Land Governance in an Interconnected World

ANNUAL WORLD BANK CONFERENCE ON LAND AND POVERTY
WASHINGTON DC, MARCH 19-23, 2018

RURAL PROPERTY RIGHTS AND MIGRATION: EVIDENCE FROM ETHIOPIA

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Paper prepared for presentation at the

"2018 WORLD BANK CONFERENCE ON LAND AND POVERTY" The World Bank - Washington DC,

March 19-23, 2018

Abstract: This paper provides evidence that security of ownership over land is of crucial importance to households when deciding whether to send a migrant. The results are particularly relevant to many developing country contexts where property rights over rural land are contingent on the occupant demonstrating productive use of the land. Using a unique farm-household panel dataset from the highlands of Ethiopia, this study demonstrates a robust positive relationship between tenure security and migration. The identification strategy relies on the gradual roll-out of a land certification program at the village level, as well as exogenous variation in water availability, a likely trigger of out-migration from agriculture. The results demonstrate that households with tenure certificates are around 15 percent more likely to have a member that has migrated for work. We further document that water scarcity during the growing season encourages out-migration from agriculture, however, droughts during the planting period discourage migration. The findings suggest that migration and the sectoral reallocation of labor can be an important channel through which tenure security affects economic performance.

Key Words: Migration, Ethiopia, Property Rights, Agriculture

Rural Property Rights and Migration: Evidence from Ethiopia

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This paper provides evidence that security of ownership over land is of crucial importance to households when deciding whether to send a migrant. The results are particularly relevant to many developing country contexts where property rights over rural land are contingent on the occupant demonstrating productive use of the land. Using a unique farm-household panel dataset from the highlands of Ethiopia, this study demonstrates a robust positive relationship between tenure security and migration. The identification strategy relies on the gradual roll-out of a land certification program at the village level, as well as exogenous variation in water availability, a likely trigger of out-migration from agriculture. The results demonstrate that households with tenure certificates are around 15 percent more likely to have a member that has migrated for work. We further document that water scarcity during the growing season encourages out-migration from agriculture, however, droughts during the planting period discourage migration. The findings suggest that migration and the sectoral reallocation of labor can be an important channel through which tenure security affects economic performance.

1 Introduction

Formalizing and protecting property rights has long been recognized as an essential condition for economic development and poverty reduction (Demsetz (1974); North (1981); De Soto (2000)). The argument follows the simple logic that investment and the efficient allocation of economic resources can only thrive when institutions secure citizens against the threat of expropriated returns. A large body of academic literature has built upon these institutional hypotheses to describe pervasive cross-country variations in economic progress (Hall and Jones (1999); Acemoglu et al. (2001); Rodrik et al. (2004)); whilst several other microeconomic studies have identified how within-country differences in effective property rights protection, impact upon credit access, investment incentives, and agricultural yields (Feder (1988); Besley (1995); Goldstein and Udry (2008)). Whilst this draws the general consensus that institutions matter, few papers have been able to gain reliable evidence on the relationship between property rights and rural labor market dynamics. This paper seeks to contribute to the literature by examining this alternative mechanism through which land rights can enhance economic welfare: namely, the productivity gains that stem from spatial and sectoral reallocation of labor away from agriculture.

Whilst entitlement to property in rich countries is regularly established and enforced by formal law, in many developing countries, informal institutions frequently arise to compensate for deficient official regulation. Such customary arrangements can give rise to property entitlements that are inherently ambiguous and prone to inequalities. In many cases, maintaining access to one's land holdings becomes conditional on demonstrating regular and productive use by the occupant, with the implicit recognition that any household neglecting their land or migrating to other areas faces a considerable risk of losing their rights (De Janvry et al., 2015). These conditions can easily give rise to a sub-optimal allocation of resources, as compared to a situation in which households make unconstrained decisions. Firstly, if households with poorly defined rights expend additional human resources solidifying their claims to land – either through maintaining production at a certain acceptable standard or by guarding their property – this restrains their ability to engage in more productive activities. Secondly, insufficient transfer rights can prevent land from being rented in accordance with its marginal productivity, which in turn, restricts the land from being

reallocated to its most productive users.

To see why this misallocation of resources is so important, it pays to consider some powerful empirical facts. In the poorest countries of the world, the vast majority of labor is typically allocated to the agricultural sector, yet in the richest countries, virtually nobody works in this sector (Caselli, 2005). At the same time, agriculture is considered an intrinsically low productivity sector; as value added in developing countries, is on average four times higher in the non-agriculture sector than in agriculture (Gollin et al., 2014). It is thus unsurprising, that the history of thought on economic development has placed a great deal of focus on the agriculture-nonagriculture dynamic (Nurske (1953); Lewis (1954); Kuznets and Murphy (1966)).

For many rural families in developing countries, migration can offer a potential avenue through which households can escape from poverty traps in the agricultural sector. Accessing higher return opportunities in distant labor markets can increase the earnings potential of household members (Harris and Todaro, 1970). Alternatively, as migration forms part of the income risk attitude and decision making strategies of households; migration can enable the diversification of income sources and reduction of risk by allocating labor across areas where income flows are not correlated with agricultural productivity shocks (Rosenzweig and Stark (1989); Banerjee (1991); Bryan and Morten (2015)).

However, despite the income generating and risk smoothing opportunities presented by migration, certain studies have highlighted a consistent lack of out-migration from rural areas in developing countries (Ghatak et al., 1996). Such studies have typically focused on the cultural, demographic and informational barriers that constrain migration, but few have paid clear attention to the role of tenure security in migratory decisions. A crucial question is whether households with poorly defined property rights may be reluctant to send out migrants for fear that any absence signals a lower need for their landholdings. This effect could be prevalent across many settings in the world where rural households experience a lack of formal and transparent land rights amidst competitive pressures for scarce land.

In recent years, policy-makers in Sub-Saharan Africa have turned their attention towards property titling arrangements as a means to target the poor and stimulate economic

growth (Binswanger et al., 1995). Since the early 1990s, a wave of land registration programs have been passed across the continent in efforts to recognize multiple claims to land, improve the rights of women, and decentralize the distribution process (Deininger et al., 2008). The question of whether improving property rights on agricultural land leads to a more efficient allocation of the work-force can thus bear important implications to guide future policy on the African continent.

