adoption	0.54 (0.07)	0.69 (0.07)	-0.15 (0.10)
Yield	26.1 (0.07)	24.7 (0.07)	1.37 (0.10) ***
Marketed surplus	0.33 (0.07)	0.26 (0.07)	0.06 (0.10)
Price	7.89 (0.07)	7.95 (0.07)	-0.06 (0.10)
Unit cost of fertilizer	14.6 (0.07)	14.8 (0.07)	-0.22 (0.10) **
Income	13818 (0.07)	12013 (0.7)	1804 (0.10) ***

Note: *** and ** refer to 1% and 5% significance level respectively, and values in parenthesis refer to standard errors.

The primary objective of establishing cooperatives in Ethiopia is to strengthen the agricultural input and output market. However, unlike the agricultural input supply service, nearly half of the members do not get output aggregation service directly from their cooperatives. Hence, a separate analysis is done on the effectiveness of cooperatives that provide output aggregation service – i.e., marketing cooperatives. Before outlining the estimation results, it is important to highlight the results of the diagnostics test that substantiate using the ESR model. The likelihood-ratio tests for joint independence of the three equations (Equations 2, 3a and 3b) of marketing cooperatives show that the error terms in these equations are significantly correlated at the 99% – i.e., LR χ^2 =5.65 (p=0.02) for yield, LR χ^2 =20.0 (p=0.00) for marketed surplus, and LR χ^2 =57.8 (p=0.00) for income outcome variables. Furthermore, the falsification test results confirm that the selection instruments are statistically valid for all outcome variables used in estimating the effectiveness of marketing cooperatives (i.e., estimation results are not reported for brevity).

Table 2.5 presents the impact of participation in marketing cooperatives. As shown in the last column of Table 2.5, membership in marketing cooperatives increases members' yield by 1.6 quintals per hectare. Perhaps more importantly, the result suggests that members of the marketing cooperatives would have nearly 34% less marketed surplus, had they not been members. The positive impact of membership on the marketed surplus could be partly because of members' incentive from increasing the overall output aggregation and hence the profit of the cooperatives. This result is consistent with a previous study in Ethiopia (Francesconi and Heerink, 2010). The

results indicate no detectable difference in price among members and nonmembers of marketing cooperatives, may be due to a positive spillover effect. Participation in marketing cooperatives also reduces members' cost of fertilizer by 55 *Birr*/quintal. The study also revealed that members of the marketing cooperative should receive 2555 *Birr* less income if they were nonmembers.

Table 2.5 – The impact of membership in marketing cooperatives

Outcome	Decision stage for members		Average treatment effect on members
	To be a member	Not to be a member	
NPS adoption	0.62 (0.09)	0.54 (0.09)	0.07 (0.13)
Yield	25.92 (0.09)	24.33 (0.09)	1.59 (0.13) ***
Marketed surplus	0.35 (0.09)	0.01 (0.09)	0.34 (0.13) ***
Price	7.94 (0.09)	8.03 (0.09)	-0.09 (0.13)
Unit cost of fertilizer	14.4 (0.09)	14.9 (0.09)	-0.55 (0.13) ***
Income	14091 (0.09)	11535 (0.1)	2555 (0.13) ***

Note: *** refers to the 1% significance level, and values in the parenthesis are standard errors.

Results of this study show that it is crucial to consider the collective behavior of cooperatives explicitly in estimating their effectiveness. Specifically, membership in marketing cooperatives has a positive and significant effect on marketed surplus. Moreover, while the sign and significance of ATT remains unchanged for other outcome variables, the impact of membership is higher for members of marketing cooperatives compared to the case of all members of the cooperatives (Table 2.4) – e.g., yield and income gain from membership in marketing cooperatives is nearly 16% and 32% higher, respectively.

In conclusion, the low participation rate of farmers in the study area could be attributed to (i) less effectiveness of cooperatives (in terms of NPS adoption, marketed surplus, and output price) or marketing cooperatives (in terms of output price and NPS adoption). (ii) less inclusiveness of illiterate and land-poor farmers in (marketing) cooperatives. (iii) less dependence of households with better access to the market (measured by distance to the district, availability of input suppliers, and the number of traders in the kebele).

(3) Heterogeneous impact of cooperatives

The previous section has shown that the effectiveness of cooperatives varies by their collective behavior (cooperatives versus marketing cooperatives). Hence, this subsection further discusses

the heterogeneity in the impact of participation among members of marketing cooperatives. Previous studies also showed that treatment effects might vary among members of agricultural cooperatives (Abebaw and Haile, 2013; Ahmed and Mesfin, 2017; Verhofstadt and Maertens, 2015).

Table 2.6 presents the heterogeneity in the impact of participation among members of marketing cooperatives. The results show that members of marketing cooperatives who have a larger asset (livestock), smaller family size, and are located in kebeles where there are a fewer number of extension agents benefit more from their marketed surplus than otherwise. A possible explanation for this can be because the role of cooperatives, in terms of improving the market orientation of members, is larger when extension agents are lacking. The results further show that members living in kebeles where there are many traders, benefit more from marketed surplus than their counterparts. This result could be partly because of the potentially positive effect traders on the competitiveness of cooperatives in terms of providing services.

The unit cost of fertilizer is another outcome variable which has a heterogeneous impact among members of marketing cooperatives. Specifically, large landholders and members living in kebeles where there are regular input suppliers benefit more from the reduced cost of fertilizer than their counterparts. This result may be because larger landholders may have higher demand and hence are marginally better off – i.e., they benefit from the lower transaction cost per kilogram of fertilizer. This result is consistent with a study done in Rwanda (Verhofstadt and Maertens, 2015) but contrary to another case study in China (Ito et al., 2012). The results further show that resource (livestock) affluent and educated members of marketing cooperatives get a higher income than otherwise.

Table 2.6 – Impact heterogeneity among members of marketing cooperatives

Variables	Yield	Marketed surplus	The unit cost of fertilizer	Income
Age	-0.03 (0.11)	0.001 (0.002)	-0.001 (0.01)	-48.1(131)
Family size	-0.34 (0.50)	-0.02 (0.01) *	-0.03 (0.07)	-285(626)
Education	0.99 (1.72)	0.05 (0.03)	0.24 (0.22)	3078(1848) *
Land size	1.84 (3.32)	0.07 (0.04)	-0.59 (0.34) *	657(3416)
Land size^2	-0.16 (0.34)	-0.01 (0.01)	0.06 (0.04)	89.4(454)
Livestock	0.83 (0.22)	0.01 (0.005) ***	-0.01 (0.03)	1055(299) ***
Social capital	4.99 (2.71) *	0.08 (0.06)	0.15 (0.37)	2239(3418)
Extension agents	-1.87 (1.43)	-0.10 (0.03) ***	0.01 (0.22)	-800(290) ***
Distance to district	-0.29 (0.36)	-0.007 (0.004)	0.02 (0.04)	-1004(468)
Credit service	1.26 (7.14)	0.11 (0.08)	0.67 (0.68)	165.7(4527)
Traders	-	0.01 (0.005) **	-	559(317) *
Input suppliers	-3.52(6.41)	-	-1.14(0.5) **	-

Note: ***, ** and * refer to 1%, 5%, and 10% significance level respectively, and reported values are coefficients with their standard error in the brackets.

6. Conclusions

This study attempted to understand why farmers are not participating in cooperatives by explicitly examining the participation in and impact of agricultural cooperatives in Ethiopia. Generally, the results show that lower participation rates, in the study area, could be due to both less inclusiveness and effectiveness of cooperatives. The impact analysis shows that cooperatives are effective in terms of improving the yield and income of their members. Furthermore, membership in agricultural cooperatives also helps farmers to reduce the unit cost of fertilizer. This study also suggests that the effectiveness of cooperatives varies by their collective behavior and finds interesting results. More specifically, membership in marketing cooperatives has effectively improved members marketed surplus – i.e., members of marketing cooperatives would have had 34% less marketed surplus if they were not members.

The results of this study have important implications regarding the ways to improve the effectiveness and inclusiveness of agricultural cooperatives. Based on the results of the study, the following implications are suggested: (i) while cooperatives have successfully improved the

agricultural performance of their members, their role in improving marketing performance was only limited. To this end, improving the market orientation of cooperatives (e.g., through capacity building and improving information access) will help farmers to benefit from increased marketed surplus and income. Hence, the government in general and the federal cooperative agency, in particular, should encourage and train cooperatives to capitalize on output aggregation service. (ii) Cooperatives should devise strategies to improve their effectiveness and inclusiveness, whenever possible. In this regard, efforts to increase members with a more extensive asset base (e.g., livestock) in (marketing) cooperatives will improve their effectiveness without compromising inclusiveness. Likewise, expanding marketing cooperatives to areas where there are competitive input and output markets will increase their efficiency.

I acknowledge that the results of this study cannot be generalized at the national level. Hence, I suggest future research to use nationally representative data to generalize results at a country level. Moreover, including kebeles/villages without cooperatives, whenever available, will help to test the robustness of the result for spillover effects of cooperatives, if any. Finally, decisions in the cooperatives can be made in two stages. First, the cooperative maximizes its profit, and then members maximize their proportion of profit (Soboh et al., 2009). Hence, future research should shed more light on accounting for this nature of cooperatives in evaluating their performance.

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Appendix

Table A2.1 – Definition, measurement, and the hypothesis of variables

Variable	Definition and measurement	Hypothesis
Outcome variables		
Cooperative member	= 1 if the household is a member of the cooperatives and 0 otherwise	
NPS adoption	=1 if the household adopt NPS at least in one wheat plot	
Yield	Household's average wheat productivity (quintals/hectare)	
Price	Average wheat price during 2015/16 (*Birr*/kg)	
Marketed surplus	The share of wheat production sold during 2015/16 (%)	
Unit cost of fertilizer	Cost of all types of fertilizer used in 2015 (*Birr*/kg)	
Income	Total revenue from wheat sale during 2015/16 (*Birr*)	
Explanatory variables		
Age	Age of the household head (years)	"+ / –"
Family size	Household size (number)	"+"
Education	The education level of household head (years of schooling)	"+ "
Land size	Households' total cultivable land (hectares)	"+ "
Land size^2	Households' total cultivable land square (hectares)	"– "
Livestock [a]	Total number of livestock the household owns (TLU)	"+"
Social capital	= 1 if member/s of household participate in local informal associations and 0 otherwise	"+"
Extension agents	Number of extension agents in the kebele	"+"
Distance to district	Distance from home to a district where there is a central market (Km)	"+ / –"
Output aggregation	= 1 if the cooperative in the kebele aggregate output and 0 otherwise	"+"
Credit service	= 1 if the cooperative in the kebele provides credit service and 0 otherwise	"+"
Traders	The number of wholesaler and assemblers in the kebele	"– "
Input suppliers	= 1 if there are regular input suppliers in the kebele and 0 otherwise	"– "

Note: [a] TLU (Tropical Livestock Unit) is a standard factor used to calculate aggregate livestock.

