DEPARTMENT OF FOOD AND RESOURCE ECONOMICS
UNIVERSITY OF COPENHAGEN

IFRO Working Paper

Social Networks and Factor Markets: Panel Data Evidence from Ethiopia

Kibrom A. Abay
Goytom Abraha Kahsay
Guush Berhane

2014 / 12

IFRO Working Paper 2014 / 12

Social Networks and Factor Markets: Panel Data Evidence from Ethiopia

Authors: Kibrom A. Abay, Goytom Abraha Kahsay, Guush Berhane

November 2014

See the full series IFRO Working Paper here:
www.ifro.ku.dk/english/publications/foi_series/working_papers/

Department of Food and Resource Economics (IFRO)
University of Copenhagen
Rolighedsvej 25
DK 1958 Frederiksberg DENMARK
www.ifro.ku.dk/english/

Social Networks and Factor Markets: Panel Data Evidence from Ethiopia

Kibrom A. Abay[†], Goytom Abraha Kahsay[‡] and Guush Berhane [§*]

Abstract

In the absence of well-established factor markets, the role of indigenous institutions and social networks can be substantial for mobilizing factors for agricultural production. We investigate the role of an indigenous social network in Ethiopia, the *iddir*, in facilitating factor market transactions among smallholder farmers. Using detailed longitudinal household survey data and employing a difference-in-differences approach, we find that *iddir* membership improves households' access to factor markets. Specifically, we find that joining an *iddir* network improves households' access to land, labor and credit transactions between 7 and 11 percentage points. Furthermore, our findings also indicate that *iddir* networks crowd-out borrowing from local moneylenders (locally referred as *Arata Abedari*), a relatively expensive credit source, virtually without affecting borrowing from formal credit sources. These results point out the roles non-market arrangements, such as social networks, can play in mitigating market inefficiencies in poor rural markets.

Key words: Social networks, *iddir* networks, factor market imperfections, factor market transactions, crowding-out

JEL-codes: D02, D13, D71, D83, D85, J46, O17, Q12

[†] Department of Economics, University of Copenhagen. Email: Kibrom.Araya.Abay@econ.ku.dk
[‡] Department of Food and Resource Economics, University of Copenhagen. Email: goytom@ifro.ku.dk
[§] Development Strategies and Governance Division, International Food Policy Research Institute.
Email: guush.berhane@cgiar.org
[*]Corresponding author.

1. Introduction

Markets in developing countries are characterized by a broad range of failures that adversely affect the individual actors and challenge the institutions created to mediate their interactions in the marketplace (Stiglitz, 1989; Besley, 1994). Factor markets, like several other markets in developing countries, are subject to widespread inefficiencies resulting from incomplete information and imperfect contract enforcement, exacerbated by unclear property rights and subsequent high transaction costs (Stiglitz and Weis, 1981; Collier, 1983; Stiglitz, 1989; Hoff and Stiglitz, 1990; de Janvry et al., 1991; Barrett and Mutambatsere, 2008; Pender and Fafchamps, 2006).

Nowhere are these problems more critical than in land, labor, and rural credit markets of developing countries. These three types of markets are particularly thin and inhibited by problems of information asymmetry. As a result, moral hazard, adverse selection, and related opportunistic behaviors are common, since transactions in these markets require extensive information for screening, monitoring, and contract enforcement. Information asymmetry in these markets results in transaction costs that are high, as monitoring and penalizing opportunistic behavior is difficult. The failure of factor markets imply that "either the transactions simply do not occur, or substitute institutions emerge to allow the transaction to take place" (de Janvry et al., 1991). A vast amount of literature points to such failures in these markets giving rise to traditional institutional arrangements and social networks playing critical roles in filling the gaps in exchanges of goods, services, and factors of production that markets fail to deliver (Binswanger and McIntire, 1987; Rosenzweig, 1988; Udry, 1990). One line of literature studies the widespread use of land and labor sharing contracts in developing countries in the face of risk and missing insurance markets (e.g. Johnson, 1950; Cheung, 1969) and imperfect monitoring of labor efforts (e.g., Newbery, 1975). These studies point to incentives, risk pooling, and the production efficiency advantage of land and labor sharing arrangements. Pender and Fafchamps (2006) point out that social relationships – capitalizing on pre-existing trust and thereby reducing transaction costs of monitoring – play important roles in determining land and labor contract arrangements.

A similar line of literature studies how information asymmetry undermines the operations and effectiveness of rural credit markets in developing countries. Empirical evidence, following the seminal work by Stiglitz and Weiss (1981), points to such information asymmetry in rural credit markets limiting lenders from writing effective contracts because, in the absence of information regarding the

characteristics and activities of their clientele, formal lenders find it difficult to discern their potential borrower types in these areas (Udry, 1990; Aryeetey and Udry, 1997). In the absence of formal credit, households often rely on credit from their informal networks to smooth consumption (Fafchamps, 2006; Rosenzweig, 1988; Townsend, 1995; Fafchamps and Lund, 1998). Informal credit often involves trust-based self-enforcing informal networks and relationships which are typically characterized by flexibility in credit allocation and repayment (Udry, 1990; Fafchamps, 2006). In most rural communities, these activities are organized in some form of traditional social networks that provide group-based informal insurance, like *iddirs* in Ethiopia. These institutions perform a crucial function for rural households in overcoming important market imperfections by expediting the flow of information within and beyond the village (Udry, 1990; Barr, 2000), reducing monitoring and enforcement costs (Sadoulet et al., 1997; Berhane et al., 2009; Fafchamps and Minten, 2002; Karlan, 2007), and developing trust among agents (Fukuyama, 1995; Fafchamps and Lund, 2003).

There is a large empirical literature on the formation, prevalence, and role of social networks in dealing with a wide spectrum of socio-economic problems, including risk and consumption smoothing (Udry, 1994; Fafchamps and Lund, 2003; Okten and Osili, 2004; Hoddinott et al., 2005; Hoddinott et al., 2009; Wydick et al., 2011; Ali and Deininger, 2014; Ali et al., 2014); credit, saving and transaction costs (Dercon et al., 2006; De Weerdt and Dercon, 2006); and technology adoption, insurance, and productivity (Bandiera and Rasul, 2006; Barr, 2000; Conley and Udry, 2002; Fafchamps and Lund, 2003; Fafchamps and Minten, 2002; Foster and Rosenzweig, 1995; Krishnan and Sciubba, 2009). However, little is known about the explicit roles of social networks in mitigating factor market imperfections, and, hence, their role in facilitating factor market transactions among smallholder farmers.

In this paper, we study the role of an indigenous social network in Ethiopia, *iddir* associations, in overcoming factor market imperfections to facilitate factor transactions among smallholder farmers. *Iddir* is the most inclusive and widespread social network in Ethiopia, commonly established by community members, neighbors, or among friends and families. The origin of *iddir* as a social network is to provide funeral services and to support bereaved family members morally and financially (see for instance, Dercon et al., 2006). However, a closer look at *iddir* networks reveals their scope to go beyond funeral associations, as they are involved in many socio-economic issues (Pankhurst and Mariam, 2000; Mariam, 2003; Dercon et al., 2006). By offering informal social insurance, information,

and trust among members, *iddir* associations share the main micro-level properties of other networks (Caeyers and Dercon, 2012). However, very little is known about how *iddir* networks contribute to the economic activity of their members. Dercon et al. (2006; 2008) studied the role of *iddir* networks as funeral and insurance institutions, while Hoddinott et al. (2005) investigated the role of *iddir* networks as risk coping mechanisms. Investigating the roles of social networks in ameliorating market imperfections in the Ethiopian case provides an interesting context given the coexistence of such social networks and evidence of pervasive market failures and their associated high transaction costs in rural Ethiopia (Deininger et al., 2008; Deininger and Jin, 2008; Ghebru and Holden, 2008).

We use longitudinal household survey data from Ethiopia to investigate the role of *iddir* networks in facilitating factor market transactions among farmers. To circumvent estimation and identification problems associated with households' self-selection into network membership, we exploit the longitudinal feature of the data and use a difference-in-differences approach. We find that *iddir* membership improves household's access to factor market transactions in a range of 7 to 11 percentage points. Specifically, we find that *iddir* membership improves households' sharecropping and labor-sharing practices, as well as their access to credit. Interestingly, our findings also indicate that *iddir* networks crowd-out borrowings from village moneylenders (locally referred to as *Arata Abedari*), who often provide expensive credit due to the screening, monitoring, and contract enforcement problems that can be removed by social networks. However, our findings suggest that membership in these networks does not crowd-out borrowing from formal credit sources that offer both relatively cheaper and larger amounts of credit. These results are robust to various empirical specifications and robustness checks. These substantial effects potentially work through households' privileged access to key resources that *iddir* networks avail to their members ranging from enabling the flow of information among members and, thereby, building trust, up to penalizing opportunistic behavior through provisions of strict rules and social sanctions. The results of this analysis are important in at least two ways. First, while much of economics continues to rely on assumptions of market-based solutions to imperfections (Fafchamps, 2004:3-21), these results suggest that non-market institutions also can play crucial roles in intermediating transactions whenever contracts are not perfectly enforceable due to lack of information or efficient court systems. Second, they further suggest that the outcomes of government intervention to improve market performance in these contexts is not

straightforward. Care must be taken not to crowd-out the role these institutions are bound to play in facilitating local exchange (Dercon et al., 2006).

The rest of the paper is organized as follows. Section 2 presents the institutional features of *iddir* networks in Ethiopia. Section 3 presents a brief exposition of factor markets in Ethiopia, while Section 4 discusses the data and empirical models used for this analysis. In section 5, we present and discuss the empirical results, while Section 6 provides concluding remarks and policy implications.

2. Institutional Features of *Iddir* Networks In Ethiopia

Iddir is the most inclusive and widespread type of social network in Ethiopia, prevalent both in rural and urban settings and inclusive of gender, wealth, education, religion, and ethnicity (Pankhurst, 2008). Originally, *iddir* networks were established to provide financial (cash) and other types of support (in kind) when a family member dies. These networks also assume a key role in facilitating the burial and funeral of the deceased member. However, a close look at *iddir* networks reveals that they go beyond funeral associations as they are involved in many socio-economic issues. *Iddirs* provide small credit for their members, often without collateral (Dercon et al., 2006); help unemployed members (Pankhurst and Mariam 2000); finance their members' health care expenditures (Mariam, 2003); provide financial assistance when their members suffer from other shocks (Dercon et al., 2006); and in recent years, *iddir* networks provide insurance for death of key livestock, such as oxen.