For the specific case of Ethiopia that is considered in this paper, land remains one of the most fundamental assets to households. Around half of the nation's GDP can be attributed to agricultural production, yet more than 85 percent of the population make their living off the land (Group, 2012). Ethiopia is one of the poorest and most populous countries in Sub-Saharan Africa, and with only 16 percent of people living in cities, pressures to raise agricultural productivity whilst addressing overlapping claims to scarce land, remain extremely high throughout the country (Figure A1). Despite recent government efforts to instigate land reforms and stimulate intensification, there continues to be a widespread perception of expropriation risk and incomplete entitlements as redistributions remain frequent. Increased internal migration to Ethiopia's urban areas could relax these land constraints whilst enabling additional individuals to reap the benefits of agglomeration and scale that manifest in cities. Moreover, the frequency of droughts and commodity price variability in Ethiopia leads to significant uncertainty in consumption and income patterns which could be smoothed by encouraging spatial reallocation of labor (De Brauw and Mueller, 2012).

In this sense, Ethiopia presents a compelling case for the purposes of this study; weak land rights are likely to constrain productive allocation of resources, and urbanization is uncharacteristically low. The objectives of the study will be to examine the relationship between these land rights and the mobility of labor. Our analysis uses data on the gradual rollout at the village level of a large land certification program implemented by the World Bank in the Highlands of Ethiopia. In particular, we use two rounds of the Sustainable Land Management Survey (SLMS) – conducted in the region in 2005 and 2007 – which cover a broad range of topics related to agriculture, migration, and family life. Our identification strategy first relies on a specification that controls for fixed unobservable characteristics at

the village level. As the program provided certificates to the entire village simultaneously, this addresses concerns about selection at the individual level. Any time-invariant village characteristic correlated with the program rollout and migration is accounted for by the fixed effects. Therefore, the identifying assumption of our first results – the relationship between land rights and migration – is that any time-varying village characteristics that affect migration are uncorrelated with the rollout of the program.

Second, we account for the possibility that migration behavior may have changed over time due to unobservable characteristics that were correlated with the timing of the land certification by including time-varying household characteristics, village-year and district-year fixed effects. Our main results indicate that having tenure certification increases the likelihood that a household has a member migrating for work purposes by around 15 percent.

These results shed new light on an important channel through which property rights can affect economic growth. In the preceding literature, the benefits of secure property rights have been demonstrated to manifest through four main channels: increased incentives for investment (Besley (1995); Dercon and Ayalew (2007); Leight et al. (2013)), collateralization of land for credit (Feder, 1988), facilitating gains from trade (Besley, 1995), and improved intrahousehold labor allocation (Field (Field); Galiani and Schargrodsky (2010)). Our paper is most closely related to the work of De Janvry et al. (2015), who show that switching from informal use-based rights to land rights established by formal titles, encouraged large-scale migration in Mexico. However, few studies have looked at the effect of land rights on migration behavior in the African context, where rural poverty is most prevalent. This paper shows that when land rights are use-based, weak property rights will constrain effective migration out of agriculture and lead to a misallocation of resources where low productivity land is kept in use.

The remainder of the paper is organized as follows. Section II discusses the conceptual framework behind this paper and reviews the literature on land rights. Section III briefly describes the historical structure of land rights in Ethiopia and the land certification program. Section IV describes the data used and Section V presents the identification strategy and results. Finally, Section VI concludes.

2 Conceptual Framework

2.1 Property Rights and Agricultural Decision Making

In broad measure, property rights can be defined in terms of the institutional framework that describes an owner's right to use an asset for consumption and income generation, to transfer the asset to other agents, and to use it for contractual employment arrangements with other parties (Besley and Ghatak, 2009). These rights are formed endogenously over time and materialize through the economic, political and social makeup of societies (North, 1981). The preceding literature has identified two broad categories in which property rights may affect the efficient allocation of resources: first, by limiting expropriation, and second by facilitating market transactions (Besley and Ghatak, 2009).

2.2 Land Rights and the Security Argument

Much of the mainstream literature has focused on the security argument, making the case that secure rights provide the incentives for long-term land-related investment as farmers gain assurance that their rewards will not be seized by others. In a seminal piece of work, Besley (1995) considers the effect of variation in land rights across regions of Ghana, and finds evidence that farmers enjoying more secure tenure invest greater amounts in tree planting. Similarly, Goldstein and Udry (2008) acknowledge that land rights in Ghana are closely related to an individual's position within the local social and political hierarchy, and document that individuals holding more powerful positions in local Ghanaian society are able to fallow their land longer – a crucial investment in land fertility.

Other studies find little evidence that improving land security positively impacts household investment decisions and many recognize that land rights are also likely to be endogenous due to reverse causation, as property owners may look to invest in a piece of land as a means for strengthening their tenure (Kimuyu, 1994; Brasselle et al. (2002)). Much of the previous empirical literature has used instrumental variable techniques to tackle issues of endogeneity; for instance, both Besley (1995) and Deininger et al. (2008) instrument for land rights based on how land was acquired. Such approaches contribute richer information regarding how land rights are determined and evolve over time, but it is de-

batable whether these instruments properly satisfy the exclusion restriction when focusing on outcomes such as investment and migration. For instance, a farmer who's land has been passed down from multiple generations may farm more intensively for sentimental and cultural attachments, rather than the security afforded to them through acquiring land via inheritance.

2.3 A Market Based View

Another key feature of property rights is the facilitation of transactions, which allows individuals to exploit gains from exchanges in land and credit markets. According to Feder (1988) security of ownership, makes land easier to collateralize and improves the chances that households obtain a loan by lowering information and screening costs to lenders. Typically, agency costs are extremely disruptive in poor countries as creditors are unwilling lend at an efficient price, or to even lend at all when their investment returns are uncertain. In this sense, ownership rights permit the creation of a more efficient credit market by allowing borrowers to pledge their assets as collateral.