Table A2.2 Definition and summary of variables

Variables	Variable definition	Mean	SDs.[1]
Participation rate	Households in the kebele who are members of cooperatives (%)	50.33	31.85
Paved road	The kebele has access to paved road (1= yes and 0 otherwise)	0.73	-
Asphalt road	The kebele has access to asphalt road (1= yes and 0 otherwise)	0.11	-
Distance from the district	Kebele to woreda (district) distance measured in kilometers	14.43	15.7
Transport service	The number of trucks based in the kebele	1.31	2.07
Extension service	The number of Development Agents (DAs) in the kebele	3.58	1.21
Information access	Households in the kebele who own a radio (%)	56.39	25.6
Landholding	Average landholding per household in the kebele (hectares)	1.69	0.95
Landholding square	Square of average landholding per household in the kebele (hectares)	3.75	4.77

Note: SDs refers to standard deviations; the number of observation is 121 for all variables.

Table A2.3 – Test on the validity of the selection instruments

Outcome variable	Participation model		Outcome models [a]			
			Nonmembers		Members	
	Chi^2	p-value	F-stat/Chi^2	p-value	F-stat/Chi^2	p-value
NPS adoption	8.01***	0.005	0.72	0.39	0.81	0.36
Yield	8.01***	0.005	0.30	0.58	0.01	0.99
Marketed surplus	52.7***	0.000	0.01	0.95	0.43	0.51
Price	52.7***	0.000	1.85	0.18	0.14	0.71
Unit cost of fertilizer	8.01***	0.005	0.48	0.49	0.05	0.98
Income	52.7***	0.000	0.01	0.92	0.94	0.33

Notes: [a] F-statistics is estimated for all outcome variables, except NPS adoption (Chi^2); *** denotes significance level at 1%.

1) NPS is a compound fertilizer which refers to Nitrogen-Phosphors and Sulfur.

2) Previous researchers in Ethiopia have reported differences between the two groups (e.g. Abebaw and Haile, 2013; Abate et al., 2014).

3) For example, household's risk preference and entrepreneurial spirit may affect both participation decisions as well as outcome variables (Bernard et al., 2008).

4) Both edir and equib are informal institutions established among neighbors or workers, but for different purposes. While equib aims to provide a rotating fund for members, edir raises fund to be used during emergency, e.g. death within members' family.

5) Most cooperatives supply agricultural inputs, however, only 46% and 28% of sampled cooperatives provide output aggregation and credit services. Hence, this study accounts for credit and output aggregation services.

6) In all what follows, unless specified cooperatives refers to all cooperatives.

7) 25%, 50%, 75% and 90% of the observations do have less or equal to 25, 41, 80 and 100% participation rate, respectively.

8) The probability to be member $\mathrm{P}_i = \mathrm{E}(\mathrm{Y} = 1|Z_i) = \frac{1}{1+e^{-(\beta_0+\sum_{j=1}^{n}\beta_j \mathrm{Z}_{ji})}}$ follows the logistic distribution function (Gujarati, 2004: pp 595). However, without a need to calculate p values explicitly, the "logit" command of STATA is employed – i.e. where the dependent variable equal to 1 if household is cooperative member (treated) and 0 otherwise (control) – to estimate Equation 1.

Chapter 3 Warehouse Service and Price Seasonality

1. Introduction

Seasonality refers to the intra-annual variability of the monthly price that is specifically related to the crop cycle (Manda, 2010; Gilbert *et al.,* 2017). Supposedly, given the associated storage and opportunity costs, the price of storable crops increases gradually after harvest (Kaminski *et al.,* 2014). Therefore, even when markets are efficient, a certain degree of food price seasonality is inevitable. However, seasonality will be more pronounced when access to storage and credit facilities are limited (Gilbert *et al.,* 2017). Previous studies also revealed that the extent of food price seasonality (hereafter seasonal gap) in developing countries is two to three times greater than the international reference market (Kaminski *et al.,* 2016; Gilbert *et al.,* 2017).

As a typical developing country located in Sub-Saharan Africa, studying the seasonality of staple food price in Ethiopia is necessary mainly for the following three reasons. First of all, there is a strong negative association between food price seasonality and intra-annual food consumption[1)] in Ethiopia and elsewhere (Dercon and Krishnan, 2000; Hirvonen et al., 2016; Kaminski et al., 2016). Specifically, consumption of the poor is highly price-sensitive and hence suffers from food insecurity during the peak periods of food price (Manda, 2010; Woldehanna and Tafere, 2015). Putting it differently, "distress sellers" – who are forced to sell their crops immediately after harvest to meet unavoidable obligations including debts on agricultural inputs, land tax, school fees, etc. – will find themselves unable to buy when prices soar, resulting in welfare loss (Manda, 2010; Sahn and Delgado, 1989; Woldehanna and Tafere, 2015).

Second of all, seasonality (predictable component) is one feature of food price volatility (Woldehanna and Tafere, 2015; Gilbert *et al.,* 2017) that discourages smallholder farmers from investing to improve their farm income (Baffes et al., 2019; Byerlee et al., 2006; Jayne et al., 2006; Manda, 2010). Over the last decade, there has been high food price volatility in Ethiopia. The government has also acknowledged the problem and attempted to take regulatory measures to resolve potential welfare loss (Woldehanna and Tafere, 2015). But the issue remains unsettled. Hence, understanding the characteristics and extent of food price seasonality will help to draw behavioral inferences and design appropriate policy intervention to stabilize the market.

The last, perhaps more important, reason is that there exists only little systematic evidence on

the extent and characteristics of food price seasonality in Ethiopia. In general, food price seasonality has been a central research area in the 1990s, till it was neglected mainly due to the public perception of improved integration of local food markets (Kaminski *et al.,* 2016). Recently, the focus on price seasonality has revived (Baffes et al., 2019; Gilbert et al., 2017; Kaminski et al., 2014, 2016; Manda, 2010). However, the issue is less studied in the case of Ethiopia. Moreover, with the exception of Gilbert *et al.* (2017), available studies are dated (Dercon and Krishnan, 2000).

In their comprehensive study on seasonality of food price in Africa, Gilbert et al. (2017) have considered Ethiopia as one of their case study countries. However, the current study is unique in three aspects. First, using the most recent data (i.e., 2010 to 2017), this study examines price seasonality of both retail and wholesale markets in Ethiopia. Second, the study analyzes the price seasonality of wheat and mixed teff – i.e., among the top staple crops in the country. Most importantly, besides estimating the extent of food price seasonality, this study extends the analysis and examines the effect of warehouse services on food price seasonal gap in the country.

In the context of this study, warehouse service refers to a service provided by the ECX. The ECX has 17 warehouses all over the country, including the four markets (Addis Ababa, Gondar, Adama, and Nekemit) considered in this study (Gabre-madhin, 2012). The benefit of using a warehouse service is twofold. While storing their crop[2)] in a reliable warehouse, farmers can also use the issued warehouse receipt as loan collateral to access finance without actually selling their produce (Gabre-Madhin and Goggin, 2005). Here it is worth noting that ECX eases the process to get credit by providing a legal receipt which can be used as collateral, but it does not offer credit directly. This service of ECX, however, could lessen the price seasonal gap by encouraging storage immediately after harvest – i.e., when the price is low.

Therefore, this study is motivated to demonstrate how and to what extent warehouse service affects the food prices seasonality in Ethiopia. Furthermore, the study also examines the characteristics and degree of staple food price seasonality in the country. In a nutshell, the results show that warehouse service has a statistically significant association with the food price seasonal gap in Ethiopia. The rest of the chapter is organized as follows: the next section describes the data and estimation strategy. Section 3 presents the main results of the study, and the last section concludes.

2. Data and Estimation Strategy

This study uses a monthly food price data (from July 2010 to April 2017) collected by the Ethiopian Grain Trade Enterprise (EGTE) and International Monetary Fund (IMF). Specifically, the study considered *teff*[3)], wheat, and maize, which are dominantly produced (i.e., altogether accounting for 60% of total grain production) and consumed in Ethiopia (CSA, 2017). Therefore, the results of this study are based on 126 price series (65 wholesale and 61 retail markets) of four crops – namely, white teff, mixed teff, white wheat, and maize – in Ethiopia. Moreover, to compare the domestic price seasonality with the global market, I considered the international prices of wheat and maize at the USA market – i.e., a major exporter of wheat and maize contributing 13% and 38% of the global export, respectively (USDA, 2018). Thus, estimation is done using monthly price series of each crop by markets which contain 82 observations. Table 3.1 summarizes the availability of the data by crop and market type. Overall, each crop has data from 14-17 markets, with only less than 4% of the observations missing.

Table 3.1. Data description

Crops	Wholesale market			Retail market		
	Markets	Observations	Missing (%)	Markets	Observations	Missing (%)
White *teff*	17	1385	0.64	16	1302	0.76
Mixed *teff*	17	1389	0.36	16	1305	0.53
White wheat	15	1190	3.25	14	1106	3.65
Maize	16	1295	1.29	15	1211	1.54
Total	65	5259	1.33	61	4924	1.56

Note: In all what follows “wheat” refers to “white wheat”.

A common approach to characterize seasonality is to estimate unrestricted 12-month seasonal factors. The attractive feature of the unrestricted dummy variable regression is that no prior structure is imposed on the form of seasonality. However, long years of time-series data is required to obtain accurate estimates of seasonal factors (Kaminski *et al.,* 2016). Using the unrestricted dummy variable regression is especially problematic (i.e., sensitive to outliers) when the seasonal gap is measured as the difference between the maximum and minimum seasonal factor. This weakness of the dummy variable approach can be mitigated by using a trigonometric function, which is more parsimonious. By imposing a harvest-based pattern on the trend of monthly

seasonality factors, the trigonometric function approach reduces the influence of any single monthly price data (Gilbert *et al.,* 2017).

