

Rural Finance and Agricultural Technology Adoption in Ethiopia: Does the Institutional Design of Lending Organizations Matter?

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Summary. — It has now become almost a stylized fact that sustained agricultural growth is central to rapid poverty reduction and economic development. Yet, world poverty is largely concentrated in the agrarian societies, which have the potential for agricultural productivity growth. This is particularly true for Sub-Saharan African countries, where the gaps between potential and actual yields remain high. Minimizing this gap through the promotion of modern inputs—such as fertilizer and modern seeds—has been at the core of almost all development strategies in Ethiopia. Among other initiatives, the country has promoted microfinance institutions and member-owned financial cooperatives to alleviate credit constraints of the smallholder farmers. This paper analyzes the impacts of these institutions. Using household survey data and a propensity-score-matching technique, we examine the effects that institutional financial services have on farmers' adoption of agricultural technology in Ethiopia. The results suggest that access to institutional finance has a significant positive impact on both the adoption and extent of technology use. However, when impacts are disaggregated by type of financial institution and farm size, heterogeneities are observed. In particular, financial cooperatives have a greater impact on technology adoption than microfinance institutions, and the results appear to vary depending on farm size and types of inputs. The paper concludes with implications for policies to promote adoption of modern agricultural inputs.

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1. INTRODUCTION

Historical evidence suggests that in most countries, sustained agricultural growth in the early stages of development was central to rapid economic growth and poverty reduction (Hazell, Poulton, Wiggins, & Dorward, 2007; Johnston & Mellor, 1961; Timmer, 2014). This has been true for the industrialized countries of Europe (Lains & Pinella, 2010) and North America (Timmer, 2014), as well as Japan and the emerging countries of East Asia (Hayami & Ruttan, 1971; Johnston, 1951). The most recent example is the Green Revolution in Asia, where the introduction of improved farm technologies led to an increase in agricultural production, which helped fuel overall economic growth, reduce poverty, and improve the livelihoods of rural households (Fan, Xing, Fang, & Zhang, 2006; Mendola, 2007; Rashid, Cummings, & Gulati, 2007). More importantly, consumers benefited as supply outpaced demand, which drove down real food prices and led to an improvement in caloric intake by the poor households (Evenson & Gollin, 2003).¹

However, this historical regularity is yet to manifest in many African countries, especially in countries south of the Sahara. Although modern technologies—such as improved seeds, fertilizer, and agro-chemicals—are readily available, their rates of adoption have been the lowest in Africa (De Janvry & Sadoulet, 2010; Jayne & Rashid, 2013). Currently, the continent has the largest yield gaps (i.e., the difference between possible and actual yields) in major cereals. For example, maize

and wheat yields are consistently lower than their yield potential by 63% and 52%, respectively (Licker *et al.*, 2010; Nkonya *et al.*, 2013). As demonstrated in Asia, this yield gap can be closed with widespread adoption of available improved technologies. According to the FAO, farmers in Africa apply 21.1 kgs of nutrients per hectare of land, which compare with 135.6 kgs in South Asia and 195.3 kgs in developed countries. Several national and continent-wide initiatives—such as the Comprehensive African Agricultural Development Program (CAADP) of the New Partnership for African Development (NEPAD)—have set targets to improve the application rates in Africa.

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Ethiopia is on the forefront for tackling these challenges in its agriculture sector. The government has allocated more than 10% of public spending to agriculture, invested in scaling up its agricultural extension and rural finance programs, and has given special attention to programs that support increased production of cereal crops (Rashid & Negassa, 2013). These investments have paid off in terms of increasing both cereal production and the growth of the agricultural gross domestic product (AGDP). During 2005–12, the value-added from agriculture almost tripled from US\$6.5 billion to \$19.2 billion, and cereal production grew from 12 million metric tons to 23 million metric tons (World Bank, 2014). Despite these impressive achievements, the country still has a large yield gap. One explanation for such a gap is the low technology adoption. For instance, one study finds that only 30–40% of Ethiopian smallholders apply fertilizer, and of those who do, the rate of application is only 37–40 kgs per hectare, which is far below the recommended rates (Spielman, Kelemwork, & Alemu, 2013). Sheahan and Barrett (2014) found slightly higher estimates of fertilizer use (45kgs/ha), but low estimates of modern seed use for barley (3.2%), maize (34%), wheat (12%), and coffee (1.5%).