Iddir networks often have well-defined and written rules (Dercon et al., 2006). Membership is on a voluntary basis and is commonly open to all members living in a village (Hoddinott et al., 2005; Dercon et al., 2006; Mariam, 2003).[1] Hoddinott et al. (2005) and Mariam (2003) report that the majority of *iddirs* in Ethiopia have no restrictions on membership and that all villages in their study samples hosted at least one *iddir* that was open to anyone living in the village. Members are required to pay a monthly contribution, while new members may have to pay an entrance fee. Membership fees in most *iddirs* are relatively small and provide some flexibility in payment due dates, and hence, most interested potential members are able to join. Dercon et al. (2006) report that the average monthly household contribution to *iddirs* in their sample amounted to 1.64 Birr (0.08 USD), which is too small to dictate participation in these networks. In addition, most *iddirs* have flexible conditions for the

[1] See Pankhurst and Mariam (2000) for an exhaustive list of types of *iddir* associations in Ethiopia.

membership of the very poor, accepting non-monetary contributions and sometimes allowing people to become members free of charge (Pankhurst and Mariam, 2000; Mariam, 2003).

Previous studies show that individual and household wealth indicators have insignificant effects on *iddir* membership. For example, Dercon et al. (2006) find that, while age and household size affects the probability of becoming a member, wealth, land, and livestock holdings had no effect. Richer households could obtain better coverage against risk by joining multiple *iddir* networks, and perhaps by joining *iddir* associations established in rich neighborhoods. As suggested by Hoddinott et al. (2005), the income and wealth status of a household could affect the intensity of participation in *iddirs*, but income and wealth are found to have an insignificant effect in defining the extensive margin of participation in these egalitarian associations. This evidence sets an interesting context to evaluate the effectiveness of such an inclusive social network in facilitating factor market transactions among households.

Like many other social networks, *iddir* associations provide informal social insurance and information and strengthen trust among members of the association (Caeyers and Dercon, 2012). Besides providing linkages among members, *iddirs* reduce transaction costs and provide security against shirking or defection in the absence of formal contractual agreements. Rigorous empirical evidence as to whether these qualities of *iddir* networks are important to facilitate factor market transactions among smallholder farmers and to complement imperfect agricultural markets in rural economies is not yet available.

3. Factor Markets In Ethiopia

As in many other developing countries, rural areas of Ethiopia are characterized by imperfect or missing factor markets (Deininger et al., 2008; Deininger and Jin, 2008; Ghebru and Holden, 2008). In Ethiopia, land belongs to the state and landlords are only entitled to user rights. Under this form of ownership, landowners are not entitled to sell, transfer, or mortgage their land. Pender and Fafchamps (2006) point out that, in the absence of land redistribution, the only means of acquiring access to land in Ethiopia is through gifts, borrowing, fixed-rental, or sharecropping. They find that the latter is the most prevalent form of securing access to land. Sharecropping is a tenancy agreement between landowners and their tenants. It evolves on the premise that tenants share a portion of the harvested production with the landowner depending on their agreement, usually half or two-third of gross

production (see, for instance, Pender and Fafchamps, 2006). In some cases, landowners contribute some production inputs, generally draft-animal (oxen) or labor. In contrast, in fixed land rentals, the tenant pays a fixed amount of money, commonly in advance and assumes ownership of the land and the harvested production for the agreed production season.

Similarly, the agricultural labor market in Ethiopia lacks formality. Labor transactions depend on traditional labor-sharing practices, which mainly involve paired-borrowing of labor between farming households in return for similar labor on another day (or season). As discussed in Krishnan and Sciubba (2009), labor-sharing practices in Ethiopia may also involve large-scale labor borrowing from a large number of households, which may be returned when a similar event is organized by contributing households. These practices sometimes exploit the seasonal variation in demand for labor among households in the crop planting, growing, and harvesting periods. For instance, if a household's crops are not ready for harvest, the household continues to credit labor to other households who are in demand for it and gets the labor back when its crops are ready for harvest.

Such traditional arrangements in local land and labor markets also extend to rural credit markets in Ethiopia. Despite recent progress, Ethiopia's agricultural credit market is not yet well developed. Rural credit is predominantly covered by informal loan arrangements, including moneylenders, and exhibits the same screening, incentive, and enforcement problems found in many rural credit markets in developing countries (Hoff and Stiglitz, 1990; Udry, 1990).

To sum up, factor markets in Ethiopia are incomplete and are dominated by traditional arrangements. Most of these arrangements or transactions do not involve formal contractual agreements. Thus, their validity hinges on informal relationships and trust among agents. In the presence of these imperfect factor markets, investigating the role of *iddir* networks is crucial in designing alternative policy measures that aim at improving factor markets in agriculture. Social networks play a key role in trust formation (Fukuyama, 1995; Fafchamps and Lund, 2003) and information sharing (Barr, 2000). These qualities of social networks offer an interesting context to reduce information asymmetry among agents of rural factor markets, and hence, facilitate factor market transactions among farmers.

In this paper, we empirically investigate the role of *iddir*, an indigenous social network in Ethiopia, in easing factor market imperfections in rural economies. We are specifically interested in investigating households' factor market transaction dynamics when they join *iddir* networks. We

hypothesize that *iddir* networks improve poorly functioning factor markets in rural Ethiopia and, hence, improve smallholder farmers' access to these markets. When information asymmetry is binding and lack of trust and reputation limits potential efficiency improvements in factor markets, *iddir* networks can serve as information hubs where households can exchange information relevant to their input endowment. Furthermore, and most importantly, the network built through *iddir* associations serves as a safety net (insurance) and a basis for stronger reciprocity among members.

More specifically, we hypothesize that *iddir* networks can bridge the information and reputation related gaps between those who would like to acquire access to land or labor and those who would like to provide these factors through land or labor sharing agreements. Likewise, *iddir* networks can also improve households' access to credit specifically from other *iddir* members by minimizing information asymmetry, thereby further strengthening trust among members. Furthermore, through their informational resource advantage, *iddir* members may even enjoy better access to factor markets that involve transactions with non-members. Since *iddirs* are formed among residents of (and often limited to) the same village, we expect that *iddir* membership may specifically improve households' access to credit from neighbors and friends, who are more likely to be from the same village. In contrast, we expect that *iddir* membership could potentially crowd-out access to credit from moneylenders who, on account of the relatively high risk and transaction cost involved, charge higher interest rates. Although *iddirs* may not have a clearly defined legal basis to enforce market transactions, they are observed to be guided by sound set rules to which members can appeal in case of default, even if loans are made one-to-one without the institutional involvement of the *iddir*. In addition, these rules are strengthened through the social leverage that *iddirs* and their leaders are bestowed from members. These include group pressure and social penalties on individuals that fail to comply with agreed terms between members, similar to the roles played by community leaders in northern Nigeria to overcome loan enforcement problems (Udry, 1990).

4. Data and Econometric Method

4.1 Data source and sample description

The data we use for this study comes from a longitudinal household survey collected to evaluate the Productive Safety Net Program (PSNP) in Ethiopia. The data is collected from 68 food-insecure *woredas* (districts) randomly drawn from the 153 food-insecure *woredas* where the program operates in

Ethiopia. These 153 food-insecure *woredas* are found in the four main regions of Ethiopia.[2] From each *woreda*, 2 to 3 PSNP beneficiary *kebeles* (villages) were randomly drawn as Enumeration Areas (EAs) from a pool of PSNP beneficiary *kebeles*. From each EA, 15 PSNP beneficiaries and 10 non-beneficiaries households were randomly selected from an exhaustive list of beneficiaries and non-beneficiaries in each EA. Four rounds of interviews (2006, 2008, 2010, and 2012) were conducted with the sample households with two-year gaps. A more detailed exposition on the sampling design is given in Berhane et al. (2011).

Table 1 presents the distribution of *iddir* membership across the surveys from the four main regions covered in the longitudinal survey. Some previous studies that focus on specific regions where *iddir* networks are particularly prevalent report higher *iddir* participation than are seen in our sample (Hoddinott et al., 2005; Dercon et al., 2006).[3] A closer look at Table 1 suggests that *iddir* membership increases across the surveys, ranging from 51 percent in the first (2006) survey to 66 percent in the third (2010) survey. This generally increasing trend may be attributed to the increasing demand for the services that these networks provide and the concurrent expansion of the networks. This is not surprising given the increase in the recurrence of drought and other idiosyncratic shocks in rural Ethiopia in recent years and that membership in an *iddir* network can directly or indirectly mitigate such shocks for a household. The increment is particularly large between the two middle surveys. Thus, we focus on these two middle surveys in this study. However, we also use information from the first (2006) and fourth (2012) surveys to corroborate and test our identification strategy. In terms of timing, both middle surveys were conducted at similar times: The 2008 survey was fielded between late May and early July, while the 2010 survey was fielded in June and July. Detailed descriptive statistics of the variables in these two surveys is given in Table A1 in the Appendix.

Table 1: Overall distribution of *iddir* membership across sample households of PSNP surveys

	Survey			
	2006	**2008**	**2010**	**2012**
Iddir-members	1,629	2,157	1,974	2,453
Non-members	1,569	1,534	1,024	1,383
Share *iddir* members, %	51	58	66	64

[2] The four main regions are Tigray, Amhara, Oromia, and Southern Nations, Nationalities, and Peoples (SNNP).
[3] For instance, if we only consider the two regions (Amhara and SNNP region) in our sample where *iddir* associations are very common, we can see substantially higher rate of *iddir* subscription in the sample.