Generally, when data samples are short or seasonal processes are poorly defined, the trigonometric seasonality approach provides less (upward) bias and hence is preferred to the dummy variable approach (Kaminski *et al.,* 2016; Gilbert *et al.,* 2017). Accordingly, the present study employed the two-parameter trigonometric seasonality approach. With trending data, the seasonal parameters to be used to calculate seasonality of each crop can be estimated as:

$$\Delta P_{ym} = \gamma + \alpha\, \Delta\cos\left(\frac{m\pi}{6}\right) + \beta\Delta\sin\left(\frac{m\pi}{6}\right) + v_{ym} \quad (1)$$

where ΔP is a change in the log price[4)], y indexes year, m indexes month, π is a number approximately equal to 3.142, α and β are parameters to be estimated and v_{ym} is error term. The stationarity test (available upon request) confirms that ΔP is stationary. Hence, for each market monthly price series, equation (1) is estimated by ordinary least squares. And the standard regression R^2 value measures the share of price volatility explained by its seasonal component.

Once seasonal parameters are estimated, seasonality can be calculated following Equation (2) below:

$$S_m = \alpha\cos\left(\frac{m\pi}{6}\right) + \beta\sin\left(\frac{m\pi}{6}\right) = \lambda\cos\left(\frac{m\pi}{6} - \omega\right) \quad (2)$$

where S_m refers to seasonality, $\lambda = \sqrt{\alpha^2 + \beta^2}$ and $\omega = tan^{-1}\left(\frac{\alpha}{\beta}\right)$. The parameter λ measures the seasonal amplitude and implies a seasonal gap of 2λ. The seasonal gap measures the percentage change in price between pre-harvest and post-harvest seasons in which the price is at its peak and trough, respectively.

3. Result and Discussion

This study estimates the extent and characteristics of staple food price seasonality in Ethiopia. Accordingly, Table 3.2 presents the price seasonal gap of food crops by market type (wholesale and retail markets). For example, the reported value of white teff at the wholesale market (8.2) is the average of estimated seasonal gaps at wholesale markets (N=17). Overall, the unconditional mean comparison test results show an insignificant difference in price seasonality of wholesale and retail markets, for all considered crops.

Table 3.2. The seasonal gap of crops by market type

Crops	Wholesale market			Retail market			Mean difference (p-value)
	N	Mean	Std. Dev.	N	Mean	Std. Dev.	
White *teff*	17	8.21	3.59	16	8.14	3.51	0.06 (0.96)
Mixed *teff*	17	9.16	3.91	16	9.53	4.48	-0.36 (0.80)
White wheat	15	13.64	2.98	14	12.65	2.56	0.99 (0.35)
Maize	16	20.32	5.65	15	19.95	6.01	0.36 (0.86)
Total	65	12.69	6.31	61	12.44	6.26	0.24 (0.82)

Note: p-values refer to the null hypothesis of no mean difference between wholesale and retail markets.

The price seasonal gap for maize is nearly 20% both at wholesale and retail markets, which is much higher than the USA international maize market (6.03%) during the same period. Indeed, previous studies in Malawi also found even higher (nearly 60%) maize price seasonal gap (Manda, 2010; Gilbert *et al.,* 2017). Likewise, wheat price seasonal gap at wholesale and retail markets is more than threefold of the seasonal gap at USA international wheat market (3.39%). These results suggest that there is "excess" seasonal gap in Ethiopia which needs due attention. On the other hand, seasonality of white teff and mixed teff are nearly 8% and 9%, respectively, in both markets.

The world market price may determine the domestic price and hence price seasonal gap of imported crops. Among the crops considered in this study, wheat is an increasingly imported cereal in Ethiopia. From 2010 to 2015, the total value of wheat import in the country has increased by 21%. However, this growth is expected to be moderated by the anticipated increase in local wheat production and the private sectors' difficulty in accessing enough foreign exchange – i.e., foreign exchange reserve of Ethiopia was estimated to be less than two months of import coverage (Francom, 2017). Hence, to this end, the "excess" price seasonal gap in Ethiopia could be due to either or both of the following reasons: (i) due to poor infrastructure and storage services, which in turn could lead to less integration of domestic markets (ii) because of poor integration of the local markets with the world market, following difficulty to get foreign exchange by the private importers (Ansah *et al.,* 2014).

Extending further, I run (Bonferroni) multiple comparison test and evaluate the difference in

seasonality among crops. Bonferroni multiple comparison test is used to reduce type 1 error (false positive result) while doing multiple tests. As shown in Table 3.3, the results revealed that seasonality is significantly higher for maize followed by wheat – i.e., on average, seasonality of maize is 12%, 11%, and 7% higher than white teff, mixed teff, and wheat respectively. Similarly, the seasonal gap for wheat is significantly higher than that of white teff and mixed teff. The variation in seasonality amongst crops is consistent with previous studies (Kaminski et al., 2014).

Table 3.3 Seasonal gap comparison among crops

Crop type	White teff	Mixed teff	White wheat
Mixed teff	1.16		
	(1.13)		
White wheat	4.98 ***	3.82 ***	
	(4.67)	(3.58)	
Maize	11.96 ***	10.8 ***	6.9 ***
	(11.41)	(10.30)	(6.45)

Notes: 1) The reported values are row mean – column means, with their respective t-statistics in the parenthesis.
2) *** refers to the 1% significance level.

Figure 3.1 provides a visual illustration of wheat price seasonality at Addis Ababa wholesale market. The graph is estimated using the trigonometric function for price data from July 2014 to June 2016. While the vertical axis in the graph measures seasonality, the horizontal line refers to a monthly interval starting from July 2014 (1) to June 2016 (24). The figure demonstrates that price reaches at its peak during summer (July to October) and declines as the next harvest time approach – i.e., autumn (November to January) is the main harvesting season in Ethiopia (Woldehanna and Tafere, 2015). This figure clearly shows that the actual seasonal structure conforms to the imposed structure, which further confirms that it is appropriate to estimate the seasonal gaps using the trigonometric approach.

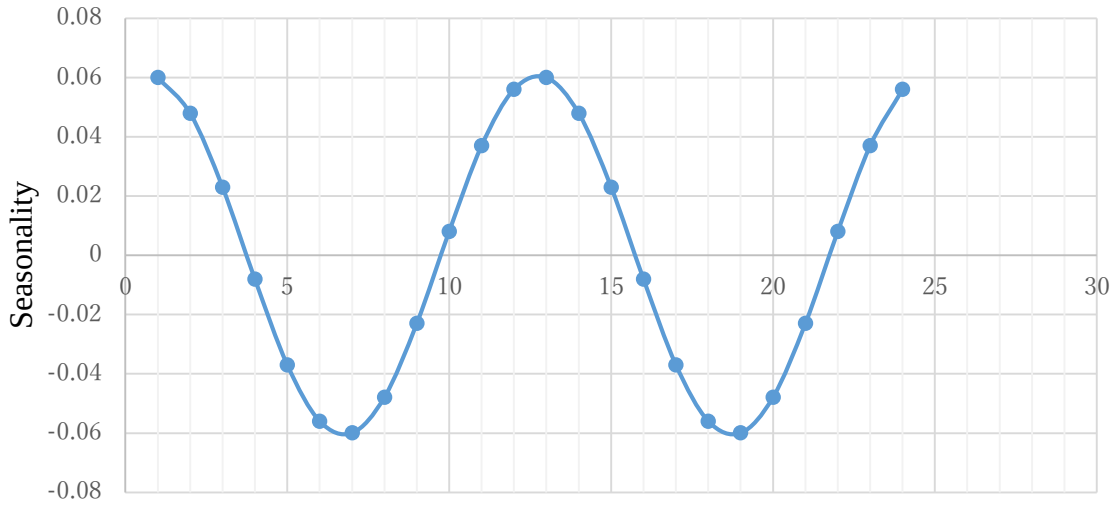

Figure 3.1 White wheat price seasonalit from July 2014 (1) - June 2016 (24), Addis Ababa wholesale market

Seasonality (known fluctuation) contributes to (domestic) price volatility (Gilbert et al., 2017). Table 3.4 presents the share of price volatility explained by its seasonal component. The results show that 10% of white teff price volatility in both wholesale and retail markets is attributed to its seasonality. Similarly, seasonality explains 10%, 12%, and 14% of price volatility in mixed teff, wheat, and maize wholesale markets, respectively. A study in Tanzania and Uganda also showed that seasonality explains 20% of the monthly price volatility (Kaminski *et al.,* 2014).

In general, price seasonality explains less than 15% of food price variability in Ethiopia. But it is higher compared to the international maize (3%) and wheat (1%) markets during the same period. This result suggests that efforts to reduce the "excess" food price seasonality in Ethiopia will, somehow, help to resolve the acute price instability in the country. However, I acknowledge that 85% or more of the variation in price is due to factors other than seasonality. Hence, future studies should consider investigating other possible options to resolve price volatility.

Table 3.4 Share of seasonality in price volatility

Crop type	Wholesale market				Retail market			
	Min	Max.	N	Seasonal R^2	Min	Max.	N	Seasonal R^2
White teff	0.01	0.30	17	0.10	0.01	0.26	16	0.10
Mixed teff	0.001	0.24	17	0.10	0.02	0.18	16	0.08
White wheat	0.04	0.19	15	0.12	0.03	0.18	14	0.11
Maize	0.01	0.26	16	0.14	0.01	0.27	15	0.14

Note: N indexes the number of markets, and seasonal R^2 refers to the average share of all markets.

Another question posited in the introduction section of this chapter refers to how and to what extent the warehouse service will affect the seasonality of food price. Two exercises are employed to examine the effect of warehouse service on the food price seasonal gap. First, I attempted to visually demonstrate the effect of warehouse service on price seasonal gap at the wholesale market (Figure 3.2). The vertical axis of Figure 3.2 measures estimated seasonal gap (%) and the horizontal axis represents the availability of warehouse service (yes = if there is warehouse service) by crop. Moreover, while the box represents 25^{th} to the 75^{th} percentile of the observations, the diamond within the box refers to the median.

The figure clearly illustrates that the median seasonal gap for wheat and maize is smaller in the markets with access to warehouse service than otherwise. Here, it is necessary to note that there is no as such a clear difference in the case of white teff and red teff. Unlike for wheat and maize, there is no warehouse service for white teff and red teff. Hence, results demonstrated in figure 3.2 are consistent with the prior expectation. The unconditional mean difference also shows that the seasonal gap for wheat and maize is 3.54% ($p = 0.03$) and 2.17% ($p = 0.38$) lower in favor of markets with access to warehouse service, respectively. However, a conclusion cannot be drawn based on the results of either the unconditional mean difference or Figure 3.2, because it could be due to other confounding factors.