This concept has been widely supported by De Soto (2000) who argues that "the poor lack easy access to the property mechanisms that could legally fix the economic potential of their assets so that they could be used to produce, secure, or guarantee greater value in the expanded market." On the other hand, several studies have struggled to find significant effects of land titling on credit (Field (2005); Fort (2007)), whilst one might also expect these effects to be less significant amongst small-holder farmers with limited commercial value land. Whether or not land can sufficiently support an efficient credit market is ultimately dependent on the liquidity of land markets and the ability to make sales transactions quickly and efficiently.

2.4 Land Rights and the Migration Decision

Both markets and security are critical to the migration decision. Firstly, when property rights are ill-defined and households are mired by the threat of expropriation, informal protection arrangements – such as community policing and individual guard labor – often has to arise so that people can defend their land. This issue can be especially challeng-

ing for marginalized groups such as women who are traditionally discriminated against owning land, and leads to a situation in which households are faced with constrained decisions regarding the length of time and spatial allocation of labor away from farm activities (Joireman, 2008). In a recent impact assessment of land titling programs targeted at urban squatters in Peru, Field (Field) demonstrates that improved property rights lead to higher incomes and lower child labor – primarily due to a reduction in guard behavior. On the other hand, studies of titling programs for urban squatters in Buenos Aires have found limited effects on labor market outcomes, despite some improvements in physical and human capital investment Galiani and Schargrodsky (2010).

A second mechanism through which property rights influence migration is through the potential gains from trade that stem from rental and sales markets in land. Generating a state of economic efficiency requires that all factors are brought to their most productive use, which ultimately depends on the ability of households to write efficient contracts for land, where the costs of exchange are not inflated by distortions in the market (Besley, 1995). In cases where rights are determined by usage, it becomes clear that households may keep inferior land in production and also feel restrained in their ability to migrate, because of the fear that by offering land for lease or sale, lenders may only receive a fraction of the fair market returns or even face the probability of losing some of that land.

These ideas of misallocation have been at the core of much of the traditional literature on migration and sectoral shifts in the labor force. In a classical paper by Lewis (1954), the rural-urban transition is explained in the context of a dual-sector economy, in which the rise of a modern industrializing sector permits surplus agricultural workers to be drawn out of rural areas, and into more productive activities in cities. The idea that a discrepancy between the productivity and income opportunities exists across sector and space also underpins many later models of migration and gives testament to the idea that resources are not brought to their most effective use (Harris and Todaro, 1970).

Later theories developed by Todaro (1969) and Harris and Todaro (1970) considered the possibility of urban unemployment arising from migration, and saw this phenomenon as a transitory phase towards equalizing expected incomes across rural and urban areas. These theories were based on the wedge between rural-urban expected incomes but arguably,

didn't give justice to the costs and risks associated with migration. Migrants often have to incur large travel costs to reach their destinations and face risks of not finding jobs or an adequate social safety net in the locations where they set up. Moreover, migrants often lack adequate information about the type of jobs available and the likelihood of securing employment positions in new locations (Banerjee (1991); Bryan et al. (2014)). In this sense, migration is often a risky decision and is taken as part of the rational decision making process of households that hope to reap higher rewards in new destinations (Katz and Stark, 1986).

A wide body of literature has since focused on labor migration as a means of diversifying income sources and protecting against income shocks. For instance, Rosenzweig and Stark (1989) documented high mobility patterns for the purpose of marriage across Indian villages and explained these occurrences as a manifestation of implicit interhousehold contractual arrangements aimed at mitigating income risks. More recently, a randomized control trial conducted in Bangladesh, has demonstrated that monetary incentives can enable agricultural households to out-migrate and smooth consumption during the periods of seasonal famine (Bryan et al., 2014).

Clearly, whilst several studies have explored migration as an income risk-reducing strategy (Cox et al. (1998); Lucas (1997)), most have focused on risk at destination rather than the implicit costs one may receive at home. In cases where landowners face a threat of expropriation, it is more likely that an explicit trade-off between migration and labor supply at home exists: as any off-farm income generation comes both at the expense of current agricultural production and tenure security necessary for future production. In such a case, profit-maximizing households decide whether to send a migrant based on the wedge between labor income on-farm vs off-farm, as well as the expected future income stream from agricultural production which will be diminishing in migration De Brauw and Mueller (2012).

On this basis, the ideas presented in this paper diverge from much of the traditional literature on rural property rights. Whilst past arguments for improving land security have implied that profit maximizing households will choose to devote more labor to agriculture in order to exploit greater gains from investment and credit access, one could intuitively

expect a counteractive force. If rights are determined endogenously based on the presence and active use of the asset by the owner, then labor could actually be inefficiently tied to land – unable to exploit productivity gains in markets outside agriculture.

Very few papers have studied the relationship between land transferability and migration in the African context or even in general. Existing studies have predominantly focused on Asia, for instance, Do and Iyer (2008) have argued that improvements in tenure security have enabled rural Vietnamese workers to temporarily migrate and take advantage of better employment opportunities. Similarly, De La Rupelle et al. (2009) demonstrate that the period of time before a rural Chinese migrant returns home will be reduced considerably as land becomes more exposed to reallocation. Hence, the context of Ethiopia offers a unique chance to improve our understanding of the migration decision by studying the relationship between land certification and labor allocation.

3 Background on Land Tenure and the Certification Program in Ethiopia

3.1 A Brief history of the Land Tenure System in Ethiopia

For several decades, the land tenure system in Ethiopia has been characterized by vagaries and a series of unclear reforms. During the imperial regime, the tenure system was divided by private landholdings and grant land (the gult system) in the southern half, where provincial rulers and the church were typically empowered to make allocation decisions; and communal rights (the rist system) in the northern half of the country. Within the gult system, land was typically concentrated in the hands of absentee landlords and tenure was highly insecure with regular evictions taking place. In the rist system, however, land allocation was denoted by a concept of shared land rights and land distribution based on the principle of equality (Bezabih et al., 2011). First the land was divided into parcels, and then, a lottery was implemented to allocate the land. In addition, if claimants could establish a direct line of descendants from the recognized original land holder then individuals obtained usufruct rights on the land, although all means of transfer such as through mortgage or sale were strictly prohibited.