Though the data is not collected for the purpose of investigating the role of *iddirs*, the sampling design is well-suited for our purpose for the following reasons: First, *iddir* participation is unrelated to PSNP selection and its targeting criteria (or determinants). We perform some empirical exercises to investigate if indeed *iddir* participation is not directly determined by some observed livelihood characteristics that define PSNP participation. Thus, we explore the association between *iddir* membership and PSNP participation as well as other observable characteristics that may affect PSNP participation, including wealth status, income, food security status, and other observed socio-economic variables. Table 2 presents these results. In the first column, we regress the propensity to join an *iddir* on different observable characteristics of households, including wealth, income, food security status, social status and other socio-demographic variables. The second and third columns extend this specification by including *zone*-level and *woreda*-level fixed effects, respectively.[4] The results indicate that self-reported wealth, income, food security status, and PSNP participation are not statistically correlated with *iddir* participation. Rather, as expected, households' socio-demographic characteristics, such as education, household size, and household's social status in the village, are correlated with *iddir* participation. This is in line with findings presented in Hoddinott et al. (2005) and Dercon et al. (2006). Furthermore, recent studies that evaluated the PSNP point out that PSNP selection is largely based on assets, income, and food security status, which we tried to control for using observable household characteristics in our regressions (Andersson et al., 2009; Gilligan et al., 2009; Berhane et al., 2011; Berhane et al., 2014).

Second, though indigenous social networks such as *iddirs* are not well-researched in Ethiopia, the few existing studies indicate that *iddir* networks are inclusive and open to all interested members of the community (Hoddinott et al., 2005; Dercon et al., 2006; Mariam, 2003). The fact that *iddir* networks are inclusive and uncorrelated with household wealth indicators has important implications for our identification strategy.

[4] Controlling for these spatial fixed-effects is crucial because we expect significant regional, zonal and *woreda*-level variation in the intensity of *iddir* practices.

Table 2—Correlates of *iddir* participation

Variables considered	Estimates with without spatial effects	Estimates with zone-level fixed effects	Estimates with *woreda*–level fixed effect
Age of household head	0.001***	0.001	0.001
	(0.001)	(0.000)	(0.000)
Female household head	-0.005	-0.013	0.006
	(0.019)	(0.017)	(0.017)
Household head attended school	0.087***	0.056***	0.062***
	(0.013)	(0.012)	(0.012)
Household size	0.010***	0.013***	0.011***
	(0.004)	(0.003)	(0.003)
Oxen	-0.028***	-0.009	-0.007
	(0.008)	(0.008)	(0.008)
Land size (in hectare)	-0.019***	-0.011*	-0.010
	(0.007)	(0.007)	(0.007)
Equib-member[5]	0.136***	0.129***	0.113***
	(0.021)	(0.020)	(0.020)
Subjective wealth status: ‘‘Rich’’	0.019	0.002	0.029
	(0.030)	(0.029)	(0.029)
Subjective wealth status: ‘‘Average’’	0.004	0.003	0.001
	(0.016)	(0.015)	(0.015)
Subjective income status:	0.008	0.004	0.002
‘‘More than adequate’’	(0.070)	(0.066)	(0.066)
Subjective income status: ‘‘Adequate’’	0.018	0.006	0.000
	(0.016)	(0.015)	(0.015)
Food insecure household	-0.012	-0.017	-0.015
	(0.012)	(0.012)	(0.012)
PSNP beneficiary household	-0.008	-0.003	0.003
	(0.014)	(0.013)	(0.013)
Father of household head respected	0.068***	0.053***	0.013
in village	(0.016)	(0.015)	(0.015)
Amhara region	0.545***	0.654***	0.337***
	(0.024)	(0.022)	(0.030)
Oromiya region	0.409***	0.737***	0.395***

[5] *Equib* is a form of ‘‘rotating credit and saving association’’ (ROSCA) in Ethiopia. ROSCAs functions as a source of informal finance in developing countries where “each member agrees to pay periodically into a common pool a small sum so that each, in rotation, can receive one large sum” (Hoff and Stiglitz, 1990). Although both *equib* and *iddir* are social networks that operate through powerful social pressures, *equib* has distinct features, compared to *iddir*, as *equib* mainly functions as a financial intermediary, rather than as an inclusive social network of broader purpose.

	(0.026)	(0.038)	(0.025)
SNNP region	0.616***	0.755***	0.609***
	(0.026)	(0.028)	(0.026)
Constant	0.005	-0.553***	-0.072*
	(0.041)	(0.046)	(0.043)
R-squared	0.226	0.377	0.376
Number of individuals	2,293	2,293	2,293
Number of observations	4,586	4,586	4,586

Notes: In the first column of this table we regress the propensity to join an *iddir* on observable socio-demographic and -economic characteristics of households. The second and third columns extend this specification by including *zone*-level and *woreda*-level fixed effects, respectively. Standard errors are in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

The share of *iddir* membership for the balanced panel sample of 2,293 households for both middle surveys estimated in Table 2 is almost identical to the full sample figures in Table 1.[6] In 2008, 59.6 percent of sample households were members of *iddir* networks, while the corresponding rate in 2010 is 67.5 percent. Other details and trends of the variables across both surveys are given in Table A1 in the Appendix. The identification strategy exploits the switching in membership status of households who were not *iddir* members in 2008, by following their *iddir* membership status in the next survey (2010). Out of the 2,293 sample households in 2008, 1,202 continued as members of an *iddir* network in 2010, 165 did not maintain their *iddir* membership, 345 households joined *iddir* networks after the 2008 survey (but before the 2010 survey), while 581 households remained non-members in both surveys. In this study, we are particularly interested in the last two groups of households – those who joined *iddir* networks after the 2008 survey (but before the 2010 survey) and those households that remained non-members in both surveys. We exploit this variation in *iddir* membership status across both surveys to identify the role of *iddir* networks in factor market transactions. Specifically, we compare the change in households' participation in factor market transactions between those who joined *iddir* networks after the 2008 survey and those who remained non-members in both surveys, before and after the former joined *iddir* networks. Observing the increasing trend in Table 1 and simple correlations in Table 2, we expect that this switching is either exogenous to our outcomes of interest or driven by factors that are dealt with in our estimation strategy. This comparison enables us to remove any time-invariant selection into *iddir* membership.

[6] The sample size in Table 2 is smaller than Table 1 because we consider those households who are in both surveys. We also exclude those households without adequate labor, so that they are beneficiaries of the direct support part of the PSNP program in Ethiopia.

Furthermore, in some of our specifications we employ time-varying controls that may induce *iddir* participation. For convenience, we label the 345 households who joined *iddir* networks after 2008 as our *treatment* group, while those 581 households who remained non-members in both surveys are *control* group households.

4.2 Outcome variables of interest

We are interested in investigating the role of *iddir* networks in complementing the poorly functioning agricultural land, labor, and credit markets. We are particularly interested in investigating households' factor market (land, labor, and credit) transaction dynamics when they join social networks that provide them information, linkages, and social capital. As discussed in Section 3, we hypothesize that *iddir* networks can improve households' access to sharecropping land. Similarly, we are also interested in examining the impact of *iddir* networks in facilitating labor-sharing practices. As discussed in Krishnan and Sciubba (2009), there are different types of labor-sharing practices in Ethiopia that involve varying numbers of participants. Here our focus is on a specific type of labor-sharing practice that commonly involves symmetric reciprocation of labor among parties involved in the network.

Finally, we aim to estimate the impact of *iddir* networks in facilitating credit transactions among farmers and, hence, their role in easing liquidity constraints of smallholder farmers. We are particularly interested in estimating how *iddir* networks affect credit flow from friends and neighbors, those individuals who are expected to be members of the *iddir* network.[7] Furthermore, we investigate whether *iddir* networks crowd-out expensive credit sources. By providing alternative sources of credit, we expect that *iddir* networks may crowd-out households' credit from local moneylenders who charge high interest rates.[8] Table 3 provides a list of the outcome variables of interest in this study and their summary statistics measured at the pre-treatment period (2008). Consistent with the literature on social networks, we generally expect that the potentially untapped role of *iddir* networks in factor market exchanges mainly works through trust formation, information sharing, and reducing enforcement costs that can instrumentally smooth the flow of transactions. Furthermore, these networks involve social

[7] Although some *iddir* associations provide soft loans to their members, this accounts for less than 1 percent in our data. Our focus is restricted to the indirect role of *iddir* networks in facilitating credit access from neighbors and friends.

[8] If *iddir* associations also include relatives, the effect of *iddir* membership on households' credit access from relatives may improve. However, in practice, *iddir* formation is heavily affected by neighborhood and friendship, rather than familial relationships.

support that enables them to impose strong social sanctions on households who defect, which is an effective tool and guarantee for members of the network.

Table 3 shows that both treatment and control group households have statistically similar pre-treatment factor market transactions for many of our outcome variables. Before households in the treatment group joined an *iddir,* the degree of involvement in factor market transactions for both the treatment and control group households was fairly similar. This helps our identification strategy, ensuring that we are comparing similar households. More specifically, around 7 percent of the treatment group households sharecropped-in land in the base year (2008), while the corresponding rate for those control group households is 10 percent. Similarly, Table 3 shows that more than 50 percent of households borrowed at least 20 Birr in the previous 12 months.[9] The most common source of credit was relatives, friends and neighbors, micro-finance institutions, and informal moneylenders (*Arata Abedari).* The distributions of these sources of credit are statistically comparable across the treatment and control group households, except for credit from informal sources.

Table 3: Factor market transaction comparison between treatment and control groups in base year (2008 survey)

	Treatment group	**Control group**	**Difference**
Panel A: Land transactions			
Sharecropping-in	0.070 (0.255)	0.098 (0.298)	-0.029
Sharecropping-out	0.110 (0.314)	0.157 (0.364)	-0.046**
Panel B: Labor transactions			
Labor-sharing-main season	0.278 (0.449)	0.289 (0.454)	-0.011
Panel C: Credit transactions and sources			
Friends and neighbors	0.125 (0.331)	0.129 (0.336)	-0.004
Relatives	0.151 (0.358)	0.158 (0.365)	-0.008
Micro-finance and government sources	0.148 (0.355)	0.364 (0.364)	-0.009
Informal lender (*Arata Abedari*)	0.099 (0.298)	0.041 (0.199)	0.057***
Other sources	0.055 (0.228)	0.043 (0.203)	0.012
Number of households	345	581	

Notes: Column 1 and 2 present the mean factor market transactions for the treatment and control group households in the base year (2008) (with standard deviations in parentheses), while column 3 presents mean differences between both groups. In Panel A, we compare land transactions between both groups, while Panel B and C make a similar comparison for labor and credit transactions, respectively. ***, **, * indicate that differences are significantly different from zero at the 0.01, 0.05 and 0.10 levels, respectively.