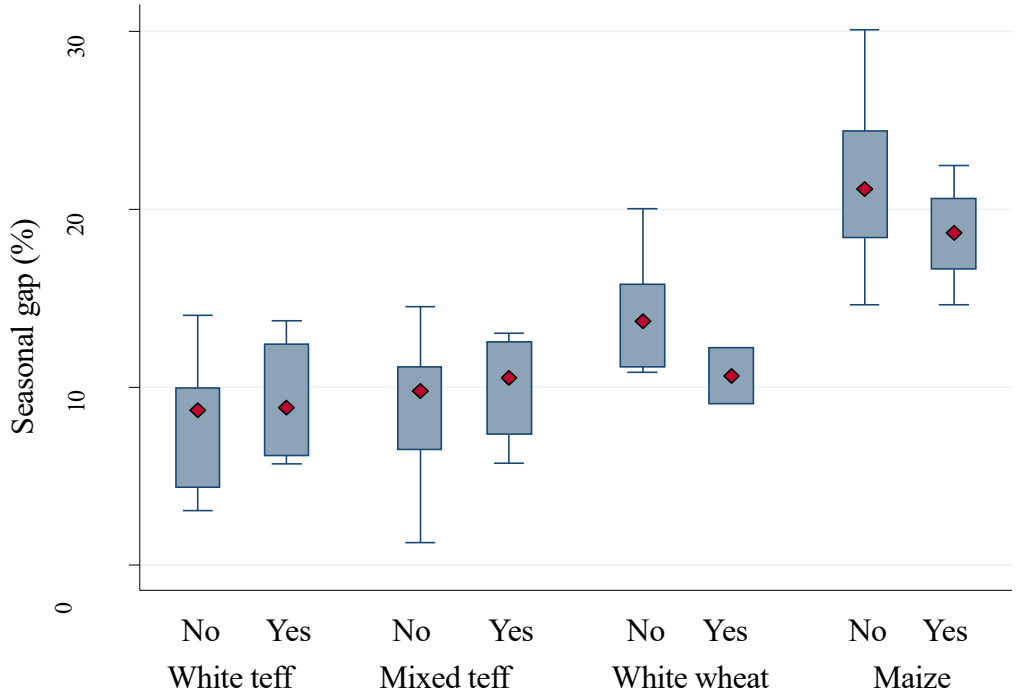

Figure 3.2 Price Seasonal gap of crops by the availability of warehouse service

In the next exercise, therefore, I examine the effect of warehouse service on seasonality by using the conventional analysis of variance (ANOVA) method. Intuitively, ANOVA helps to assess the potential differences in a continuous dependent variable by variables having two or more categories – i.e., crop, market type, and location-specific heterogeneity in this particular case. The dependent variable in this analysis is the estimated seasonal gap of 60 price series of wheat and maize.

The first panel of Table 3.5 presents ANOVA estimates for wheat and maize. The results show that access to warehouse service has a statistically significant effect on price seasonal gap[5)] – i.e., explaining nearly 5% of the variation in the extent of price seasonality. The results also confirmed that there is significant variation in the seasonal gap among crops and market locations (Figure A3.1). Overall, the model explained 67% of the total variation in the wheat and maize price seasonal gap. As a consistency check, the analysis was done for all crops case. Accordingly, as presented in the second panel of Table 3.5, the results show that warehouse service has a positive and statistically significant association with price seasonal gap. The results, therefore, suggest that improving access to warehouse services will contribute to resolving the "excess" seasonal gap in the country. Furthermore, interventions should consider characteristics of the crops (e.g., storability, the price elasticity of demand) and the markets (e.g., accessibility, market size, and structure).

Table 3.5 Analysis of variance on the seasonal gap

Source	Wheat and Maize		All crops	
	% explained	F-statistics	% explained	F-statistics
Warehouse service (yes/no)	4.80	5.94 **	1.30	4.30 **
Crop type	35.4	43.53 ***	54.0	60.68 ***
Market type (wholesale/retail)	0.40	0.55	0.01	0.30
Market location	26.0	2.01 **	12.0	2.56 ***
Number of observations	60		126	
R-squared	67.44		68.74	

Notes: 1) *** and ** refers to 1% and 5% significance level respectively.
2) % explained refers to the proportion of variance explained by the factors.

4. Conclusions

The present study examines the characteristics and extent of staple food crops' seasonality in Ethiopia. Above all, the study demonstrates the effect of warehouse service on food price seasonal gap in the country. The results show that there is a detectable seasonal gap among crops, the highest being for maize (20%). Overall, the extent of seasonality in Ethiopia is greater than the international market. Furthermore, the results revealed that price seasonality explains 10-14% of monthly food price volatility. The last, perhaps more important, result suggests that availability of warehouse service has a statistically significant association with price seasonal gap – explaining nearly 5% of the variation in the price seasonal gap of wheat and maize.

Altogether, the findings of the study suggest that improving access to warehouse services will contribute to resolving the acute seasonality of food price in Ethiopia. Furthermore, amongst considered crops, maize is a priority crop that needs attention towards minimizing the "excess" seasonal gap. To this end, the impact of warehouse service on reducing price seasonal gap will be higher if priority is given for food items with a higher seasonal gap, maize in this particular case. The scope of this study is limited to estimating the level of seasonality and evaluating the role of warehouse services in stabilizing the food market. Hence, future studies should go further and identify which characteristics of crops and markets are major determinants of price seasonal gap.

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1) Seasonal price variability may translate into seasonal variation in (food) consumption when capital markets fail and off-farm employment or migration are inadequate to cope with (Kaminski et al., 2014).

2) Coffee, sesame, haricot beans, maize and wheat are commodities transacted through ECX, details available on http://www.ecx.com.et/commodities.aspx.

3) Teff is small grain cereal originally from Ethiopia.

4) Seasonal effects are generally higher at times of higher prices than when prices are low, hence, it is more appropriate to use logarithms of prices (Kaminski et al., 2014). In fact we use change in log price because, even if price series are not trend stationary, it will generally be difference stationary (Kaminski et al., 2016).

5) Ordinary least squares estimation result, using same covariates, shows that availability of warehouse service significantly decreases price seasonal gap of wheat and maize by 8.4% (P value = 0.00). Full estimation result is not reported for brevity, but it is available upon request.

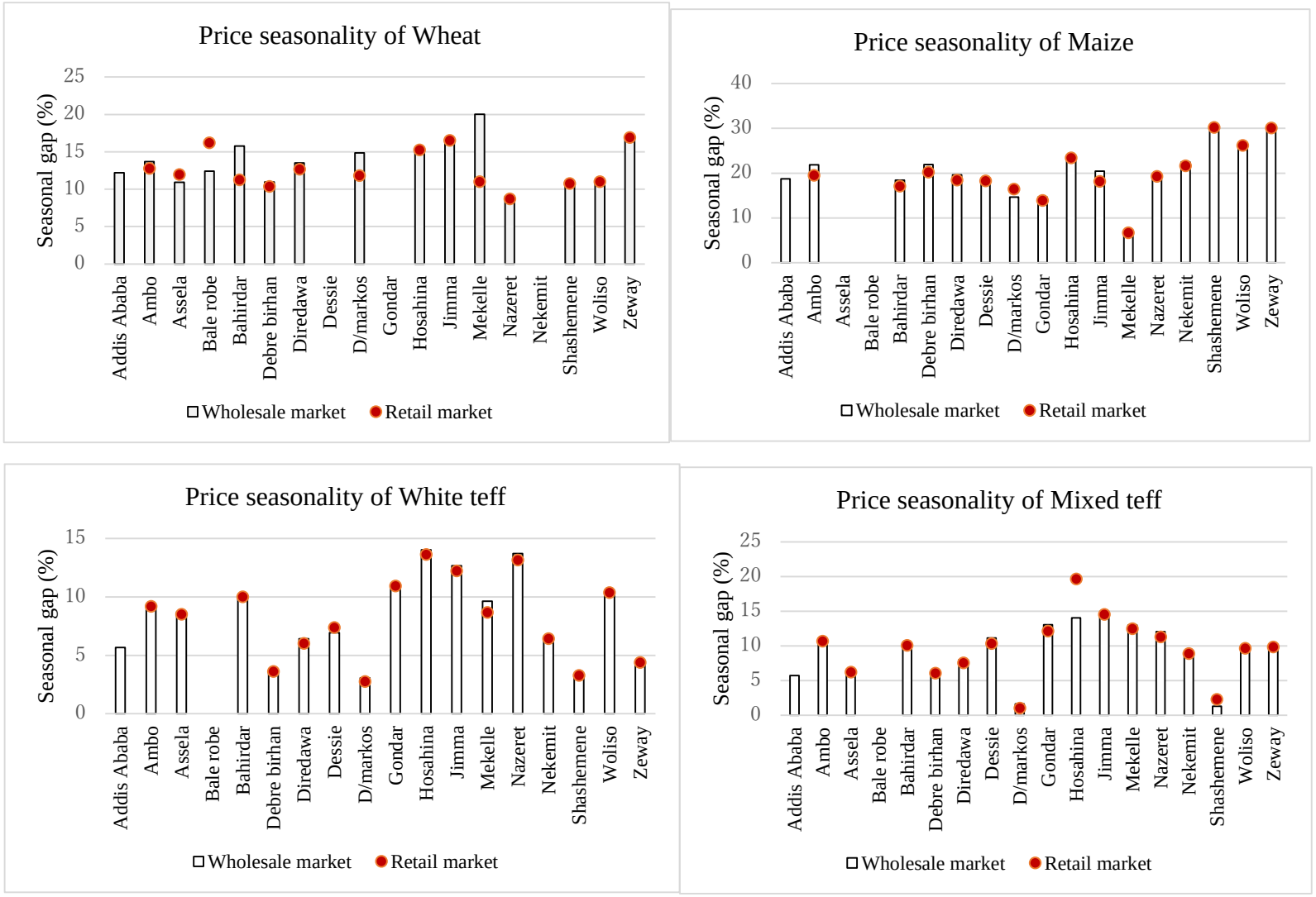

Figure A3.1 Seasonality of crops by market location and market type

Chapter 4 Performance of Microfinance Institutions

1. Introduction

Limited access to financial services is among the major problems impeding rural livelihood development (Hermes and Lensink, 2007; Wijesiri et al., 2017). The problem is particularly severe in developing countries like Ethiopia, mainly for two reasons. First, most of the conventional banks in the country are concentrated in urban areas, while more than 80 percent of the population is rural. Second, whenever available, the formal banking sector systematically excludes the rural poor due to the higher screening, monitoring, and enforcement costs of providing a small loan. Moreover, most poor have few or no assets that can be secured by a bank as collateral (Cull et al., 2011; Hermes and Lensink, 2007; Shu and Oney, 2014). Thus, a considerable number (more than 80 percent) of the poor in Ethiopia obtain financial services from informal lenders, who can enforce loan contracts but at a higher interest rate (Demirguc-Kunt et al., 2018; Wolday, 2004). However, the government is making efforts to curb the roles of informal lenders through the support of MFIs. In recognition of this, the Ethiopian government issued the first microfinance legislation in 1996. Since then, the number of clients, volume of the loan portfolio, and savings of MFIs have been increasing (Wolday, 2004).