After the fall of the imperial regime and the accession of a new military government (the Derg) in 1975, all land was nationalized and distributive power was granted to committees in local Peasant Associations (PA) (Ali et al., 2011). These PAs persist to the present day and act as an administrative unit – typically consisting of one or a few neighboring villages – that appropriate use rights to households over a given amount of land. Accordingly, the new system allowed any Ethiopian usufruct rights and the chance to make a living off the land if they so pleased. However, land transfer rights through bequests, leases, mortgages or sales, as well as hiring of labor remained outlawed (Holden and Yohannes, 2002).

During the initial land reform, redistributions occurred on a regular basis, mainly depending on the size of each household; although several studies have noted that the criteria for redistribution were largely open to interpretation, leading to suspicions over forms of reallocation that were guilty of nepotism or political and social favoritism (Rahmato, 1984). In the dataset used for this paper, 35 percent of households report losing land during the early reform periods between 1975 and 1991. Similarly, a study by Pender et al. (2001) has documented that for 98 PAs, the average village experienced 3 land redistributions across the same period. This gave rise to a situation of widespread tenure insecurity, largely contingent on households demonstrating consistent land cultivation.

Since the fall of the Derg in 1991, the succesding Ethiopian People's Revolutionary Democratic Front made some important changes to the nature of land rights provision. In 1995, the Ethiopian Constitution declared the legal allowance of land leasing practices such as sharecropping and rental contracts in order to facilitate more efficient land distribution and reduce farmer's fears surrounding the loss of land. Pastoralist and peasants were guaranteed the rights to access land, and to transfer, remove or claim compensation for any improvements they made on land. In addition, the ban on land market activity was lifted, giving incentives for the development of a land rental market. These changes have brought some greater security in land use rights which mainly manifested in the form of land transfers across family members (De Brauw and Mueller, 2012). However, even despite the new constitution, there are persistent fears that land redistribution is never far off the agenda. For instance, between 1997 and 1999, the region of Amhara experienced a sudden reform in which land was taken from tenants and redistributed to former soldiers

and other political constituencies (Dercon, 2004). In a survey of the region, 73 percent of villages in Amhara experienced, on average, three land redistributions since 1991 (Benin and Pender, 2009).

3.2 The Land Certification Program

Since 1998, the Ethiopian government has been embarking on a wide-scale land certification program that to date, has provided the largest number of non-freehold land rights per time unit in Sub-Saharan Africa. The program has rolled-out over 5 million certificates across the four most populated regions of Ethiopia: Tigray in 1998 and 1999, Amhara in 2003, and Oromia and the Southern Nations, Nationalities and People's Region (SNNPR) in 2004 (Deininger et al., 2008; Bezabih et al., 2011). The rollout of certificates has been particularly smooth, with most households covered within 2-3 years of initiation.

The focus of our analysis is the Amhara state, which is the second largest region in Ethiopia, located in the Northwest of the country (see Figure 1 in the Appendix for a map of the Amhara region). The most devolved level of government – village and sub-village (kebele and sub-kebele) – handled the actual process of implementing certificates. Kebele and sub-kebele land administration committees were elected by the local community and trained as land registrars. Elected committees then demarcated and measured parcel boundaries alongside farmers and other claimants to land. The technology was very simple and fees were generally very low. The process was also highly participatory with most of the input for adjudication and the demarcation of land provided by the local community, including women. After the local consultations, plot maps and ownership records were submitted for public approval, after which, final approval resulted in the issuance of certificates simultaneously to all land holders in each village. The major advantage of the program is the decentralised implementation process at the village level and the lack of political interference in the decision-making.

To the extent that these certificates can affect household confidence in their tenure security, such periods of change represent policy-induced sources of variation within the sample. From a theoretical perspective, it seems intuitive that the relationship between land rights and migration cannot be signed a priori: increasing land security may dissuade

households from sending a migrant as it lowers the risk of expropriation on farm profits; contrastingly, greater security may lower the need to continue cultivation as a signal that land is being used to an appropriate standard, thus lowering the costs of sending a migrant. Ultimately, the question of whether and how land security impacts migration is an empirical one, and these variations in formal tenure across the sample will help to identify this relationship.

4 Data

To study the impacts of land tenure on the migration decisions of rural households, this paper makes use of information from the Sustainable Land Management Survey (SLMS) – a farm-household panel dataset conducted in the years of 2005 and 2007 by the Department of Economics at Addis Ababa University, in collaboration with the Ethiopian Development Research Institute, the University of Gothenburg, and the World Bank. The survey was conducted in the Amhara National Regional State of Ethiopia, covering roughly 1,500 households that were selected by random stratified sampling based on indicators such as population density, access to the market and agricultural potential. These households are dispersed across 12 villages in seven different districts (woredas): six villages are from the East Gojjam zone and six from the South Wello zone.

These villages reflect much of the diversity in living and agro-ecological conditions within the country. As a result, the data has been used for a variety of studies on aspects of the rural Ethiopian economy such as conflict over land (Di Falco et al., 2017), intrahousehold welfare and resource allocation (Fafchamps et al., 2009), and women's participation in the labour market (Bezabih et al., 2015).

The SLMS also presents itself as an ideal basis for the purposes of this study for the following reasons: first, the surveys include detailed modules on household demographics, consumption, agricultural practices, assets, and migration behavior – all of which are essential to answer the research questions of this paper. Secondly, the survey has a remarkably low level of household attrition rates at less than 1 percent per year, limiting the chances of biased results from sample selection due to attrition. The fact that households cannot obtain land when moving to different areas is an obvious explanation for low attri-

tion rates, and also enables the study to isolate land rights as a push factor for migration rather than a draw to different areas. Whilst there were actually four waves of this survey, conducted in 2000, 2002, 2005 and 2007, only the last two waves have sufficient comparable information on migration and tenure security with which to carry out the study of interest.