[9] Around 25 percent of this borrowing is for consumption purposes, while 13 percent is drawn for purchasing farm inputs.

4.3 Econometric method and identification strategy

As discussed in Section 4.1, we exploit the variation in *iddir* membership across both surveys (2008 and 2010) to empirically identify the effect of this indigenous network in facilitating factor market exchanges. We use a difference-in-differences approach and compare factor market transactions of households that joined *iddir* networks (treatment group) with those non-member households (control group), before and after the former joined *iddir* networks. Such an identification strategy helps us to cancel out time-invariant selection into *iddir* membership based on some time-invariant unobservable factors. Furthermore, to capture some time-varying factors that might induce *iddir* participation, we control for households' time-varying demographic and socio-economic characteristics, as well as their exposure to shocks. Note that *iddir* networks are formed with the aim of supporting members in case of death in the household or another type of idiosyncratic shock. These shocks can drive some dynamics in factor market transaction, and those households who recently suffered death of a family member or other type of shock might be more likely to join these networks. Thus, we need to explicitly control for shocks that may induce *iddir* participation. More explicitly, we estimate the following difference-in-differences (DID) equation:

$$Y_{ht} = \beta_0 + \beta_1 T_h + \beta_2 Post + \beta_3 (T_h * Post) + \beta_4 X_{ht} + \alpha_v + \varepsilon_{ht} \qquad (1)$$

where Y_{ht} is a binary variable that stands for the households' participation in land, labor, and credit transactions. T_h is a dummy variable for households from the treatment group (equal to one if the household became an *iddir* member after the 2008 surveys, zero otherwise); while *Post* stands for a period after the treatment households joined *iddir* networks (a dummy that takes a value equal to one for 2010, zero otherwise). β_1 captures pre-treatment potential differences in factor market transactions between the treatment and control group households. Our parameter of interest, β_3, captures the interaction effect between *iddir* membership and the latter survey year (2010). β_4 captures the effect of other time-varying and time-invariant covariates, while α_v absorbs village-level fixed effects. ε_{ht} captures other unobserved factors that may induce heterogeneity in factor market transactions.

Our parameter of interest, β_3, measures the effect of change in *iddir* membership status on the change in household's participation in factor market transactions across both surveys. Identifying β_3 hinges on the common trend assumption. This assumption implies that in the absence of *iddir* participation those households who joined *iddir* networks (after 2008) would have had, on average, a similar growth pattern in their factor market transactions as those households who did not join. This

assumption is not directly testable, but the implication of the assumption can be tested using pre-treatment survey data. We have access to pre-treatment data from the 2006 and 2008 surveys for many of our outcome variables. Thus, we estimate equation (1) using the pre-treatment surveys (2006 and 2008), assuming placebo treatment for those households who joined an *iddir* after 2008. We know that our households from the treatment group joined *iddir* networks after 2008, thus, estimating equation (1) using the 2006 and 2008 survey should yield a treatment effect close to zero. Our placebo regression results (see Table A2 in Appendix) unambiguously confirm this argument. These estimates, along with the comparable pre-treatment factor market transactions shown in Table 3, suggest that our treatment effects are not driven by some sort of selection based on unobserved heterogeneity among the treated and control group households.

Since all our outcome variables of interest are binary response outcomes, we estimate equation (1) using linear panel data models and probit models. We rigorously attempt different specifications of the covariates, including some non-linear effects of the variables. As mentioned earlier, the intensity and prevalence of *iddir* networks can vary across *woredas*, and perhaps across villages. Thus, we also control for village-level fixed effects in some of our specifications.[10] For each factor market (land, labor, and credit), we estimate equation (1) without any control, with controls, and with village-level fixed effects. We estimate equation (1) for two land transaction outcomes of interest: probability of sharecropping-in and sharecropping-out of land in the main (*meher*) season. Similarly, we estimate equation (1) for households' tendency to participate in labor-sharing practices in the main season. Finally, we estimate equation (1) for modeling households' credit access from neighbors and friends, as well as their credit access from local moneylenders. For each of these estimations, we present treatment effects estimated through linear regression models and marginal effects from probit models. Not surprisingly, the treatment effects from the linear regression models are very comparable with the implied marginal effects from the probit models.

5. Estimation Results and Discussion

In this section, we present and discuss the main results. Table 4 presents the estimation results for the land transactions of households: sharecropping-in and sharecropping-out practices. Columns 1 to 3

[10] To ensure that our estimates of interest persist even after controlling household's time-invariant unobserved differences for each outcome of interest, we also estimate our models controlling for household level fixed effects. However, this forces many of the time-invariant variable effects to disappear, and hence these results are not reported here.

present the estimation results for household's propensity to participate in sharecropping-in practices considering different specifications. In the first column, we present estimates without controls, while in the second column we control for demographic and socio-economic variables. In the third column, we extend the specification by controlling village level-fixed effects. Similarly, columns 4 to 6 of Table 4 present the estimation results for households' participation in sharecropping-out practices without controls, with controls, and with village-level fixed effects, respectively.[11]

Table 4: Effect of *iddir* networks on land transactions, difference-in-differences estimates

	Sharecropping-in			**Sharecropping-out**		
Explanatory variables considered	(1) Without controls	(2) With Controls	(3) With village-fixed effect	(4) Without controls	(5) With controls	(6) With village fixed effect
β_1 *(treated)*	-0.029	-0.033*	-0.054**	-0.046*	-0.018	-0.042
	(0.019)	(0.019)	(0.023)	(0.024)	(0.025)	(0.030)
β_2 *(Post)*	-0.034**	-0.050***	-0.047***	0.003	0.000	0.003
	(0.015)	(0.016)	(0.016)	(0.018)	(0.020)	(0.020)
β_3 *(treated*Post)*	0.092***	0.094***	0.088***	0.057*	0.058*	0.054*
	(0.024)	(0.024)	(0.024)	(0.030)	(0.031)	(0.031)
Probit DID: Marginal effects[¥]	0.093***	0.091***	0.124***	0.058**	0.064**	0.066**
	(0.028)	(0.027)	(0.032)	(0.034)	(0.034)	(0.036)
Other controls	No	Yes	Yes	No	Yes	Yes
Regional dummies (4)	No	Yes	Yes	No	Yes	Yes
Village-level-fixed effects	No	No	Yes	No	No	Yes
Constant	0.098***	0.133***	0.136**	0.157***	0.276***	0.173**
	(0.012)	(0.033)	(0.054)	(0.015)	(0.043)	(0.071)
R-squared	0.007	0.118	0.233	0.003	0.101	0.216
Number of observations	1,852	1,852	1,852	1,852	1,852	1,852

Notes: Each column presents difference-in-differences estimations for household's involvement in land transactions. The second and fifth columns include four regional dummy variables corresponding to the main regions of Ethiopia. Estimates on the third and sixth columns additionally include 65 village (*kebele*)-level fixed effects. Robust standard errors are in parentheses. ***, **, * indicates significance level at 1, 5 and 10 percent, respectively. [¥]Marginal effects are from a probit difference-in-differences estimation.

Consistent with our hypothesis, *iddir* membership causally improves households' probability to participate in land markets through share tenancy, particularly by enabling them to enter into sharecropping arrangements, the most common and vibrant forms of land tenancy contracts in Ethiopia (Pender and Fafchamps, 2005). Specifically, joining *iddir* networks improves households' probability

[11] Full set of estimates for all variables in the various specifications are given in Table A3 in the appendix.

to acquire access to land through sharecropping-in by about 9 percentage points, while also symmetrically improving landlords' probability to sharecrop/loan-out their land by around 6 percentage points. These results are quantitatively strong and stable over alternative specifications and robustness checks. Particularly, these estimates are robust to the inclusion of many covariates and village level-fixed effects. These estimates suggest that i*ddir* networks do indeed bridge the gap between those who would like to offer their land for others to cultivate (for various reasons, including efficiency and risk pooling considerations) and those who would like to acquire access to land lease through share tenancy. This is particularly appealing in the Ethiopian context where formal land markets are inhibited by legal restrictions on land sales market; alternative tenancy mechanisms are subject to production risk, shirking on labor effort, and high cost of monitoring; and there are significant imperfections in other factor markets (e.g., seed and fertilizers). These estimates can plausibly be attributed to the role of *iddir* networks in reducing factor market inefficiency resulting from information asymmetry between demanders and suppliers of land, as well as to their role as a safety net by providing security and trust for agents interested in land transactions. As discussed in Section 2, *iddir* members meet regularly for general meetings or when members face idiosyncratic shocks. These kinds of events allow members to discuss their general activities and share information, including those relevant to their demand and supply of factor markets. This in turn, reduces search costs, reduces potential land use inefficiency due to information asymmetry, and reduces monitoring costs. *Iddir* networks thus play a crucial role in reducing transaction costs in relation to the screening and enforcement of land transactions. The fact that such networks strengthen friendship and trust among members implies that farmers reduce their screening cost as they have inside information about potential tenants and landlords. Furthermore, *iddir* networks reduce potential enforcement problems through strict *iddir* rules and the social stigma and social disapproval through which these networks punish rule-breakers.

Table 5 presents difference-in-differences estimates on the effect of *iddir* membership on labor-sharing practices of households. Column 1 presents the estimation results without controlling for socio-economic and demographic variables, while column 2 presents results with these controls. In column 3, we additionally control for village level-fixed effects.[12]

[12] Full set of estimates for all variables in the various specifications are given in Table A4 in the Appendix.

Table 5: Effect of *iddir* networks on labor transactions, difference-in-differences estimates

	Labor-sharing (Main season)		
Explanatory variables considered	(1) Without controls	(2) With Controls	(3) With village-fixed effect
β_1 *(treated)*	-0.011	-0.023	-0.010
	(0.032)	(0.032)	(0.039)
β_2 *(Post)*	0.033	0.025	0.025
	(0.025)	(0.027)	(0.027)
β_3 *(treated*Post)*	0.101**	0.098**	0.101**
	(0.041)	(0.041)	(0.041)
Probit DID: Marginal effects¥	0.099***	0.101***	0.109***
	(0.044)	(0.043)	(0.042)
Other controls	No	Yes	Yes
Regional dummy variables (4)	No	Yes	Yes
Village-level fixed effects (65)	No	No	Yes
Constant	0.289***	0.167***	0.244***
	(0.019)	(0.055)	(0.090)
R-squared	0.010	0.100	0.213
Number of observations	1,852	1,852	1,852

Notes: Each column presents difference-in-differences estimations of equation (1) for household's involvement in labor transactions. The second column includes regional dummies corresponding to the main regions of Ethiopia. Estimates on the third column additionally include 65 village (*kebele*)-level fixed effects. Robust standard errors are in parentheses. ***, **, * indicates significance level at 1, 5 and 10 percent, respectively.