The main distinctive characteristics of MFIs in the financial market include, but are not limited to, the following: 1) they provide financial services to the poor, who are usually not considered to be creditworthy by banks; and 2) they solve the problem of information asymmetry and ease collateral requirement by establishing strong personal relationships, which generates social collateral (Assefa et al., 2013). Therefore, MFIs face the dual challenge of providing financial services to the poor (outreach) and attaining financial sustainability. There are two schools of thought concerning the ultimate goal of MFIs: welfarists and institutionalists. Welfarists argue that the essence of establishing MFIs is to serve the poor, and hence, they should focus on outreach, whereas institutionalists re-emphasize that MFIs should be

financially sustainable, even to help the poor (Tsegaye, 2009).

Arguably, providing financial services to the poor is too costly, and hence the focus on outreach will be at the expense of the firm's financial performance (Abate et al., 2014; Hermes et al., 2011; Shu and Oney, 2014). Here, an empirical question to answer is whether MFIs with commercial motives drift from their original mission of providing financial service to the poor. More explicitly, given the increasing focus of MFIs on commercialization (Daher and Le Saout, 2013; Vanroose and D'Espallier, 2013), is there a "mission drift" or re-orientation from serving the poor in pursuit of commercial viability? With this question in mind, the present chapter aims to 1) evaluate the performance of MFIs based on the sector's overriding objectives 2) investigate the driving factors of MFI performance with the aim of supporting the path forward for improving social and financial performances; and 3) test if there exists a mission drift in the Ethiopian MFIs.

Admittedly, there are empirical studies on the performance of MFIs both in Ethiopia and elsewhere (Abate et al., 2014; Assefa et al., 2013; Cull et al., 2007; Hermes et al., 2011; Kebede and Berhanu, 2012; Kipesha, 2013; Servin et al., 2012; Tsegaye, 2009; Vanroose and D'Espallier, 2013; Wolday, 2004). However, while some of the previous studies (Abate et al., 2014; Hermes et al., 2011; Kebede and Berhanu, 2012) focus on a single performance indicator (cost efficiency), others are either dated studies using cross-sectional data and qualitative analysis or case studies of other countries.

Empirical studies showed that, among other factors, the age of the MFIs have a positive and significant impact on the financial performance (Abate et al., 2014; Cull et al., 2007; Kipesha, 2013; Vanroose and D'Espallier, 2013) and social performance (Assefa et al., 2013; Vanroose and D'Espallier, 2013) of MFIs. The size of the institutions is another factor driving the performance of MFIs. Specifically, bigger MFIs tend to have better financial performance (Cull et al., 2007; Luzzi and Weber, 2006; Vanroose and D'Espallier, 2013) and outreach (Assefa et

al., 2013; Vanroose and D'Espallier, 2013) than smaller MFIs. The other strand of the literature studies mission drift by MFIs (Christen, 2001; Cull et al., 2007; Mersland and Strøm, 2010; Vanroose and D'Espallier, 2013). Using panel data, Mersland and Strøm (2010) investigated mission drift and found no evidence supporting the hypothesis that MFIs drift away from serving the poor. Another study in Latin America also found similar results (Christen, 2001).

Building on previous studies, this chapter contributes the following to the current literature. First, this study evaluates the effectiveness of MFIs by estimating unique performance metrics from multi-dimensional indicators, capturing the maximum possible information from the original outcome variables. Specifically, I employ Principal Component Analysis (PCA) and create indexes which are used as a proxy for the two primary objectives of MFIs, namely, serving the poor (social performance) and attaining sustainability (financial performance). Aggregating different outcome indicators into an index helps to comprehend the results easily. Second, with a priori assumption that the social and financial performances of MFIs are not independent (Hermes et al., 2011), this study uses a simultaneous equation model – i.e., a Seemingly Unrelated Regression (SUR) model. Third, taking advantage of the panel data used in this study, random and fixed effect models are employed to account for firm-specific omitted variables and unobservable factors (e.g., technological change) that could affect performance (Green, 2008; Vanroose and D'Espallier, 2013). Finally, the current research sheds light on the issue of mission drift, which is a less studied subject in the Ethiopian context.

The remainder of the chapter is structured as follows. Section 2 describes the data and estimation strategy employed in the study. Section 3 presents the result and discussions. The last section concludes the chapter by highlighting the implications of this study.

2. Data and Estimation Strategy

The results of this chapter are based on unbalanced panel data (2000-2017) of 15 MFIs in Ethiopia. The data is primarily from the MIX market database available online, but data from

the Association of Ethiopian Microfinance Institution was consulted when necessary to fill gaps in the MIX data. The MIX market database encompasses a wide range of information regarding MFIs, including, but not limited to, performance indicators, firm characteristics, infrastructure, human capital, asset and liability management, and types and composition of clients.

Using a panel of 155 MFI-year observations, primarily from the MIX market database, this chapter aims to investigate the performance of MFIs and its determinants on the one hand and the existence of mission drift on the other hand. To this end, I performed three exercises. First, I evaluated the performance of MFIs in Ethiopia in comparison with SSA countries and average regional performances. Second, I estimated the performance metrics and examined the factors that drive the social and financial performances of MFIs in Ethiopia. Finally, I investigated whether or not mission drift exists in Ethiopian MFIs.

The study employed PCA to generate social and financial performance metrics. Intuitively, PCA is a data reduction method used to re-express multivariate data with fewer dimensions or "components" that capture the maximum possible information from the original outcome variables (Luzzi and Weber, 2006). The selection of both outcome and explanatory variables used in this study was based on previous studies (Ahlin et al., 2011; Assefa et al., 2013; Cull et al., 2007; Luzzi and Weber, 2006; Rosenberg, 2009; Tsegaye, 2009; Vanroose and D'Espallier, 2013). Accordingly, a total of six indicators, namely, number of borrowers, number of depositors, total Gross Loan Portfolio (GLP), Returns on Asset (ROA), Returns on Equity (ROE), and Financial Self-Sufficiency (FSS) are used to estimate the social and financial metrics.

The Kaiser-Meyer-Olkin (KMO) sample adequacy measure of the data (0.72) was larger than the minimum threshold of 0.5 (Table A4.1). The eigenvalues criteria for the appropriate number of factors suggests using two factors (Figure A4.1). While the first component alone explained 48% of the variance among the six indicators considered, the second component

explained 38%. Moreover, of the listed indicators above, the first and the latter three are positively loaded on the first and second components, respectively (Table A4.1). Hence, component 1 and component 2 estimates were used as a proxy for measuring social performance and financial performance, respectively. In the context of this study, social performance refers to outreach breadth.

After estimating the performance metrics, there were two possible options at disposal: to estimate two independent equations for the two outcome variables or to estimate them simultaneously. With the prior assumption that there may be unobservable factors that affect both the social and financial performances of MFIs, the SUR model was employed. The SUR model allows the correlation of the error terms across equations (Tsegaye, 2009). Denoting the performance or score of MFI i on dimension $j = 1, 2$ by S_{ji}, the SUR model can be specified as:

$$S_{ji} = X_{ji}\beta_j + T_{ji}\rho_j + \varepsilon_{ji} \quad (1)$$

where S_{ji} is an index estimated from outcome indicators representing social performance(S_{1i}) and financial performance (S_{2i}), X_i is a row vector of MFI i's characteristics that explain social and financial performance, the vector T_i denotes the fiscal year, β and ρ are parameters to be estimated, and ε_{ji} refers to the error terms. Here the error terms are assumed to be normally distributed with mean, uncorrelated across observations, but correlated across equations. More formally, $E(\varepsilon_{1i}, \varepsilon_{2i}) = \delta_{12} \neq 0$ and $E(\varepsilon_{ji}) = 0$ (Green, 2008).

Taking advantage of the panel data used in this study, the random and fixed effect models were employed to check the consistency of the results. Fixed effect approach is costly in terms of degrees of freedom lost. However, it is preferred as it relaxes the assumption of a random effect model – i.e., the individual effects are strictly uncorrelated with the other regressors (Green, 2008). Therefore, an inevitable question here is which one should be used? To this end, the model that best fits the data was selected using the Hausman specification test. Following

Green (2008), the basic framework for the specification of the fixed effect and random effect models is given as:

$$\begin{aligned} S_{it} &= X_{it}^{`}\beta^{`} + Z_{i}^{`}\alpha^{`} + \varepsilon_{it}^{`} \\ &= X_{it}^{`}\beta^{`} + C_i + \varepsilon_{it}^{`} \end{aligned} \tag{2}$$

Suppose there are K regressors in $X_{it}^{`}$, excluding a constant term. The individual effect is $Z_{i}^{`}\alpha^{`}$ where $Z_{i}^{`}$ contains a constant term and a set of firm-specific variables (e.g., legal status, bylaws, location). If $Z_{i}^{`}$ is unobserved but correlated with $X_{it}^{`}$, then the fixed effect model is specified as:

$$S_{it} = X_{it}^{`}\beta^{`} + \alpha_i + \varepsilon_{it}^{`} \tag{3}$$

where $\alpha_i = Z_{i}^{`}\alpha^{`}$ embodies all the observable effects and specifies an estimable conditional mean. On the other hand, if the unobserved individual heterogeneity is assumed to be uncorrelated with the included variables, then the random effect model can be formulated as:

$$\begin{aligned} S_{it} &= X_{it}^{`}\beta^{`} + E[Z_{i}^{`}\alpha^{`}] + \{Z_{i}^{`}\alpha^{`} - E[Z_{i}^{`}\alpha^{`}]\} + \varepsilon_{it}^{`} \\ &= X_{it}^{`}\beta^{`} + \alpha + \eta_i + \varepsilon_{it}^{`} \end{aligned} \tag{4}$$

where η_i is a group-specific random element, similar to $\varepsilon_{it}^{`}$ except that for each group there is a single draw that enters the regression identically in each period.

The last question posited in Section 1 of this chapter refers to mission drift. Mission drift can be measured by the increasing loan size of MFIs (Mersland and Strøm, 2008). Mission drift is, therefore, a shift in the composition of new clients or re-orientation in favor of the so-called “less poor” (relatively better) amongst existing clients in pursuit of profitability. A profit-oriented MFI that adopts a commercial approach may either increase the interest rate or reduce cost by lending larger loans to a few clients. In both cases, the less poor (as opposed to very poor) will qualify for loan (Mersland and Strøm, 2010). On the other hand, the profit motive may lead the MFI to reach new markets and to be more efficient (Christen, 2001). Hence, the issue of mission drift is an empirical question specifically related to the commercialization of

MFIs.