4.1 Measures of Migration

For the purposes of this paper, I focus on migration in the form of sending at least one member outside of the household, rather than entire households moving location. In this sense, it can be thought of as an extensive margin effect. In the survey rosters, each household reported on present members as well as absent members. We use this information to elicit whether the household has a migrant member.

It should be noted that migration is conceptually challenging to measure, as people have different reasons for moving out of households. Generally, migration is defined in terms of distance or length of time in which individuals are separated from the rest of the household. This is particularly relevant in case of rural African societies where individuals may often move within villages and continue to work in similar types of employment, such as sharecropping on neighboring farms (De Brauw and Mueller, 2012). The objectives of this paper are to consider migration as a means to seek gainful employment or to diversify risk associated with volatile agricultural incomes, and since individuals in the survey reported migrating for a wide variety of reasons (e.g. due to sickness, conscription into the army, to look after relatives), we construct the main outcome variable to indicate if household members have left for work purposed, but we also include a more broad measure of migration for robustness purposes.

4.2 Reasons and Destinations for Migration

Table 1 presents the different reasons why individuals chose to leave households in the 2005 and 2007 rounds. As can be seen, leaving for marriage and other family-related reasons such as moving to be with a parent, or to be with relatives, represent the predominant reasons for migration. Across the sample cases, migrating for work-related purposes happens on average, around 18 percent of the time, and migrating for a better education happens in

about 5 percent of all cases:

Table 1: Reasons for Migrating

	2004	**2007**
To be with family	98	143
To be near school/for better education	120	97
Family to sick to care for/nobody to look after	7	11
Sent to relatives/friends	70	125
To live with spouse/marriage	406	546
Divorced/Out of family	93	95
Returned home	55	176
To look for work	135	229
To take up a job	85	113
To run own enterprise	61	71
To finalise work contract	45	81
Shortage of farmland	4	4
Migrated, intentions unknown	9	2
Other	34	30
Total	1,222	1,723

Although we have sufficient data on why people move in the SLMS, no specific measure was taken to elicit where household members move to. To motivate the idea of the destinations chosen for rural migrants, we make use of a similar survey conducted between 1994 and 2009, called the Ethiopian Rural Household Survey (ERHS). This was likewise collected by the economics department of Addis Ababa University and covers around 1,470 households across 15 Ethiopian villages. Table 2 presents the distribution of migrant destinations for the 1997, 1999, 2004 and 2009 rounds, which demonstrate that the vast majority of migration from these rural areas happens within the surrounding rural areas – largely, giving testament to the country's remarkably low urbanization levels, and perhaps suggesting that migration may be less effective as a risk-diversifying strategy if the majority of rural migrants remain within the same peasant association.

Table 2: Destinations for Migration

	Round 1	Round 2	Round 3	Round 4
This village or peasant association	428	445	795	703
Rural area, this Woreda	209	221	267	164
Rural area, this zone	83	93	123	114
Other rural area	131	120	146	106
Urban area, this Woreda	40	63	102	125
Addis Ababa	67	86	135	117
Other Urban area	99	115	197	179
Other	16	47	71	77
Total	1,073	1,190	1,836	1,585

4.3 Land Certification

Our treatment variable occurs at the village level depending on whether or not a respondent was living in a village where certificates were made available before 2007. For villages covered by the SLMS, the provision of the certificates to the farmers began in May 2005 and by 2007, four villages had received land titles (the "certified" group) whilst eight villages remained "uncertified". The four "certified" villages are found in three districts (Machakel, Tenta and Debre Elias) and the eight uncertified villages are part of four other districts (Gozmin, Enemay, Tehuldere and Harbu/Kalu). Because the first round of the survey covered the period before the certification started (beginning of 2005) and all households in certified villages had received formal titles before the implementation of the second survey round in 2007, the nature of the program and surveying allow for a simple difference-in-difference methodology to identify causal effects. Our final sample includes 1,487 farm-households (1,027 with land tenure and 460 without land tenure) for a total of 2,974 observations across the two periods. It is worth emphasising that whilst our treatment occurs at the village level, the relevant variation for identification will occur at the household level based on household migration decisions and other covariates used in the regression analyses.

4.4 Identification Approach

Although our target areas for the program intervention are not randomly selected, these data have the advantage that all sample members live in areas that were eventually treated with certificates, increasing confidence in the comparability of treated and untreated households. Furthermore, the universal nature of the treatment and the participation rules of the program generally rule out concern over individual selection bias may arise. Since, implementation progressed differentially over space, the main threat is timing bias, wherein villages that were selected for early program participation are different from the rest .

The effect of non-random intervention timing can be resolved with village fixed effects in our regressions. It is also possible to do an informal check on random assignment by comparing early and late neighbourhood characteristics before and after the program. In Tables 3 and 4, we present descriptive statistics of the variables used in this study for certified and non-certified units at the village and household level respectively.

Table 3 shows that certified and non-certified villages are not statistically different in many characteristics at the baseline in year 2005 before the land certification was implemented; whilst Table 4 shows that at the baseline, households that eventually received certificates by 2007 are (i) more literate, (ii) have more livestock, (iii) are more likely to use improved seed, (iv) are less likely to use soil conservation measures, (v) have less access to credit, (vi) are less likely to have a corrugated roof and (vii) are closer to the main town and road on average than households that weren't to receive certification .

In the main analyses, we account for the heterogeneity of these observable characteristics as well as their interaction with time effects. We note that the key variables of interest – the indicator for a household having a work migrant, and the number of work migrants – are not statistically different between certified and non-certified households at either the village or household level. However, by 2007 – after program implementation – the proportion of households with work migrants and the number of work migrants is significantly higher in the certified group at the household level.