Ethiopia has much to gain by promoting widespread use of modern input use. The broader constraint, however, has the deficient markets for risk management (credit and insurance), which, to a large extent, is responsible for slow adoption of technologies by smallholders.² The conventional policy approach to addressing this challenge has been to provide subsidized credit through state-owned banks. However, it has been well documented that this policy has either failed or has had limited success (Adams, Graham, & Von Pischke, 1984; Binswanger, Khandker, & Rosenzweig, 1993). Recently, Ethiopia has adopted a new approach by moving away from subsidies to a more market-oriented financial system. As of 2010, Ethiopia's specialized Microfinance Institutions (MFIs) and Financial Cooperatives (FCs) have become the primary source of credit for smallholders, with about two-thirds of their loan portfolio channeled to smallholders (Amha & Peck, 2010; Obo, 2009).

To the best of our knowledge, there is no systematic study that evaluates the effects of these institutional credit provisions on farmers' decisions to adopt new technology. This paper attempts to fill this knowledge gap. Using survey data, we undertake two main tasks: (1) analyze the effect of access to institutional credit on smallholders adoption and application rates of agricultural technology using propensity score matching; and (2) assess whether the institutional design of the lending organizations (i.e., the way ownership of the financial services providers is organized and operated) makes a difference in promoting agricultural technologies.

The remainder of the paper is organized as follows: Section 2 reviews the history of institutional finance provisions for smallholder farmers in Ethiopia. Section 3 presents a brief summary of the characteristics and lending approaches of FCs and MFIs in Ethiopia. Section 4 describes the survey methods and the measurement of the main variables and the estimation strategy—i.e., the impact evaluation problem, propensity score matching, and propensity score estimation procedures, and results. The main findings are presented in Section 5, and the paper concludes with a summary and a discussion on policy implications in Section 6.

2. INSTITUTIONAL FINANCE AND SMALLHOLDER AGRICULTURE IN ETHIOPIA

There is a clear need for a robust agricultural finance system in Ethiopia. Even though smallholder farmers produce 90% of the country's agricultural production, they are resource-poor and on average, own less than one hectare of land (Ethiopia, Central Statistical Agency, 2011, 2013; Headey, Dereje, Ricker-Gilbert, Josephson, & Taffesse, 2013). Furthermore, they are characterized by their inadequate investment in productivity-enhancing inputs (Dercon & Christiaensen, 2011; Spielman *et al.*, 2013). This implies that there is a potentially large credit demand from smallholders that is unlikely to be met by the formal banking system because smallholders require smaller transactions, have large covariant risk, and live in rural areas that lack access to a bank (Amha & Peck, 2010; Croppenstedt, Demeke, & Meschi, 2003). Since the 1960s, there have been several policies designed to address this challenge, including institutions tailored for smallholder agriculture. Evaluations of these programs, however, have shown that they neither increased productivity nor reduced poverty (Braverman & Guasch, 1986). Instead they suffered from elite capture and institutional capacity constraints (Admassie, 1987).

During the imperial regime (1960s–1974), about half of the total domestic credit that went to agriculture was disbursed through two intermediary institutions—the grain enterprises and primary cooperatives. These intermediaries received funds from state-owned banks to provide credit to farmers at concessional rates (EEA, 2000). However, like most of the government-controlled credit programs elsewhere in the same period, the efforts to extend agricultural credit to smallholders did not succeed. During 1960–74 period, between 42% and 65% of all total domestic loans went to agriculture. Of this total, smallholders received only a fraction (7.5%) compared to the wealthier and influential farmers (Admassie, 1987, 2004).

The socialist regime (1974–91) perpetuated the tradition of instituting specialized financial institutions, but it did not translate into greater access to credit by smallholders. Instead, they were deprived of credit because larger state-run farms received higher priority. For instance, during the first 10 years of the regime (1974–84), about 89% of the agricultural credit was extended to state farms, while private smallholder farmers received only 9–11% (EEA, 2000).

Smallholder farmers did not fare any better by the reforms under the Structural Adjustment Program. As Figure 1 shows, during the years after the economic reform, the share of agricultural credit shrank considerably. A recent study by Amha and Peck (2010) estimated a \$3 billion credit shortage in the overall economic system. The smallholders suffered more severely due to this shortage than the other sectors. Although agriculture accounted for 41% of the total GDP in 2010–11, the sector's share in overall loan disbursement was only about 14% (Figure 1). The ratio of the share of total agricultural lending to the share of agriculture to GDP was also low at only 34%, which was also more or less the case for most of Ethiopia's neighboring countries.³ Moreover, the credit-to-output ratio for the same period indicates a substantial credit shortage in agriculture—the mean credit-to-aggregate value of total agricultural production over the last two decades is only 6% (Figure 1).

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