¥ Marginal effects are from a probit difference-in-differences estimation.

The estimates in Table 5 indicate that *iddir* membership causally improves the probability of households' participation in labor-sharing arrangements by about 10 percentage points. These estimates remain stable even after controlling for households' observable characteristics and regional and village level-fixed effects. Conceptually, this treatment effect represents a remarkable improvement in the households' demand for labor and the allocation of excess agricultural labor supply. Intuitively, *iddir* networks are well-suited institutions for creating paired partnerships and reciprocal group labor exchange through their frequent meetings and group level discussions. *Iddir* networks not only provide access to potential members who would like to engage in labor-sharing, but they also provide the needed labor at the right time by exploiting the seasonal variation in demand for labor among members of the network. Recalling previous studies on the effect of labor-sharing practices on farmers' productivity (Krishnan and Sciubba, 2009), our results indirectly indicate that *iddir* networks can also

boost smallholder farmers' productivity by generating social capital. In this sense, our results complement previous studies on the effect of labor-sharing networks on economic performance.

Finally, in Table 6 we present the estimation results associated with the effect of *iddir* membership on credit access for households from different sources. Columns 1 to 3 present the estimation results for households' credit access from neighbors and friends, those households who are expected to be members of the *iddir* network. In the first column, we present estimates without controls, while the second column presents results with additional socio-economic and demographic controls. In the third column, we present the estimation results controlling for village level-fixed effects. Similarly, columns 4 to 6 present difference-in-differences estimates for households' credit access from local moneylenders (*Arata Abedari*) without controls, with controls, and with village-level fixed effects, respectively.[13]

Table 6: Effect of *iddir* networks on credit access, difference-in-differences estimates

	Credit from neighbors and friends			**Credit from local moneylenders (*Arata Abedari*)**		
Explanatory variables considered	(1) Without controls	(2) With controls	(3) With village-fixed effect	(4) Without controls	(5) With controls	(6) With village fixed effect
β_1 *(treated)*	-0.004	-0.041*	-0.063**	0.057***	0.033**	0.053***
	(0.023)	(0.024)	(0.030)	(0.015)	(0.016)	(0.019)
β_2 *(Post)*	-0.010	-0.016	-0.023	-0.003	-0.008	-0.004
	(0.018)	(0.020)	(0.020)	(0.012)	(0.013)	(0.013)
β_3 *(treated*Post)*	0.074**	0.068**	0.072**	-0.046**	-0.043**	-0.043**
	(0.030)	(0.030)	(0.030)	(0.019)	(0.019)	(0.019)
Probit DID: Marginal effects¥	0.074**	0.065**	0.075**	-0.046**	-0.034**	-0.070***
	(0.034)	(0.031)	(0.033)	(0.023)	(0.020)	(0.032)
Other controls	No	Yes	Yes	No	Yes	Yes
Regional dummies (4)	No	Yes	Yes	No	Yes	Yes
Village-level-fixed effects	No	No	Yes	No	No	Yes
Constant	0.129***	0.026	-0.006	0.041***	0.028	0.045
	(0.014)	(0.040)	(0.070)	(0.009)	(0.027)	(0.044)
R-squared	0.005	0.094	0.162	0.010	0.054	0.204
No. of observations	1,852	1,852	1,852	1,852	1,852	1,852

Notes: Each column presents difference-in-differences estimations for household's access to credit from different sources. The second and fifth columns include four regional dummy variables corresponding to the main regions of Ethiopia. Estimates on the third and sixth column additionally include 65 village (*kebele*)-level fixed effects. Robust standard errors

[13] Full set of estimates for all variables in the various specifications are given in Table A5 in the appendix.

are in parentheses.***, **, * indicates significance level at 1, 5 and 10 percent, respectively. ¥ Marginal effects are from a probit difference-in-differences estimation.

The estimation results in Table 6 show that *iddir* membership, in the same fashion as the analyses of other factors presented earlier, causally improves households' access to credit from friends and neighbors by about 7 percentage points. The results are fairly stable across different specifications. These estimates tell a consistent story in the sense that friends and neighbors are commonly members of the *iddir* network, and hence the flow of credit from these members in the village should increase. These findings support previous studies in Ethiopia which argue that membership in social networks by smallholder farmers affect their credit access from semi-formal institutions (Berhane et al., 2009; Ali and Deininger, 2014). Intuitively, this implies that *iddir* networks play an important role in overcoming households' liquidity constraints by availing potential lenders.[14] This, in turn, suggests that *iddir* networks can play a potential role in overcoming some of the prevalent high transactions costs in rural credit markets by providing information and security against defections in credit transactions.

The estimation results in columns 4 to 6 of Table 6 show the effect of *iddir* networks in crowding-out credit sources that charge high interest rates. These results show that *iddir* membership crowds-out credit from local moneylenders (*Arata Abedari*) who are often blamed locally for being exploitative by charging very high interest rates. Households who joined *iddir* networks reduced their reliance on local moneylenders for credit by around 4 to 5 percentage points. These results highlight the potential of indigenous rural institutions and networks, such as *iddir* associations, for crowding-out other informal lenders that are not perhaps related to the network and charge higher interest rates. This is in contrast to the ineffectiveness of formal credit institutions in driving out informal moneylenders (Hoff and Stiglitz, 1990; Bell, 1990). This result potentially arises because, unlike formal credit institutions, *iddir* members have greater access to local information useful for dealing with problems of screening, monitoring, and enforcement, to which formal banks do not have access. *Iddir* member lenders have lower transactions costs than moneylenders. This has crucial implications for the supply of credit and the level of interest rates charged, which may drive moneylenders out of the market. For

[14] One possible question here is whether the three factor markets are interlinked and instead one market (e.g., credit market) is deriving the other market (e.g., land market) as discussed in Ray (1998:561). To investigate this, we compute simple associations (cross-correlations) among the outcome variables of interest in this study. We found insignificant correlation among the different outcomes in the three different factor markets. More specifically, we compute simple associations between our credit market transactions indicators and land market transactions indicators for the whole sample in Table 2 and note that there is no significant association among the transactions in different markets. This is in line with the previous literature which generally show that direct credit linkages between landowners and tenants are rare in Ethiopia.

instance, Aleem (1990) argues that one reason why moneylenders charge high interest rates is that they have high average costs related to screening and enforcement. We also attempt to estimate the effect of *iddir* networks on crowding-out credit from formal government sources and micro-finance institutions, but the treatment effect estimates were statistically insignificant.[15] This is of course not unexpected, given the low interest rate these institutions charge and their supply of reliable and substantially larger loans. This provides interesting policy implications for countries like Ethiopia, which are striving to provide formal credit access to smallholder farmers.

To summarize, the overall empirical results presented above are quite intuitive. The results generally highlight that informal indigenous networks can help the formation of physical and social capital that can improve factor market transactions among smallholder farmers. Our findings are robust to alternative model specifications and explanations. We rigorously attempt to check alternative model specifications and explanations that we think may affect our identification strategy. For instance, some of the existing sociological literature on *iddir* networks in Ethiopia (for instance, Mariam, 2003), which focused on specific regions and very few villages, suggests that households who are not *iddir* members are commonly new arrival immigrants. If such behavior somehow prevails in our data, it may confound the effect of joining *iddir* networks with some immigration or family (network) formation effect. To rule out such confounding effects, we estimate our models restricting the sample to those households whose household head was born in the village where he or she is currently living. Table A6 in the appendix presents these results. All estimates are quite similar in magnitude to the main estimates presented in Tables 4, 5 and 6.

As mentioned in Section 4.3, we also test the implication of our common trend assumption using pre-treatment surveys. This assumption implies, that in the absence of *iddir* networks, both treatment and control group households would share identical time trends in factor market transactions. Our placebo estimation results (see Table A2 in the Appendix) indicate that both treatment and control group households share identical pre-treatment time trend in factor market transactions, as indicated by the insignificant and almost zero treatment effect estimates.[16] This evidence suggests that the treatment effects estimated, and hence our main results, are not driven by potential differential time trend between the treatment and control group households.

[15] These results are available from the authors on request.

[16] Since some of the households joined the survey at a later stage (at 2008), the sample size in these placebo regressions is slightly lower than the sample used for our main estimations.

One could also argue that some of the relationships and networks already built in labor-sharing and land transactions might lead to *iddir* formation, thereby suggesting reverse causality. There are two reasons why such a scenario should be ruled out. First, as discussed earlier, it is important to note that *iddirs* are traditionally intended for serving as insurance and risk-sharing networks and have been there since time immemorial. They are the most common and stable social networks of Ethiopia, including in urban areas. As such, they are more generic and less likely to be driven by such localized small group labor sharing practices. Second, technically, our identification strategy also rules out this type of reverse causality. We are identifying the effect of change in *iddir* membership status on change in labor-sharing practices. If the reverse causality is in effect, there would not be a change in labor-sharing practices, and hence we would not find any effect of joining *iddir* networks on these factor market transactions.

As a further robustness exercise, we also use the fourth survey (2012 survey) instead of the third (2010 survey) in estimating our difference-in-differences equations for some of our outcome variables. We specifically assess the path of factor market performance of those treated households compared to the control group households even at later years. This exercise, for which the estimates are provided in Table A7 in the Appendix, provides two further insights. First, once households join *iddir* networks, they continue enjoying the benefits of the network as measured in the relative growth in factor market performance. Second, these results also avoid concerns on the timing of the measurement of some of our outcomes. For instance, the question related to credit access spans the last 12 months. However, we do not know exactly when the households joined these networks, only that they joined after the 2008 survey and before the 2010 survey. Thus, these estimates confirm that the effects of *iddir* networks persist even if we assume that the treatment group households joined the *iddir* networks at the onset of the 2010 survey. More generally, many of the results for the outcomes for which we have data are similar to the main estimates given in Tables 4, 5 and 6.