Table 3: Descriptive Statistics at the Village Level

	Full Sample	Certified	Non-Certified	t_Δ
Panel A: Year 2005				
Migrated for work	0.17	0.17	0.17	
No. work migrants	0.21	0.19	0.22	
Male Head	0.82	0.824	0.811	
Age Head	50.315	50.62	49.705	
Literacy Head	0.475	0.446	0.534	*
HH size	6.36	6.329	6.42	
Farm size (ha)	1.821	1.766	1.932	
Total livestock (TLU)	4.258	3.87	5.035	*
Access to credit	0.182	0.2	0.148	
Panel B: Year 2007				
Migrated for work	0.22	0.24	0.21	
No. work migrants	0.31	0.34	0.29	
Male Head	0.817	0.823	0.804	
Age Head	51.519	51.997	50.562	
Literacy Head	0.432	0.391	0.513	
HH size	6.667	6.604	6.793	***
Farm size (ha)	2.082	1.901	2.443	
Total livestock (TLU)	4.462	4.053	5.28	
Access to credit	0.24	0.225	0.269	
Observations	12	8	4	

Notes: Means of the variables used in this study and reported results of t-tests of differences in means.

Table 4: Descriptive Statistics at the Farm-Household Level

	Certified		Not-Certified		t_Δ
	Obs.	Mean	Obs.	Mean	
Panel A: Year 2005					
Migrated for work	460	0.17	1,027	0.17	
No. work migrants	460	0.19	1,027	0.22	
Male Head	459	0.81	1,027	0.82	
Age Head	458	49.7	1,027	50.9	
Literacy Head	440	0.53	1,001	0.45	***
HH size	430	6.43	997	6.32	
Farm size (ha)	430	1.95	997	1.76	
Total livestock (TLU)	430	5.05	997	3.83	***
Access to credit	459	0.15	1,027	0.19	**
Panel B: Year 2007					
Migrated for work	460	0.24	1,027	0.22	*
No. work migrants	460	0.34	1,027	0.29	*
Male Head	459	0.8	1,027	0.82	**
Age Head	458	50.6	1,027	52.2	**
Literacy Head	440	0.51	1,001	0.4	***
HH size	441	6.81	997	6.58	
Farm size (ha)	441	2.46	997	1.88	***
Total livestock (TLU)	441	5.3	997	4	***
Access to credit	460	0.27	1,027	0.22	***

Notes: Means of the variables used in this study and reported results of t-tests of differences in means.

We note that on average across both rounds, 20 percent of households had one or more members who had left for work purposes. The average number of migrants for all households was under 1 person, at around 0.26 household members, whereas, for the subset of households that had migrant members, on average, 1.32 individuals left the household.

An important concern for difference-in-difference analysis is the issue that treated and non-treated groups do not follow parallel trends in the outcome of interest. In this case, certified and non-certified villages may follow different time trends on migration patterns due to some unobserved heterogeneity such as different risk preferences or attitudes towards different lifestyles. Although in the main empirical analysis, we only use data on migration and land tenure in the last two survey periods (2005 and 2007), there is also available data on migration in the 2002 round, which enables us to provide evidence supporting a common trend between certified and non-certified villages in reported migration before the implementation of the program (i.e. before 2005). Our empirical analysis provides three sets of results supporting the absence of time-trending unobserved heterogeneity correlated with migration decisions.

First, our data show that the correlation between a dummy variable indicating whether a household was certified or not in year 2007 and a dummy variable indicating whether a household has any migrant members at the baseline is statistically not significant (-0.005; s.e. 0.21). This provides first evidence that land certification was not implemented based on the propensity for all household members being present or not. We also conduct a parallel trends falsification test by moving the treatment dummy one period earlier as a placebo which regresses migration outcomes on the certification variable before the program had actually been implemented (i.e. between the 2002 and 2005 rounds). This shows that there are no significant differences pre-treatment between certified and non-certified households.

Second, we will show in section 4 that our main result is invariant to the inclusion of (i) village fixed effects, (ii) household fixed effects, (iii) time-varying household characteristics, (iv) village characteristics interacted with year fixed effects and (v) district-year fixed effects. The first four robustness checks account for the possibility that migration patterns changed over time due to characteristics that were (possibly) correlated with the timing of land certification. The last robustness check aims to control for the possibility that the

program started earlier in certain types of districts that experienced differential changes in migration due to reasons other than land certification (i.e. disputes decrease faster in a district because it has better administrative capacities) . Allowing for the time effects to depend on district fixed effects we further control for district characteristics that might have changed overtime and might have been correlated with the timing of the certification and the likelihood of migration (recall that certified and non-certified villages are in different districts).

Finally, as it is not possible to fully rule out the potential endogeneity of the treatment variables, we will address remaining concerns through an instrumental variables approach that exploits the fact that in some villages, exogenous unseasonal rainfall in October 2006 delayed the main harvest and the timing of the certification program.

5 Empirical Strategy and Results

We will first investigate the effect of land certification on the likelihood of households having a member that has migrated for work purposes and then whether farm-households with secure property rights are more or less likely to take up migration in the face of weather shocks.

The main variable of interest, $Migrate_{ijt}$, is measured in discrete form, which makes clear that the analytical approach will need to allow for discrete choice. Specifically, $Migrate_{ijt}$, is a variable equal to one if any member of household i, in village j, is reported to have left the household for work purposes at time t; one can imagine that households would undertake the effort to send a migrant when the expected return from doing so is greater than some associated cost, such as the cost of risking tenure security:

$$Migrate_{ijt} = \begin{cases} 1 & \text{if } y^*_{ijt} > c \text{ and} \\ 0 & y^*_{ijt} < c \end{cases}$$

A standard approach for discrete outcome models would be to appeal to a theoretical structure which posits that the outcomes are generated by underlying continuously valued latent indices (Heckman, 1977). This type of view calls for non-linear estimation techniques

such as probit or logit models: the main advantage being, that these models take account the bounded nature of the outcome variable, and unlike linear specifications, ensure that the identifying model does not predict values of the dependent variable that fall outside the unit interval.

The main approach for estimation in this paper however, is to use a simple linear probability model. In contrast to non-linear models, this allows for the incorporation of fixed effects as incidental parameters without biasing the other coefficients (Hsiao, 2014). As a sense check, in the case where a fixed effects estimator is not used, it's possible to compare the results from a probit or logit specification with the linear probability model, and these comparisons demonstrate that the coefficients are somewhat similar. The possibility that predicted probabilities fall outside the unit interval does not appear to be an issue either; this tends to be the case when the mean of the dependent variable is close to 0, and since, the proportion of migrants across the survey rounds in the SLMS falls between (0.17–0.22), this is unlikely to be an issue that could bias the results (Horrace and Oaxaca, 2006). In light of this, as well as the advantages of using fixed effects as a means to control for unobserved heterogeneity across the sample, and the main purpose of estimating the partial effect of land rights on the response probabilities of the dependent variable migration, it seems that the compromises associated with a linear specification are worth making (Wooldridge, 2010).