Therefore, in this study, I employ fixed and random effect models to examine if there exists mission drift by MFIs in Ethiopia. Intuitively, this analysis aims to investigate whether or not their commercial motive has led MFIs to ignore the poor and women systematically. For this purpose, I use average loan/Gross National Income (GNI) and the percentage of women borrowers as measures of poor and women clients, respectively.

3. Result and Discussion

Table 4.1 presents the definition and summary of the variables used in this study. A total of six outcome variables, focusing on outreach and sustainability of MFIs, are used. The number of borrowers and depositors shows how many clients, on average, the MFIs are serving. The other outreach performance indicator used in this study is the GLP (a proxy for the scale of their operation). On average, MFIs in Ethiopia have a GLP of 192 million Ethiopian birr. The FSS measures how well the MFI can cover its costs, accounting for adjustments to operating revenues and expenses (Rosenberg, 2009). Accordingly, 64 percent of the MFIs considered in this study are financially sustainable.

The ROA and ROE are also sustainability/profitability measures indicating how well the MFI uses its asset to generate returns and how commercially viable it is, respectively (Daher and Le Saout, 2015; Rosenberg, 2009). The result shows that each birr investment in the sector generates nearly 3.95 birr. The result also prevails that roughly half of the borrowers, on average, are women. Overall, for most outcome indicators, the standard deviations are larger than their corresponding mean, implying that there is considerable disparity in the performances of MFIs in the country (Tsegaye, 2009).

The majority (51.6%) of the MFIs considered in this study are matured, whereas only 15% are new. On average, MFIs have 207 loan officers. The average number of clients served by the loan officer and personnel were also found to be 496 and 179, respectively. The yield on

portfolio measures the MFI's ability to generate cash from interest, fees, and commissions on GLP, whereas portfolio to asset indicates the management's ability to allocate resources to the primary and most profitable activity of MFIs – making microloans (Rosenberg, 2009). Accordingly, on average, the MFIs considered in this study devoted nearly 70 percent of their assets to their primary purpose of making loans.

Table 4.1 Definition and summary statistics of variables

Variables	Definition and measurement of variables*	Mean (Std. Dev)
Outcome indicators		
Number of borrowers	Number of active borrowers (thousands)	86.3 (159.6)
Number of depositors	Number of active depositors (thousands)	88.5 (238.0)
Gross loan portfolio (GLP)	Total outstanding principal due for all outstanding client loans (millions of birr)	192.3 (483.8)
FSS	= 1 if financially self-sufficient and 0 otherwise	0.64 (0.47)
ROA	Returns on asset (%) = [Net operating income, less Taxes/ Average assets] *100	1.37 (7.19)
ROE	Returns on equity (%) = [Net operating income, less Taxes/ Average equity] *100	3.95 (20.54)
Average loan	An average loan per client divided by gross national income (GNI) per capita	57.56 (28.58)
Women borrowers	Percentage of women borrowers	52.36 (20.11)
Explanatory variables		
Age	Firm age = 1 if new (1-4 years)	0.147
	Firm age = 2 if young (5-8 years) and	0.337
	Firm age = 3 if matured (>8 years)	0.516
Asset	Total asset (millions of birr)	270.3 (709.9)
Loan officer	The number of employees mainly managing client loans (thousands)	0.207 (0.39)
Loan officer productivity	Total number of borrowers divided by loan officers (thousands)	0.496 (0.74)
Personnel productivity	Total number of borrowers divided by total number of staffs (thousands)	0.179 (0.16)
Yield on gross portfolio	= [Financial revenue /average gross loan portfolio] *100 (%)	3.39 (37.57)
Portfolio to asset	= [Gross loan portfolio/total asset] *100 (%)	69.7 (16.01)

Note: * Variable definitions are based on the Microfinance Information Exchange (The MIX Market) https://www.themix.org/glossary.

As outlined above, the aims of this study are threefold: (i) evaluating the performance of MFIs; (ii) examining the factors that drive the performance of MFIs; and (iii) testing whether or not mission drift exists in Ethiopian MFIs. The microfinance literature shows that measuring the performance of MFIs spins at evaluating their performance with respect to outreach, sustainability/profitability, and social impact (Rosenberg, 2009; Servin et al., 2012; Tsegaye, 2009; Vanroose and D'Espallier, 2013). Accordingly, the following section discusses the performance of MFIs in Ethiopia, mainly with respect to outreach breadth, outreach depth, and financial performance. Briefly, while outreach breadth measures the scale of operation and the number of clients served, outreach depth refers to the level of poverty of the clients. On the other hand, the financial performance metric objectively measures how successfully the MFIs recover their cost through operating income.

Tables 4.2 and 4.2A present the performance of MFIs in Ethiopia in comparison with other regions and countries in Sub-Saharan Africa (SSA), respectively. While the variables used in the econometric analysis (Table 4.1) are measured in a local currency, for consistency reason, the United States dollar (USD) was used for the data reported in Table 4.2. Similarly, for ease of comparison across countries and regions, the values reported in Table 4.2 and Table A4.2 are weighted averages based on the online MIX database. The number of borrowers and GLP can be used to assess outreach breadth (Bibi et al., 2018). Accordingly, the average number of borrowers per MFIs in Ethiopia (86,200) is larger than all the regional averages, except South Asia. Similarly, using the same metric, MFIs in Ethiopia are the second largest among the 10 biggest economies in SSA (Table A4.2). On the contrary, the average GLP of MFIs in Ethiopia is only 14.8 million USD, which is the least of all the regional averages.

The other important aspect of outreach measures the poverty level of clients. Measuring a client's poverty level is expensive and requires sophisticated indicators. However, the average loan/GNI can be a rough proxy to measure outreach depth and hence the poverty status of clients, because better-off clients tend to be uninterested in smaller loans (Rosenberg, 2009). Similarly, the percentage of female borrowers refers to loan distribution to the minority group of society (Bibi et al., 2018; Mersland and Strøm, 2010). In this regard, the smaller ratio of the average loan/GNI implies that MFIs are serving the relatively poor in the country. Accordingly, Ethiopian MFIs serve relatively poorer clients compared with the African regional average and that of Eastern Europe and Central Asia. Following the target market classification of MIX, Ethiopian MFIs target "broad markets" – i.e., depth from 20% to 149%. Of the 10 biggest economies in SSA, while MFIs in South Africa serve the poorest (depth = 5.47%), MFIs in

Kenya serve relatively better off clients (depth = 120%) (Table A5.2).

The last, but not least, performance indicator measures the ability of a MFI to recover its costs through operating income. The average Operational Self-sufficiency (OSS) of Ethiopian MFIs is 145%, which is high er than all the regional averages. Hence, *ceteris paribus,* Ethiopian MFIs have relatively higher financial performance. As shown in Table A4.2, of the 10 biggest economies in SSA, MFIs in Ethiopia, followed by those in the Sudan and Nigeria, have the highest OSS, implying that they are relatively more profitable.

Table 4.2 Performance of MFIs in Ethiopia: comparison with regional performance

Country/region	Number of borrowers	GLP (million $)	Average loan/GNI	% female borrower	OSS
Ethiopia	86,213	14.84	58.22%	45.76%	145.73%
Africa	22,383	21.61	72.58%	45.01%	116.66%
East Asia and Pacific	84,489	103.56	55.26%	43.65%	109.22%
E/Europe and C/Asia	10,875	35.84	101.53%	39.88%	114.89%
Middle East and N/Africa	40,025	20.85	18.50%	57.63%	119.87%
South Asia	217,941	45.15	16.86%	78.18%	120.58%
World	68,211	51.44	50.19%	51.82%	115.99%

Note: The number of borrowers is rounded to the nearest whole number.

Table 4.3 presents the determinants of MFIs' performance, estimated using different approaches. The first panel of Table 4.3 shows the SUR model estimation, while the second and third panels present results of the random effect and fixed effect models, respectively. The overall goodness of fit of the SUR model reveals that the model has significantly explained the variation in the performance of MFIs in Ethiopia. However, the Breusch Pagan test of independence result shows that error terms are not correlated across equations (Chi-square = 0.043, p-value = 0.83). In other words, there is no significant unobserved factor that affects both the social and financial performances of MFIs. This result suggests that pursuing both social and financial performances is possible (Tsegaye, 2009). In this particular case, pooled ordinary least square estimation could have given a similar result (Vanroose and D'Espallier, 2013). The Hausman specification test result shows that random effect (second panel of Table 4.3) and fixed effect (third panel of Table 4.3) models fit the data better than the pooled regression model (the results are not reported here for brevity but are available upon request). Hence, the following discussions are based on the second and third panels of Table 4.3.

The second panel of Table 4.3 presents the estimated results on the factors affecting the social

performance of MFIs in Ethiopia. The results show that while the social performance of MFIs increases with asset holding, there is no detectable difference among new, young, and matured MFIs. The positive effect of asset holding on the social performance or outreach of MFIs is as expected and consistent with previous studies (Bibi et al., 2018; Daher and Le Saout, 2015; Vanroose and D'Espallier, 2013). Similarly, the number of loan officers has a positive and significant impact on outreach performance. Intuitively, *ceteris paribus,* the higher the number of loan officers, the larger the domain the MFI can operate (Luzzi and Weber, 2006). The loan officer and personnel productivities also have positive and significant impacts on social performance. These results suggest that improving the quality of human capital, e.g., through training and use of technology, could help MFIs in Ethiopia to enhance their social performance. The yield on the gross portfolio is another important variable affecting outreach performance. The yield on gross portfolio measures the firm's ability to generate cash, which could increase the loanable fund and hence, the social performance. Previous studies have also found similar results (Assefa et al., 2013; Cull et al., 2007).

The third panel of Table 4.3 presents estimation results on the determinants of financial performance. Previous studies have shown that age has a nonlinear relationship with financial performance (Ahlin et al., 2011; Vanroose and D'Espallier, 2013). One possible explanation for the positive effect of age on financial performance is that firms learn over time. On the other hand, older firms may face liability obsolescence and tend to be inflexible to the changing business environment (Coad et al., 2013). In this regard, the results of this study show that young MFIs have better financial performance than a new one. However, there is no detectable difference between the financial performance of matured and new firms.