Finally, we carried out several other robustness checks. Compared to Amhara and SNNP regions, *iddir* networks are not widely practiced in Tigray region. To assess if such heterogeneity can confound some of the results, we estimate all our models excluding sample households from Tigray region, and confirm the results do not change.[17] Although many of our explanatory variables do not vary much across the years, we also attempt to control for some background characteristics such as

[17] These results are available from the authors on request.

land, labor, and livestock assets of households from previous surveys to capture inertia effects and initial differences among the treated and control group households. However, doing this did not affect any of our estimates, perhaps because these assets did not exhibit substantial dynamics across the surveys. Finally, we attempt to assess if the effect of *iddir* networks varies across different types of households. However, we are slightly constrained in performing this exercise because we only know whether the household is a member of an *iddir* in the village. We cannot identify if they subscribe to more than one *iddir* network.[18] As pointed out in Hoddinott et al. (2005) and Dercon et al. (2006), households (particularly richer households) may subscribe to more than one *iddir*, which suggests that the heterogeneous effect of *iddirs* cannot be ruled out. However, our sampling and identification strategy helps us to minimize such heterogeneity as we are comparing households who have just joined with those who have not. It is less likely that households would suddenly subscribe to many *iddirs* in such a short time.

6. Concluding Remarks and Policy Implications

Using a detailed longitudinal household survey data from Ethiopia, we empirically show that indigenous social networks such as *iddir* associations can play a crucial role in facilitating factor market transactions. *Iddir* networks are the most popular and widely available social networks both in urban and rural areas of Ethiopia. The fact that these networks are inclusive, offers interesting context and perspective through which to investigate their role in overcoming some of the factor market imperfections in rural economies. While studies such as Krishnan and Sciubba (2009) investigate the compositional and architectural impact of social networks on economic performance (or agricultural output), we investigate the role of *iddir* networks in facilitating factor market transactions, which are key inputs for improving the economic performance of smallholder farmers. To circumvent the selection of households into *iddir* networks, we rely on a difference-in-differences approach by comparing the growth in factor market transactions between those households who joined *iddir* networks and those who did not, before and after the former joined the networks.

The fact that *iddir* networks avail information, strengthen trust, and reduce enforcement costs has important implications in view of the binding factor market imperfections in rural economies. Owing to these qualities, *iddir* networks can substantially reduce transaction costs and information

[18] Note also that we lack data to assess whether these transactions are intra-*iddir* or otherwise.

asymmetry among agents of factor markets, facilitating smooth transactions within factor markets. For instance, in countries like Ethiopia where land insecurity is a limiting factor in land transactions (Deininger et al., 2008; Ghebru and Holden, 2008; Deininger and Jin, 2008), understanding the role of *iddir* associations is crucial. In this context, our results indicate that *iddir* networks offer alternative ways to overcome land market imperfections by bridging the gap between those farmers who own excess land (in excess of their draft power), and those with excess draft power (in excess of their land endowment).[19] Similarly, we find that *iddir* networks can improve agricultural labor market imperfections by facilitating labor-sharing practices among households. While Krishnan and Sciubba (2009) find that social capital generated through labor-sharing arrangements matters for agricultural output, our results show that indigenous social networks, such as *iddir* associations, generate social capital by facilitating labor-sharing arrangements.

Another important implication of *iddir* networks relates to credit markets and their role in easing the liquidity constraints of smallholder farmers. Access to credit is a central factor in transforming smallholder farming of the Ethiopian type. Dercon and Christiaensen (2011) emphasize that credit constraints and uninsured agricultural production are key factors that keep smallholder farmers in poverty. In this context, our results show that *iddir* networks boost the credit access of households from potential members of the *iddir* association. *Iddir* networks improve households' credit access from friends and neighbors. Interestingly, our findings also indicate that *iddir* networks crowd-out expensive and inefficient credit sources, including informal local moneylenders (*Arata Abedari*) without virtually affecting formal credit sources such as microfinance institutions. This is intuitively expected, because *iddir* members (both borrowers and lenders) have privileged access to information, which lowers the transaction costs associated with their credit transactions. Thus, households' access to alternative, and perhaps, cheaper credit sources through these networks can drive high cost informal lenders out of the credit market. This is particularly appealing in view of the fact that formal credit markets are commonly thought to be ineffective at crowding-out informal moneylenders in rural areas (Hoff and Stiglitz, 1990; Udry, 1990).

To summarize, given the direct and indirect roles that *iddir* networks can play in factor markets and other development initiatives, new thinking regarding ways of supporting these networks is needed. As suggested by Dercon et al. (2006), policy makers may focus on scaling up the

[19] However, the efficiency of these transactions has to be investigated, which is a potential future avenue of research.

institutional capacity of these networks without diluting their institutional strength. Although our results highlight the potential of indigenous social networks, such as *iddirs*, in facilitating factor market transactions, further investigation into how to exploit the potential of these networks is needed. One possible dimension might be forming partnerships between *iddir* networks and other government and non-government organizations as suggested by Pankhurst (2008). Such partnerships may be vital in expanding formal credit institutions by combining the desirable qualities of *iddir* networks with the institutional capacity of the formal organizations. Whichever direction is considered, there needs to be an initiative to tap the potential that these networks offer.

However, this study is not without its limitations. First, it is understood that we are estimating a reduced form equation where the mechanics and channels through which *iddir* networks affect factor markets are not clearly visible. Second, we only know whether the households are members of an *iddir* in the village. There might be heterogeneity among the services given by different *iddirs*, and, hence, households subscribing to different *iddirs* might be subject to heterogeneous treatment effects. Though not expected in such a short time span, households may also subscribe to more than one *iddir* association simultaneously. It would be interesting to investigate the heterogeneous effects of these networks and their policy implications. For instance, Krishnan and Sciubba (2009) emphasize that the impact of social networks on economic performance heavily depends on the size and type of the network. Finally, although *iddir* networks facilitate factor market transactions, further research on the efficiency of such transactions is worth considering. More generally and as also argued in Fafchamps (2006), social networks present both positive and negative externalities emanating from the complicated attributes of these networks; thus, further research on the potential of these indigenous networks would help in designing better policy interventions.

Acknowledgments

The data used in this study comes from longitudinal data collected for the evaluation of the Productive Safety Net Programme (PSNP) of Ethiopia funded by the World Bank, the Department for International Development (DfID) and the US Agency for International Development (USAID). This paper benefited from comments by Henning Tarp Jensen and seminar participants at the IFRO seminar at the University of Copenhagen. All remaining errors are ours.

References

Aleem, I., 1990. Imperfect information, screening, and the costs of informal lending: a study of a rural credit market in Pakistan. *The World Bank Economic Review* 4, 329-349.

Ali, D.A., Deininger, K., 2014. Causes and implications of credit rationing in rural Ethiopia: The importance of spatial variation. *Journal of African Economies 1, 1–35.*

Ali, D.A., Deininger, K., Duponchel, M., 2014. Credit constraints and agricultural productivity: Evidence from rural Rwanda. *Journal of Development Studies* 1-17.

Aryeetey, E., Udry, C., 1997. The characteristics of informal financial markets in sub-Saharan Africa. *Journal of African Economies* 6, 161-203.

Bandiera, O., Rasul, I., 2006. Social networks and technology adoption in northern Mozambique. *The Economic Journal* 116, 869-902.

Barrett, C., Mutambatsere, E., 2005. Agricultural markets in developing countries. The New Palgrave Dictionary of Economics, 2nd edition.

Barr, A., 2000. Social capital and technical information flows in the Ghanaian manufacturing sector. *Oxford Economic Papers* 52, 539-559.

Bell, C., 1990. Interactions between institutional and informal credit agencies in rural India. *The World Bank Economic Review* 4, 297-327.

Berhane, G., Gardebroek, C., Moll, H.A., 2009. Risk-matching behavior in microcredit group formation: evidence from northern Ethiopia. *Agricultural Economics* 40, 409-419.

Berhane, G., Hoddinott, J., Kumar, N., Taffesse, A. S., Diressie, M.T., Yohannes, Y., Sabates-Wheeler, R., Handino, M., Lind, J., Tefera, M., Sima, F. 2011. Evaluation of Ethiopia's Food Security Program: Documenting progress in the implementation of the Productive Safety Nets Programme

and the Household Asset Building Programme. *International Food Policy Research Institute, Washington, DC.*

Berhane, G., Hoddinott, J., Gilligan,D. O., Kumar, N., Taffesse, A. S., 2014. Can social protection work in Africa? The impact of Ethiopia's Productive Safety Net Programme. *Economic Development and Cultural Change* 63:1, 1-26

Besley, T., 1994. How do market failures justify interventions in rural credit markets? *The World Bank Research Observer* 9, 27-47.

Binswanger, H.P., McIntire, J., 1987. Behavioral and material determinants of production relations in land-abundant tropical agriculture. *Economic Development and Cultural Change* 73-99.

Caeyers, B., Dercon, S., 2012. Political connections and social networks in targeted transfer programs: evidence from rural Ethiopia. *Economic Development and Cultural Change* 60, 639-675.

Cheung, S.N.S., 1969. The Theory of Share Tenancy, Chicago, IL: University of Chicago Press.

Conley, T.G., Udry, C., 2010. Learning about a new technology: Pineapple in Ghana. *The American Economic Review* 35-69.

Collier, P., 1983. Malfunctioning of African rural factor markets: Theory and a Kenyan example. *Oxford Bulletin of Economics and Statistics* 45, 141-172.

Deininger, K., Jin, S., 2008. Land sales and rental markets in transition: Evidence from rural Vietnam. *Oxford Bulletin of Economics and Statistics* 70, 67-101.

Deininger, K., Ali, D.A., Alemu, T., 2008. Assessing the functioning of land rental markets in Ethiopia. *Economic Development and Cultural Change* 57, 67-100.

De Janvry, A., Fafchamps, M., Sadoulet, E., 1991. Peasant household behavior with missing markets: some paradoxes explained. *The Economic Journal* 1400-1417.

Dercon, S., Christiaensen, L., 2011. Consumption risk, technology adoption and poverty traps: Evidence from Ethiopia. *Journal of Development Economics*, 96, 159-173.

Dercon, S., De Weerdt, J., Bold, T., and Pankhurst, A., 2006. Group-based funeral insurance in Ethiopia and Tanzania. *World Development* 34, 685-703.