5.1 Land Certification and Migration Decisions

A general specification of the land rights and migration relationship used in this paper can be shown by equation (2). Whilst it is clear that tenure security may be an important determinant of migration, other factors will also play an important role such as heterogeneity between farmers' skill levels, wealth effects, and labor requirements at home – all of which, may inhibit the reallocation of labor resources irrespective of tenure security. One can write a simple linear model that is consistent with controlling for these factors as follows:

$$Migrate_{ijt} = \alpha_i + \beta_1 Certified_{jt} + x_{ijt}\beta + \delta_j + \mu_t + \epsilon_{ijt} \tag{1}$$

where $Migrate_ijt$ is equal to 1 if household i in village j reported that one or more

members had migrated for work purposes in year t (t = 2005,2007). $Certified_{ijt}$ is a dummy variable equal to one if village j was certified by year t; x_{ijt} is a vector of control variables representing factors such as household wealth, demographics and farm characteristics; the variables δ_j and μ_t reflect fixed unobservable village and time characteristics respectively, lastly, ϵ_{ijt} is an idiosyncratic error term.

If one were to estimate this relationship using ordinary least squares (OLS), but neglecting fixed effects as a means to control for unobserved characteristics across households, the coefficient on the variable of interest $Certified_{ijt}$, would almost certainly be biased. In such a case, measured rights would also be proxying for omitted variables such as farmer knowledge and social mobility. Including household fixed effects allows the model to control for unobserved household level characteristics that may be omitted from the model and helps prevent these from biasing the results. The implication is that the regression also controls for a wide variety of fixed characteristics that may affect migratory behavior such as the tendency of respondents to be either over confident or overly pessimistic of their transfer rights, or the potential for ethno-linguistic and socio-cultural barriers to migration (Ali et al., 2011).

It is also likely that a number of further controls are relevant, for instance, the decision to migrate away from household farm work is likely to be influenced by a wide variety of time-varying characteristics in the surrounding environment such as agro-climatic conditions or price movements affecting the profitability of different crops (Dercon, 2004). To account for this, the model will also include a series of time-trending district fixed effects which capture other variables that are not necessarily of interest to this study but still affect migration decisions.

5.2 Econometric Concerns

Using panel data allows the model to identify any effects on migration that stem from changes in rights over time in Ethiopia that wouldn't be possible with cross sectional variation only. However, there are still causality concerns that should be addressed with the models specified above. The first issue is one of potential reverse causality: whilst households may choose to migrate due to reasons related to tenure security, it could be argued

that household members might refrain from migrating in order to strengthen their social rights over land and increase their chances of receiving certification. A second issue is the possibility of anticipation; the fact that farmers may expect to get treated in the future and therefore wait behind until they get certified or spend disproportionate amounts of time safeguarding their property due to extra security needs in this key period of time. The result would be that any measured effect seen could just be a short-run phenomenon that is picking up lack of migration in the control group rather than changes in the treatment, which may subside after the program activity.

These types of simultaneity are possible under the hypothesis that land redistribution is largely contingent on whether occupants are able to demonstrate productive use of their plots.

6 Results

Table 5 presents results of the land rights and migration relationship. Column (1) presents results from the baseline specification including year and village fixed effects. The positive and significant coefficient on the treatment variable *Certified* shows that as households enjoy more secure tenure, the probability of migration increases; specifically, a treated household is around 3 percent more likely to have a migrant member than the control. The average rate of migration during the sample period is 19 percent, indicating that certification increases the likelihood of work migration by 15 percent. This result is not sensitive to different sets of fixed effects; column (3) includes household fixed effects, confirming that time-invariant household characteristics did not influence the program roll-out differently than time-invariant village unobservables. Similarly, column (5) controls for district-year fixed effects, controlling for the possibility that the program was initiated earlier in certain types of districts that experienced differential changes in migration due to reasons other than land certification.

In columns (2), (4) and (6), we add important household level covariates to the fixed effects regressions. Controls include the gender, age, and literacy/education level of the household head; the family size and number of working age males; the area of land cultived (Ha), the number of livestock units (TLU), and farming practices adopted by the

household. The main result is largely invariant to these richer specifications: the effect of land rights is still positive and also becomes stronger in magnitude after controlling for these time-varying characteristics. We do not report the coefficients, however, the regressions demonstrate that the probability of migration is increasing in household size, the presence of working age males and the age of the household head, but unrelated to our measure of farm wealth which is proxied for by livestock value. Our measured effect is strongest in column (4) where the model is specified using household fixed effects, suggesting that some important omitted factors that are negatively correlated with the measure of rights were not captured under a village fixed effects specification .

Table 5: Land Certification and Migration: Baseline Results

	HH has work migrant					
	(1)	(2)	(3)	(4)	(5)	(6)
Certified	0.0286*	0.0353**	0.0295**	0.0460*	0.0446***	0.0275**
	(0.0131)	(0.0123)	(0.0131)	(0.0213)	(0.000369)	(0.0101)
Controls		✓		✓		✓
Year FE	✓	✓	✓	✓	✓	✓
Village FE	✓	✓			✓	✓
Household FE			✓	✓		
District x time FE					✓	✓
Sample Mean	0.197	0.194	0.197	0.194	0.197	0.194
Observations	2973	2604	2973	2604	2973	2604
R^2	0.046	0.144	0.017	0.020	0.046	0.144

Notes: Controls: age of Household head; female head dummy; working age males; literacy head; HH size; land size (Ha); Livestock units (TLU) uses improved seed; uses conservatuon methods; has access to credit. Standard errors clustered at the village level are presented in parentheses with asterisks indicating *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

The validity of these results depends on the assumption that common trends of the outcome variable hold across the treatment and control group prior to certification taking place. We therefore test for the presence of non-parallel trends by estimating a version of the regressions in Table 5 for the period before program implementation actually took place. This 'placebo' test basically compares treatment and control groups before treatment was actually realised to see if there are systematic differences between the groups. The results are presented in Table A1 of the appendix and they show that there were no signficant differences between treatment and control group prior to program roll-out, suggesting that our estimates are not driven by differences in early and late program areas before implementation took place.