The asset holding of MFIs is also among the driving factors of financial performance. The results reveal that asset holding has a positive and significant impact on the firm's financial performance, possibly because larger firms can benefit from economies of scale (Kipesha, 2013). Similarly, the yield on the gross portfolio is positively and significantly associated with financial performance. This result shows that a MFI's ability to manage its loan portfolio significantly improves its financial performance. Previous studies (Cull et al., 2007; Vanroose and D'Espallier, 2013) also found similar results.

Table 4.3 Factors driving the performance of MFIs in Ethiopia

Variable	(1) SUR estimation		(2) Social performance (RE)	(3) Financial performance (FE)
	Social performance	Financial performance		
Age (reference = New)				
Young	-0.09 (0.09)	0.42 (0.46)	-0.12 (0.09)	0.93 (0.45)**
Matured	-0.03 (0.11)	-0.62 (0.55)	-0.11 (0.12)	0.82 (0.64)
Asset	0.001 (0.00)***	0.0004 (0.0003)	0.001 (0.00)***	0.0008 (0.0004)*
Loan officer	1.40 (0.11)***	0.07 (0.56)	1.58 (0.17)***	-1.55 (1.39)
Loan officer productivity	0.21 (0.07)***	-0.56 (0.34)	0.16 (0.08)**	-0.17 (0.41)
Personnel productivity	0.36 (0.15)**	-0.28 (0.74)	0.32 (0.15)**	0.20 (0.65)
Yield on gross portfolio	0.002 (0.001)***	0.01 (0.003)***	0.002 (0.00)***	0.006 (0.003) *
Portfolio to asset	0.002 (0.002)	0.01 (0.006)*	0.02 (0.02)	0.01 (0.01)
Fiscal year	0.002 (0.01)	-0.04 (0.05)	0.12 (0.11)	-0.14 (0.06)**
Constant	-4.45 (19.74)	79.97 (99.69)	-25.06 (23.32)	284.0 (121.2)**
Observations	140	140	140	140
Chi^2	5379.7***	35.61***	3185.33***	25.80***
Breusch-Pagan test of independence (Chi^2)		0.043		

Notes: 1) The Hausman specification test results show that Random Effect (RE) and Fixed Effect (FE) models best fit the data for social performance and financial performance, respectively.

2) ***, **, and * refer to 1%, 5%, and 10% significance level, respectively.

3) The values reported are coefficients with their standard error in the parenthesis.

Table 4.4 presents the relationship between financial performance – a proxy for commercialization motive of MFIs (Christen, 2001) – and outreach depth. I used average loan/GNI as a measure of how poor the clients are relatively and the percentage of women borrowers to refer to how many of the clients belong to the minority social group (Bibi et al., 2018; Mersland and Strøm, 2010). Here, the lower (higher) the average loan/GNI (percentage of women borrowers) the deeper the outreach. The first panel of Table 4.4 shows that the main effect of financial performance (i.e., FSS) has no impact on outreach depth. Likewise, the interaction effects of FSS with age and GLP are insignificant. The overall impact of financial performance was tested using a joint test. The test result shows that the null hypothesis that the overall impact (the main and interaction effects) of financial performance is equal to zero cannot be rejected ($Chi^2 = 0.08$, p-value = 0.773), implying that there is no evidence of mission drift.

On the other hand, the second panel of Table 4.4 shows that the main effect of financial performance (i.e., FSS) is negative and significant, suggesting that MFIs which are financially self-sufficient tend to have a lower proportion of women borrowers. However, the interaction effect shows that, when they are financially self-sufficient, matured MFIs tend to have a higher proportion of women borrowers than new MFIs. Overall, the joint test result reveals that the total effect of financial performance on outreach depth is not significantly different from zero ($Chi^2 = 1.73$, p-value = 0.118). Hence, the results suggest that there is not enough evidence supporting the existence of mission drift in Ethiopian MFIs. This result is consistent with the findings of Cull *et al.* (2007).

Table 4.4 Outreach depth and financial sustainability: test for a mission drift

Variable	(1) Average loan/GNI		(2) Percentage of woman borrowers	
	Coefficient	Std. Err	Coefficient	Std. Err
FSS	-8.22	10.36	-19.44**	8.28
Age (reference = New)				
Young	11.98	10.75	-15.02*	8.50
Matured	3.17	13.01	-23.32**	9.64
FSS # Age				
FSS x Young	-1.36	12.07	11.40	9.68
FSS x Matured	13.65	11.99	22.67**	9.52
GLP (measure of size)	0.02**	0.01	0.01	0.01
FSS x GLP	-0.05	0.01	-0.009	0.007
Portfolio to asset	0.49***	0.13	-0.23**	0.10
Fiscal year	-4.92***	0.90	0.49	0.64
Constant	9897.5***	1820.3	-889.9	1281.1
Observations	153		154	
Wald Chi^2	7.35***		21.10**	
Joint test of FSS = 0 (Chi^2)	**0.08**		**1.73**	

Notes: 1) Fixed effect (panel 1) and Random effect (panel 2) models are used following Hausman specification test.

2) ***, **, and * refer to 1%, 5%, and 10% significance level, respectively.

3) The joint test for FSS refers to the main effect and all the interaction effects.

4. Conclusion

Measuring the performance of MFIs is important to make reforms, when necessary, to meet organizational goals. Similarly, identifying the factors driving their performance is also crucial to determine the path forward. While the main goal of this research was to investigate the performance of MFIs and its determinants in Ethiopia, the current chapter specifically addressed the following research questions: How well do MFIs in Ethiopia perform in terms of attaining their social and financial goals? Are MFIs serving the poor? Which factors drive

the performance of MFIs? Is there mission drift by MFIs in Ethiopia?

Overall, Ethiopian MFIs have better outreach performance compared with both the regional average performances and the 10 biggest economies in SSA. The financial performance measure also shows that MFIs in Ethiopia have the highest OSS compared with all the regional averages. The econometric estimation results reveal that asset holding, the number of loan officers, loan officer productivity, personnel productivity, and the yield on gross portfolio have a positive and significant effect on the social performance of MFIs in Ethiopia. Likewise, age, asset holding, and the yield on gross portfolio were found to have a positive and significant impact on the financial performance of MFIs. Finally, the study sheds light on the debate whether or not MFIs are shifting away from the poorer clients in pursuit of profitability. To this end, I used two measures of outreach depth and found no evidence that the overall impact of financial performance (a proxy for the commercialization motive of MFIs) is related to outreach depth. Hence, the results suggest that there is no mission drift by MFIs in Ethiopia.

To sum up, the results of the study show that: First, relatively, MFIs in Ethiopia perform better with regards to serving the poor. Second, there is no evidence supporting mission-drift, suggesting that the MFIs in Ethiopia do not shift from their original goal of serving the poor. Third, pursuing both social and financial performances of MFIs in Ethiopia is possible. Hence, MFIs in Ethiopia are encouraged to exert more effort towards improving their social performance. To this end, efforts to meet their social obligations can be attained by increasing the number of loan officers and improving their productivity – e.g., by training and adopting innovative approaches that ease the monitoring and evaluation of borrowers and outstanding loans.

I acknowledge that this research has the following limitations. First, while more than 50 percent of the MFIs registered by the national bank are considered, some MFIs are not accounted for mainly due to lack of data. Hence, the result of this study cannot be generalized

for all MFIs in Ethiopia. Second, using average loan size as a measure of poverty has been criticized in the literature. I have used the average loan size as a percentage of GNI to infer how far down the MFIs reach with respect to the national income distribution. However, a more rigorous measure of client poverty will be preferred when it is available. Third, similar to other previous studies, there was insufficient exogenous variation in key variables to estimate causal impacts; therefore, the estimation results should be interpreted carefully. Despite the outlined shortcomings, the current chapter contributes to the literature in two ways. First, this study contributes to the scarce literature on the performance of MFIs in general, and the issue of mission drift by MFIs in the Ethiopian context, in particular. Second, methodologically, the study employed the SUR model together with fixed effect and random effect models to choose the robust estimation results based on the appropriate tests. Lastly, I suggest future researches to combine household data with MFI-level data to examine the actual impact of MFIs using direct measures of clients` poverty status and welfare (e.g., consumption expenditure).

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Appendix

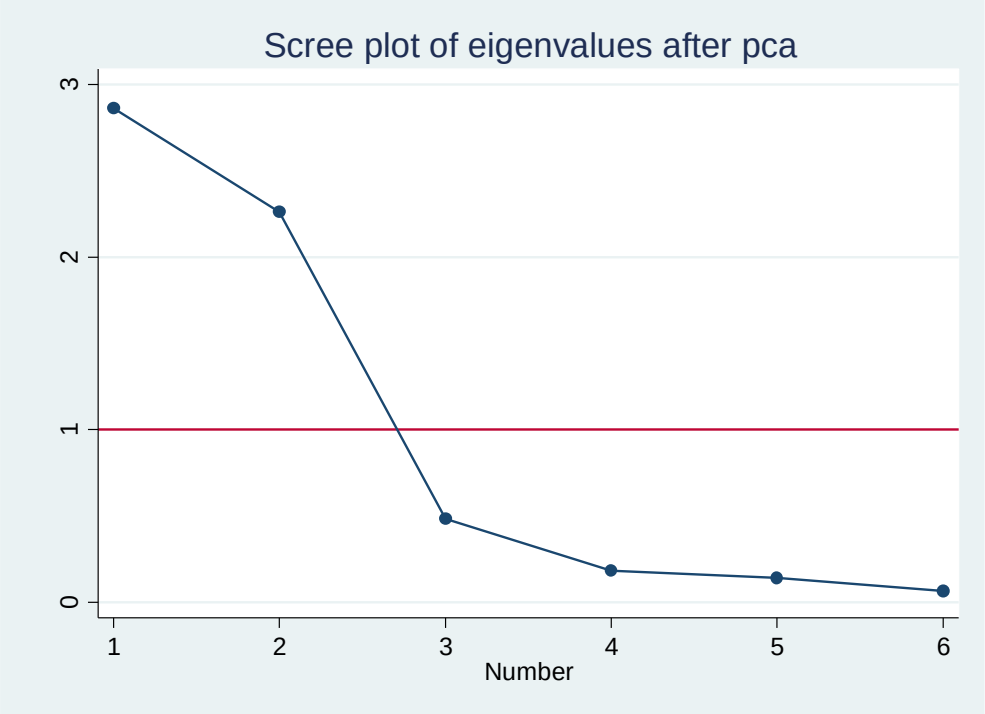

Figure A4.1 Scree plot of eigenvalues

Table A4.1 The PCA estimates and diagnostics tests

Components	Eigenvalue	Proportion explained	Rotated components[1]		KMO
			Component 1	Component 2	
Number of borrowers	2.86	0.48	0.569		0.84
Number of depositors	2.26	0.38	0.577		0.74
Gross loan portfolio	0.48	0.08	0.585		0.69
FSS	0.18	0.03		0.592	0.64
ROA	0.14	0.02		0.607	0.61
ROE	0.07	0.01		0.529	0.84
Rho		0.85			
Overall KMO					0.72

Note: [1] = Oblique (promax rotation) rotation method was used.