Dercon, S., Hoddinott, J., Krishnan, P.,Woldehannna, T., 2008. Collective action and vulnerability: burial societies in rural Ethiopia. *CAPRI Working Paper* No. 83

De Weerdt, J., Dercon, S., 2006. Risk-sharing networks and insurance against illness. *Journal of Development Economics* 81, 337-356.

Durlauf, S., Fafchamps, M., 2005. Social capital, in (Durlauf, S. and Aghion, P., eds), *Handbook of Economic Growth* 1, 1639–99, Amsterdam: North Holland.

Fafchamps, M., 2001. Networks, communities and markets in Sub-Saharan Africa: Implications for firm growth and investment. *Journal of African Economies* 10, 109-142.

Fafchamps, M., 2004. Market institutions in sub-Saharan Africa: Theory and evidence. MIT Press Books 1.

Fafchamps, M., 2006. Development and social capital. *The Journal of Development Studies* 42, 1180-1198.

Fafchamps, M., Lund, S., 1998. Risk sharing networks in rural Philippines. Stanford: Department of Economics, Stanford University, (mimeograph).

Fafchamps, M., Lund, S., 2003. Risk-sharing networks in rural Philippines. *Journal of Development Economics* 71, 261-287.

Fafchamps, M., Minten, B., 2002. Returns to social network capital among traders. *Oxford Economic Papers* 54, 173-206.

Foster, A.D., Rosenzweig, M.R., 1995. Learning by doing and learning from others: Human capital and technical change in agriculture. *Journal of Political Economy* 1176-1209.

Ghebru, H., Holden, S.T., 2008. Factor market imperfections and rural land rental markets in northern Ethiopian Highlands. *The Emergence of land markets in Africa: Assessing the impacts on poverty, equity and efficiency* 74-92.

Gilligan, D., Hoddinott, J., Taffesse, A.S. 2009. The impact of Ethiopia's Productive Safety Net Programme and its linkages. *Journal of Development Studies*, 45, 1684-1706

Hoddinott, J., Dercon, S., Krishnan, P., 2005. Networks and informal mutual support in 15 Ethiopian villages, in (Kirsten J.F., Dorward, A.R., Poulton, C., Vink, N.), *Institutional Economics Perspectives on African Agricultural Development*, International Food Policy Research Institute, Washington, DC.

Hoff, K., Stiglitz, J.E., 1990. Introduction: imperfect information and rural credit markets: Puzzles and policy perspectives. *The World Bank Economic Review* 235-250.

Holden, S.T., Deininger, K. Ghebru, H, 2011. Tenure insecurity, gender, low-cost land certification and land rental market participation in Ethiopia. *The Journal of Development Studies* 47:1, 31-47.

Johnson, D.G., 1950. Resource allocation under share contracts. *The Journal of Political Economy* 111-123.

Karlan, D.S., 2007. Social connections and group banking. *The Economic Journal* 117, 52–84

Krishnan, P., Sciubba, E., 2009. Links and Architecture in Village Networks. *The Economic Journal* 119, 917-949.

Mariam, D.H., 2003. Indigenous social insurance as an alternative financing mechanism for health care in Ethiopia (the case of iddirs). *Social Science and Medicine* 56, 1719-1726.

Newbery, D. M. G., 1975. Tenurial obstacles to innovation *Journal of Development Studies* 11, 263-277.

Okten, C., Osili, U.O., 2008. Social networks and credit access in Indonesia. *World Development* 32, 1225–1246.

Pankhurst, A., Mariam, D.H., 2000. The iddir in Ethiopia: Historical development, social function, and potential role in HIV/AIDS prevention and control. *Northeast African Studies* 7, 35-57.

Pankhurst, A., 2008. The Emergence, evolution and transformations of iddir funeral associations in urban Ethiopia. *Journal of Ethiopian Studies* 143-185.

Pender, J., Fafchamps, M., 2006. Land lease markets and agricultural efficiency in Ethiopia. *Journal of African Economies* 15, 251-284.

Ray, D., 1998. Development economics. Princeton University Press.

Rosenzweig, Mark R., 1988, Labor markets in low-income countries, in: Hollis Chenery and T.N. Srinivasan, eds., *Handbook of Development Economics* (North-Holland, Amsterdam) 113-162.

Sadoulet, E., De Janvry, A., Fukui, S., 1997. The meaning of kinship in sharecropping contracts. *American Journal of Agricultural Economics* 79, 394-406.

Stiglitz, J.E., 1989. Discussion: mutual funds, capital structure, and economic efficiency. Theory of Valuation: Frontiers of Modern Financial Theory, Rowman & Littlefield, New York, NY 342-356. Stiglitz, J.E. and Weiss, A., 1981. Credit rationing in markets with imperfect information. *The American Economic Review* 393-410.

Townsend, R.M., 1995. Financial systems in northern Thai villages. *Quarterly Journal of Economics* 110:4, 101 1-46.

Udry, C., 1990. Credit markets in Northern Nigeria: Credit as insurance in a rural economy. *The World Bank Economic Review* 4, 251-269.

Udry, C., 1994. Risk and insurance in a rural credit market: An empirical investigation in northern Nigeria. *The Review of Economic Studies* 61, 495-526.

Wydick, B., Karp Hayes, H., Hilliker Kempf, S., 2011. Social networks, neighborhood effects, and credit access: evidence from rural Guatemala. *World Development* 39, 974-982.

APPENDIX

Table A1*:* Descriptive statistics of the explanatory variables considered

	Full sample			Selected sample		
Explanatory variables considered	2008 Survey	2010 Survey	Difference	2008 Survey	2010 Survey	Difference
Age of household head	44.813	45.895	-1.082***	44.474	45.489	-1.015
Head female	0.182	0.195	-0.013	0.200	0.218	-0.018
Household head attended schooling	0.359	0.623	-0.264***	0.279	0.589	-0.310***
Household size	5.611	5.657	-0.047	5.512	5.610	-0.098
Oxen	0.781	0.800	-0.020	0.868	0.892	-0.024
Land (in hectare)	1.008	1.252	-0.244***	1.065	1.252	-0.188***
Iddir-member household	0.596	0.675	-0.078***	0.000	0.373	-0.373***
Equib-member household	0.090	0.099	-0.009	0.035	0.057	-0.023**
Subjective wealth status: ‘‘Rich’’	0.043	0.043	-0.000	0.045	0.033	0.012
Subjective wealth status: ‘‘Average’’	0.201	0.252	-0.051***	0.227	0.225	0.002
Subjective income: more than adequate	0.005	0.009	-0.003	0.006	0.003	0.003
Subjective income: adequate	0.203	0.263	-0.061***	0.240	0.251	-0.011
Food insecure household	0.751	0.464	0.287***	0.732	0.492	0.240***
PSNP beneficiary household	0.478	0.456	0.022	0.518	0.482	0.037
Father of head respected in village	0.576	0.576	0.000	0.487	0.487	0.000
Exposure to shock†	0.422	0.298	0.124***	0.327	0.259	0.068***
Tigray region	0.141	0.141	0.000	0.295	0.295	0.000
Amhara region	0.390	0.390	0.000	0.308	0.308	0.000
Oromiya region	0.205	0.205	0.000	0.254	0.254	0.000
SNNP region	0.265	0.265	0.000	0.144	0.144	0.000
Number of observations	*2,293*	*2,293*	*2,293*	*926*	*926*	*926*

Notes: This table provides mean estimates and differences across both surveys for the variables of the complete and selected sample.

† Shocks include death of family members and other types of unplanned events that affect production, including drought, flood, erosion and other.

Table A2*:* Placebo regression on pre-treatment sample using 2006 and 2008 surveys

	Sharecropping-in		Sharecropping or loaning-out		Labor-sharing (main-season)	
Explanatory variables considered	(1) Without controls	(2) With controls	(3) Without controls	(4) With controls	(5) Without controls	(6) With controls
β_1 *(treated)*	-0.011	0.020	-0.064***	-0.015	0.061*	0.043
	(0.018)	(0.023)	(0.025)	(0.031)	(0.034)	(0.041)
β_2 *(Post)*	-0.002	0.006	-0.010	-0.008	0.164***	0.149***
	(0.013)	(0.014)	(0.018)	(0.019)	(0.028)	(0.027)
β_3 *(treated*Post)*	-0.015	-0.018	0.019	0.021	-0.048	-0.068
	(0.023)	(0.023)	(0.032)	(0.032)	(0.048)	(0.045)
Other controls	No	Yes	No	Yes	No	Yes
Regional dummies (4)	No	Yes	No	Yes	No	Yes
Village-level fixed effects	No	Yes	No	Yes	No	Yes
Constant	0.059***	0.118***	0.121***	0.157**	0.209***	0.371***
	(0.009)	(0.049)	(0.013)	(0.065)	(0.018)	(0.089)
R-squared	0.002	0.115	0.006	0.136	0.015	0.167
No. of observations	1,434	1,434	1,434	1,434	1,434	1,434

Notes: Each column presents difference-in-differences estimations for household's involvement in factor market transactions. In this table we are using pre-treatment surveys to estimate placebo treatment effects. We did this exercise only for the outcome variables where we have complete information in both pre-treatment surveys. Estimates in the second, fourth, and sixth columns include 65 village (*kebele*)-level fixed effects. Robust standard errors are in parentheses. ***, **, * indicates significance level at 1, 5 and 10 percent, respectively.

Table A3*: Effect of *iddir* networks on land transactions, difference-in-differences estimates, full model results

	Sharecropping-in			Sharecropping-out		
Explanatory variables considered	(1) Without controls	(2) With Controls	(3) With village-fixed effect	(4) Without controls	(5) With controls	(6) With village fixed effect
β_1 *(treated)*	-0.029	-0.033*	-0.054**	-0.046*	-0.018	-0.042
	(0.019)	(0.019)	(0.023)	(0.024)	(0.025)	(0.030)
β_2 *(Post)*	-0.034**	-0.050***	-0.047***	0.003	0.000	0.003
	(0.015)	(0.016)	(0.016)	(0.018)	(0.020)	(0.020)
β_3 *(treated*Post)*	0.092***	0.094***	0.088***	0.057*	0.058*	0.054*
	(0.024)	(0.024)	(0.024)	(0.030)	(0.031)	(0.031)
Probit DID:	0.093***	0.091***	0.124***	0.058**	0.064**	0.066**
Marginal effects¥	(0.028)	(0.027)	(0.032)	(0.034)	(0.034)	(0.036)
Age of household head		-0.001**	-0.001***		-0.001**	-0.001**
		(0.000)	(0.000)		(0.001)	(0.001)
Female household head		-0.068***	-0.060***		-0.012	-0.027
		(0.017)	(0.017)		(0.022)	(0.022)
Head attended school		0.038***	0.022		0.022	0.003
		(0.014)	(0.014)		(0.018)	(0.018)
Number of adults		0.008	0.010*		-0.005	-0.001
		(0.005)	(0.005)		(0.007)	(0.007)
Number of oxen		0.020***	0.019**		0.008	0.004
		(0.008)	(0.008)		(0.010)	(0.010)
Land (in hectare)		-0.001	0.003		0.009	0.013
		(0.007)	(0.007)		(0.009)	(0.009)
Equib-member		-0.047	-0.044		-0.028	-0.044
		(0.031)	(0.031)		(0.039)	(0.039)
PSNP beneficiary		-0.034**	-0.029**		-0.026	-0.020
		(0.013)	(0.013)		(0.017)	(0.017)
Exposure to shocks		0.021	-0.013		0.002	-0.031
		(0.014)	(0.015)		(0.018)	(0.019)
Regional dummies (4)	No	Yes	Yes	No	Yes	Yes
Constant	0.098***	0.133***	0.136**	0.157***	0.276***	0.173**
	(0.012)	(0.033)	(0.054)	(0.015)	(0.043)	(0.071)
R-squared	0.007	0.118	0.233	0.003	0.101	0.216
Number of observations	1,852	1,852	1,852	1,852	1,852	1,852

Notes: Each column presents difference-in-differences estimations of equation (1) for household's involvement in land transactions. Except the first and fourth columns, all estimations include four regional dummies corresponding to the main regions of Ethiopia. Estimates on the third and sixth columns include 65 village (*kebele*)-level fixed effects. Robust standard errors are in parentheses. ***, **, * indicates significance level at 1, 5 and 10 percent, respectively.
[¥] Marginal effects are from a probit difference-in-differences estimation.

Table A4*: Effect of iddir networks on labor transactions, difference-in-differences estimates, full model results*

	Labor-sharing (Main season)		
Explanatory variables considered	(1) Without controls	(2) With controls	(3) With village-fixed effect
β_1 *(treated)*	-0.011	-0.023	-0.010
	(0.032)	(0.032)	(0.039)
β_2 *(Post)*	0.033	0.025	0.025
	(0.025)	(0.027)	(0.027)
β_3 *(treated*Post)*	0.101**	0.098**	0.101**
	(0.041)	(0.041)	(0.041)
Probit DID: Marginal effects¥	0.099***	0.101***	0.109***
	(0.044)	(0.043)	(0.042)
Age of household head		-0.001	-0.001
		(0.001)	(0.001)
Female household head		0.055*	0.037
		(0.029)	(0.027)
Head attended school		-0.053**	-0.034
		(0.023)	(0.023)
Number of adults		0.025***	0.017**
		(0.009)	(0.009)
Number of oxen		0.026**	0.020
		(0.013)	(0.013)
Land (in hectare)		0.028**	0.028**
		(0.011)	(0.012)
Equib-member		0.091*	0.048
		(0.051)	(0.051)
PSNP beneficiary household		-0.041*	-0.032
		(0.022)	(0.022)
Exposure to shocks		0.064***	0.055**
		(0.024)	(0.025)
Regional dummy variables (4)	No	Yes	Yes
Constant	0.289***	0.167***	0.244***
	(0.019)	(0.055)	(0.090)
R-squared	0.010	0.100	0.213
Number of observations	1,852	1,852	1,852

Notes: Each column presents difference-in-differences estimations of equation (1) for household's involvement in labor transactions. Except the first column, all estimations include four regional dummies corresponding to the main regions of Ethiopia. Estimates on the third column include 65 village (*kebele*)-level fixed effects. Robust standard errors are in parentheses. ***, **, * indicates significance level at 1, 5 and 10 percent, respectively.
¥ Marginal effects are from a probit difference-in-differences estimation.

Table A5: Effect of *iddir* networks on credit access, difference-in-differences estimates, full model results

	Credit from neighbors and friends			Credit from informal lenders (*Arata Abedari*)		
Explanatory variables considered	(1) Without controls	(2) With Controls	(3) With village-fixed effect	(4) Without controls	(5) With controls	(6) With village fixed effect
β_1 *(treated)*	-0.004	-0.041*	-0.063**	0.057***	0.033**	0.053***
	(0.023)	(0.024)	(0.030)	(0.015)	(0.016)	(0.019)
β_2 *(Post)*	-0.010	-0.016	-0.023	-0.003	-0.008	-0.004
	(0.018)	(0.020)	(0.020)	(0.012)	(0.013)	(0.013)
β_3 *(treated*Post)*	0.074**	0.068**	0.072**	-0.046**	-0.043**	-0.043**
	(0.030)	(0.030)	(0.030)	(0.019)	(0.019)	(0.019)
Probit DID:	0.074**	0.065**	0.075**	-0.046**	-0.034**	-0.070***
Marginal effects¥	(0.034)	(0.031)	(0.033)	(0.023)	(0.020)	(0.032)
Age of household head		0.001	0.001		-0.000	-0.001*
		(0.001)	(0.001)		(0.000)	(0.000)
Female household head		0.002	0.013		-0.009	-0.011
		(0.021)	(0.021)		(0.014)	(0.013)
Head attended schooling		0.015	0.028		0.015	0.011
		(0.017)	(0.018)		(0.011)	(0.011)
Number of adults		0.005	0.007		0.002	-0.002
		(0.007)	(0.007)		(0.004)	(0.004)
Number of oxen owned		-0.025***	-0.029***		-0.013**	-0.012*
		(0.009)	(0.010)		(0.006)	(0.006)
Land (in hectare)		-0.010	-0.008		0.000	0.002
		(0.008)	(0.009)		(0.005)	(0.006)
Equib-member		0.055	0.044		-0.036	-0.038
		(0.038)	(0.039)		(0.025)	(0.025)
PSNP beneficiary		0.008	0.009		0.018	0.015
		(0.016)	(0.017)		(0.011)	(0.011)
Exposure to shocks		-0.009	0.013		-0.000	-0.004
		(0.018)	(0.019)		(0.012)	(0.012)
Regional dummy variables (4)	No	Yes	Yes	No	Yes	Yes
Constant	0.129***	0.026	-0.006	0.041***	0.028	0.045
	(0.014)	(0.040)	(0.070)	(0.009)	(0.027)	(0.044)
R-squared	0.005	0.094	0.162	0.010	0.054	0.204
No. of observations (*N**2)	1,852	1,852	1,852	1,852	1,852	1,852

Notes: Each column presents difference-in-differences estimations of equation (1) for household's access to credit from different sources. Except the first and fourth columns, all estimations include four regional dummies corresponding to the

main regions of Ethiopia. Estimates on the third and sixth columns include 65 village (kebele)-level fixed effects. Robust standard errors are in parentheses. ***, **, * indicates significance level at 1, 5 and 10 percent, respectively. ¥ Marginal effects are from a probit difference-in-differences estimation.

Table A6: Difference-in-differences estimates for households whose head was born in the village

	Panel A: Land transactions					
	Sharecropping-in			Sharecropping-out		
Explanatory variables considered	(1) Without controls	(2) With Controls	(3) With village-fixed effect	(4) Without controls	(5) With controls	(6) With village fixed effect
β_1 *(treated)*	-0.027	-0.029	-0.055**	-0.052*	-0.022	-0.045
	(0.021)	(0.021)	(0.026)	(0.027)	(0.027)	(0.034)
β_2 *(Post)*	-0.031*	-0.046***	-0.043**	-0.004	-0.010	-0.007
	(0.016)	(0.018)	(0.018)	(0.020)	(0.022)	(0.022)
β_3 *(treated*Post)*	0.101***	0.104***	0.099***	0.068**	0.069**	0.064*
	(0.027)	(0.027)	(0.027)	(0.033)	(0.034)	(0.034)
Constant	0.100***	0.126***	0.142**	0.166***	0.254***	0.173**
	(0.013)	(0.038)	(0.061)	(0.016)	(0.048)	(0.079)
	Panel B: Labor transactions					
	Labor-sharing – main season					
β_1 *(treated)*	-0.037	-0.070**	-0.094**			
	(0.034)	(0.034)	(0.042)			
β_2 *(Post)*	0.029	0.018	0.014			
	(0.027)	(0.029)	(0.029)			
β_3 *(treated*Post)*	0.112**	0.110**	0.114***			
	(0.044)	(0.045)	(0.044)			
Constant	0.299***	0.123**	0.164*			
	(0.021)	(0.059)	(0.098)			
	Panel C: Credit transactions					
	Credit from neighbors and friends			Credit from informal lenders		
β_1 *(treated)*	0.009	-0.034	-0.033	0.052***	0.030*	0.056***
	(0.024)	(0.025)	(0.032)	(0.016)	(0.017)	(0.021)
β_2 *(Post)*	-0.018	-0.026	-0.031	-0.010	-0.012	-0.011
	(0.020)	(0.021)	(0.021)	(0.013)	(0.014)	(0.014)
β_3 *(treated*Post)*	0.079**	0.068**	0.071**	-0.037*	-0.032	-0.031
	(0.032)	(0.032)	(0.032)	(0.021)	(0.021)	(0.021)
Constant	0.119***	0.036	0.016	0.045***	0.065**	0.057
	(0.015)	(0.043)	(0.074)	(0.010)	(0.030)	(0.049)
No. of observations (N^*2)	1,572	1,572	1,572	1,572	1,572	1,572

Notes: Each column presents difference-in-differences estimations of equation (1) for household's access to factor market transaction. . Except the first and fourth columns, all estimations include four regional dummies corresponding to the main regions of Ethiopia. Estimates on the third and sixth columns include 65 village (kebele)-level fixed effects. Robust standard errors are in parentheses. ***, **, * indicates significance level at 1, 5 and 10 percent, respectively.