Table A4.2 Performance of MFIs in the 10 biggest economies of SSA

Country	Borrowers	GLP (Million $)	Average loan/GNI	Female borrowers	OSS
Angola	9,798	7.40	27.74%	56.76%	113.40%
Congo, Dem. Republic	5,980	13.59	57.61%	47.86%	89.36%
Cote d'Ivoire	4,850	8.90	109.13%	27.37%	90.98%
Ethiopia	86,213	14.84	58.22%	45.76%	145.73%
Ghana	11463	8.54	41.92%	59.31%	108.26%
Kenya	45,304	80.26	120.10%	46.33%	124.72%
Nigeria	47,844	47.83	15.00%	75.00%	132.94%
South Africa	96,472	127.00	5.47%	36.76%	116.33%
Sudan	8,673	11.33	46.50%	57.66%	141.00%
Tanzania	20,523	54.73	80.67%	62.25%	122.38%

Source: MIX market database.

Notes: 1) Top 10 economies in SSA are selected based on World Bank database https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=ZG&year_high_desc=true.

2) The number of borrowers is rounded to whole numbers

Chapter 5 Summary, Concussion, and Implications

1. Summary

Underdeveloped infrastructure and missing institutions have resulted in higher transaction cost, coordination failure, and pervasive market imperfection in the Ethiopian agricultural market (Shiferaw et al., 2011). High price volatility and seasonality is also another feature of the agriculture sector (Woldehanna and Tafere, 2015). Considering the limited access to financial institutions that support the poor, seasonal food price variability may translate into seasonal variation in food consumption (Kaminski et al., 2014). The credit constraint could also hinder investment in the agricultural production (e.g., technology adoption) and hence productivity.

There is no single solution for all the multifaceted problems in Ethiopian agriculture. However, strong market-enabling institutions will have a substantial contribution in resolving agricultural production and marketing problems in the country (Gabre-Madhin and Goggin, 2005). It is increasingly recognized that institutions have the potential to improve the wellbeing of rural households (Bernard et al., 2008). In recognition of this, the Ethiopian government showed renewed interest in founding and strengthening institutions. As such, the increasing interest in the cooperative sector, the establishment of ECX, and efforts to improve access to credit of the poor through MFIs are assumed to have a considerable contribution in resolving the problems outlined above.

Focusing on these agricultural marketing and financial institutions in Ethiopia, the dissertation examines members' participation decision, the impact of membership, and the performance of the institutions. The first chapter of the dissertation describes the agricultural marketing and financial institutions in Ethiopia. While the chapter focuses on agricultural cooperatives, ECX, and MFIs, it also explains the overall role of institutions towards poverty reduction and livelihood development. This chapter also outlines the structure and objectives of the dissertation.

Chapter two focuses on agricultural cooperatives in Ethiopia. It used the 2016 wheat growers survey data that comprises both household and community level data (e.g., production, cost, marketing, cooperatives, population, production, institutions, access to infrastructure, etc.). The chapter employed Logit and ESR models to investigate participation in and impact of agricultural cooperatives in Ethiopia, respectively. Furthermore, the chapter examines the factors affecting the community-level participation rate in agricultural cooperatives.

The estimation results revealed that access to a paved road, average landholding per household, and information access have a positive and significant effect on the community-level participation rate in agricultural cooperatives. The results also showed that agricultural cooperatives are less inclusive of land-poor and illiterate households. On the other hand, estimated results indicated that cooperatives have effectively improved agricultural performance and welfare of its members—i.e., members would have received 1.37 quintal/hectare (nearly 5%) yield reduction and 1804 *Birr* (about 13%) less income if they had not joined cooperatives. Likewise, members would have cost 22 *Birr*/quintal (about 1.5%) more for fertilizer if they had not been members. Moreover, members of marketing cooperatives would have got 34% less marketed surplus if they were not members.

The 3rd chapter studies the price seasonality in Ethiopia. Seasonality refers to the intra-annual variability of the monthly price that is specifically related to the crop cycle. Studies of food price seasonality in developing countries are necessary for two main reasons. First, the consumption of the poor is price sensitive and hence suffer from food insecurity during the peak periods of food price. Second, seasonality (predictable component) is one feature of food price volatility that discourages smallholder farmers from investing in improving their farm income.

Therefore, using 128 domestic and international monthly price series of four commodities from EGTE and IMF, this chapter analyzed the extent and characteristics of staple food price

seasonality in Ethiopia. Furthermore, the chapter demonstrates to what extent the warehouse service of ECX affects the seasonality of food prices in Ethiopia. For this purpose, the study employed a two-parameter trigonometric seasonality approach and ANOVA.

The results showed no detectable difference in price seasonality between wholesale and retail markets. However, there is a statistically significant seasonal gap variation among crops, the highest seasonal gap being for maize (20%). The findings also prevailed that 10-14% of monthly price volatility in Ethiopia is explained by its seasonal (predictable) component. Most importantly, there is a significant association between the availability of warehouse service and the food price seasonal gap in Ethiopia.

Chapter four deals with MFIs in Ethiopia. Since its inception in the 1970s, MFI has gotten increasing attention both from policymakers and academic circles. Using unbalanced panel data (2000-2017) from Ethiopia, the chapter discussed the performance of MFIs and its determinants in one hand, and the existence of a mission drift on the other hand. The results indicated that, based on various outreach and financial performance metrics, the MFIs in Ethiopia have better performance compared to the 10 biggest economies in SSA. The econometric estimation results showed that asset holding and the yield on gross portfolio have a positive and significant effect on the social and financial performances of MFIs in Ethiopia. Furthermore, the number of loan officers, loan officer productivity, and personnel productivity have a positive and significant impact on the financial performance of MFIs. The chapter also demonstrated that MFIs are not shifting away from the more unfortunate clients, suggesting that there is no mission drift by MFIs in Ethiopia.

2. Conclusion

In developing countries like Ethiopia, where less developed input and output markets are typical features of the agricultural sector, marketing institutions have an indispensable role in poverty reduction (Getnet and Tsegaye, 2012). Likewise, access to financial institutions

improves rural livelihood by easing the liquidity constraint, which in turn increases farmer's investment in agricultural technologies, asset holding, and welfare (Wolday, 2004). Despite the differences in their organizational activities, ultimately, the establishment of the cooperatives, ECX, and MFIs in Ethiopia aims to eradicate poverty and improve rural livelihood. Realizing this potential of agricultural marketing and financial institutions, however, requires collective action.

Collective action is a remedy to correct market imperfections. By collaborating through agricultural cooperatives, smallholder farmers can benefit from lower transaction costs, higher bargaining power, reaching quality standards, and operating on a large scale (Markelova et al., 2009). However, the participation rate in the study areas is not high. To this end, access to road and market information can significantly improve the community-level participation rate, suggesting that this can be one area of intervention to enhance the overall participation rate. To further understand why farmers do not participate, the dissertation examined the household participation decision and ex-post impact of cooperative membership in Ethiopia. The lower participation rate in the study area is partly due to less inclusiveness and effectiveness of the cooperatives. Specifically, the results showed that cooperatives have successfully improved their members' productivity and income, while their impact on price and the marketed surplus is only marginal.

The ECX is another agricultural marketing institution considered in this dissertation. The ECX aims to improve the existing market by adding information technology and warehouse service. The warehouse service is expected to lessen the price seasonal gap by encouraging storage after harvest when the price is low. With this premise, a chapter of the dissertation attempts to examine the effect of warehouse service of EXC on staple food price seasonality. The results showed that the availability of warehouse service is significantly associated with lower price seasonal gap. Specifically, improving access to warehouse service will contribute

to resolving the acute seasonality of food price in Ethiopia. This result has important implications for poor farmers who are forced to sell immediately after harvest to meet their obligations and buy when prices soar, resulting in welfare loss (Sahn and Delgado, 1989). However, it is worth to acknowledge that the availability of warehouse service explains only a modest share of price seasonal gap.

The MFIs are motivated to extend the frontier of financial intermediation to those who are excluded from the conventional financial markets, the poor (Kebede and Berhanu, 2012). Hence, the overriding objective of MFIs is reaching as many clients as possible (social performance) while attaining their financial viability (financial performance). A chapter of the dissertation, therefore, examines the social and financial performances of MFIs in Ethiopia and their driving factors.

The results demonstrate that the Ethiopian MFIs have better social and financial performances, compared to the 10 biggest economies in SSA. However, the MFIs in Ethiopia have limited scale of operation in terms of the gross loan portfolio. The estimation results showed that the number and productivity of employees have a positive and significant impact on the social and financial performance of MFIs. Furthermore, social performance and financial performance can be attained concurrently. The study also suggests that there is no mission drift by MFIs in Ethiopia.

3. Implications

Based on the results of the dissertation, the following implications are forwarded.

- While cooperatives have successfully improved the agricultural performance of their members, their role in improving marketing performance was only limited. To this end, improving the market orientation of cooperatives (e.g., through capacity building and improving information access) will help farmers to benefit from increased marketed surplus and income. Hence, the government in general and the federal cooperative

agency, in particular, should encourage and train cooperatives to capitalize on output aggregation service.

- Cooperatives should devise strategies to improve their effectiveness and inclusiveness, whenever possible. In this regard, efforts to increase members with a larger asset base (e.g., livestock) in (marketing) cooperatives will improve their effectiveness without compromising inclusiveness. Likewise, expanding marketing cooperatives to areas where there are competitive input and output markets will increase their effectiveness.
- Warehouse service of ECX has a positive impact on price stabilization. While market price stabilization is not its primary purpose, the effect of warehouse service will be higher if priority is given for food items with a higher price seasonal gap, maize in this particular case.
- Estimation results revealed that there is no evidence of mission drift in Ethiopian MFIs. Hence, the MFIs in Ethiopia are encouraged to exert more effort towards improving their social performance. To this end, MFIs can attain their social obligations by increasing the number of loan officers and improving employees' productivity – e.g., by adopting innovative approaches that ease the monitoring and evaluation of borrowers and outstanding loans. Furthermore, efforts to enhance the asset holding of MFIs will help to realize their social obligations, serving as many clients as possible.

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