Another concern is the issue of omitted variables from the regression. In particular, household income and resources is likely to be an important determinant of migration decisions and but will also be itself influenced by migration. How best to measure income from rural household surveys is also an issue of contention; self-reported numbers are often subject to measurement issues due to factors such as recall bias and challenges for converting diverse types of income receipts into standardised units. Contrastingly, focusing on household assets or production values may only capture one stream of income and neglect the fact that households may well have multiple income streams. Not knowing how best to capture income sources, we take several different measures of househod income and subject our main specification to these controls separately, with the idea of testing how well our main coefficient of interest behaves in response to including income measures. First, in columns (1) and (2) we control for measures of water balance in the soil, a clear determinant of farm-household production and income. Column (1) shows that the effect of treatment is still strong and positive after controlling for total rainfall over the growing seasons, whilst column (2) likewise shows that treatment has a positive effect on migration when we control for the average Standardised Precipitation Evapotranspiration Index, which reflects the water balance in an area's soil. Column (3) controls for the total production of crops in kilograms by the household over the year, whilst column (4) controls fo total household yields, and column (5) total yield values, derived by multiplying each crop yield by a reference price for the crop in the base year. Finally, in column (6) we control for self-

reported income from on and off-farm work. Across the measures, certification increases the probability of migration by around 3-5 percent for the treated group above control.

Table 6: Land Certification and Migration: Checking for OVB with income measures

	HH has work migrant					
	(1)	(2)	(3)	(4)	(5)	(6)
Certified	0.0470**	0.0304**	0.0473**	0.0500**	0.0532**	0.0348**
	(0.0174)	(0.0124)	(0.0196)	(0.0189)	(0.0237)	(0.0120)
Rainfall	✓					
SPEI		✓				
Farm Output			✓			
Yield (Kg/ha)				✓		
Yield Value					✓	
On + off farm income						✓
Year FE	✓	✓	✓	✓	✓	✓
Village FE	✓	✓	✓	✓	✓	✓
Sample Mean	0.202	0.202	0.187	0.186	0.187	0.194
Observations	2394	2394	2435	2395	2398	2604
R^2	0.150	0.148	0.147	0.146	0.144	0.144

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Robust standard errors are presented in parentheses with asterisks indicating *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Whilst Table 6 indicates a strong and positive relationship between land rights and migration. We also consider the consistency and robustness of the model under alternative definitions of migration as detailed earlier. Table 7 presents the results under these different definitions; first, by considering the number of work migrants leaving households in columns (1) and (2), before relaxing the definition of migration to include all members who left the household in columns (3) and (4) and the number of members who did so in columns (5) and (6). Columns (1), (3) and (5) present results of parsimonious specifications, whilst all other columns include village fixed effects and time trending district effects. The results are fairly robust: in all cases, there is a positive correlation between the measure of land rights and the dependent variable for migration. The measure of Rights, has a much stronger effect on general migration, which implies the effect of certification is not restricted to out-migration from agriculture in search of other employment opportunities.

Table 7: Land Certification and Migration: Results for Different Defintions of Migration

	No. Work Migrants		Has Migrant		No. Migrants	
	(1)	(2)	(3)	(4)	(5)	(6)
Certified	0.0751**	0.0297	0.0441*	0.0717***	0.194***	0.122***
	(0.0289)	(0.0250)	(0.0205)	(0.0139)	(0.0601)	(0.0345)
Controls		✓		✓		✓
Year FE	✓	✓	✓	✓	✓	✓
Village FE	✓	✓	✓	✓	✓	✓
Household FE						
District x time FE		✓		✓		✓
Sample Mean	0.259	0.260	0.346	0.340	0.542	0.533
Observations	2973	2604	2973	2604	2973	2604
R^2	0.045	0.146	0.041	0.136	0.046	0.169

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Robust standard errors are presented in parentheses with asterisks indicating *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

As a final robustness check, we account for different error clustering methods. Given the small number of clusters in the sample (n $<$ 13), the standards errors may well be biased downwards, we therefore re-estimate our main specifications using finite sample corrections. The results are presented in Table A2 of the appendix; column (1) estimates equation (1) applying the finite sample correction in Cameron et al. (2011), colun (2) estimates two-way cluster-robust standard errors to account for within-panel autocorrelation (clustering on farm-households) and cross-panel correlation (clustering on time), and column (3) adjusts standard errors to account for potential spatial autocorrelation within one kilometer (Hsiang, 2010). The results in Table A2 shows that the positive effect of land certification on migration decisions stays significant for all the specifications. In summary, our analysis firmly points to land certification increasing the probability that a household sends a work migrant.

To summarise, the initial results presented in this section are immediately revealing. The consistently positive coefficient on the certification treatment variable across a wide variety of specifications and definitions for migration suggest that as certification is implemented, households are more inclined to send migrants in search of work. The results are similar to other studies such as De Janvry et al. (2015) who find that the probability of Mexican households having a migrant increases by 0.015 after being reached by a land certification program. However, as far as the author is aware, this is one of the first papers to document a positive relationship between land rights and migration in the African context, and certainly in Ethiopia.

6.1 Alternative explanations

Our regressions show that land certification increases migration and the arguments developed in the paper imply that this measured effect is a result of lowering the need for occupants to demonstrate productive use of their land. However, the outcome could also be consistent with other traditional mechanisms in the previous literature on land rights; namely, the credit and investment channels. Land certification could have relaxed liquidity constraints by allowing poor households to sell, rent or mortgage their land in order to accrue the funds necessary to finance migration. Likewise, tenure security might encourage

increased land investment which is profit-generating and supports migration. Neither of these channels invalidates the clear link between certification and migration, but they each offer alternative explanations of our results, leading to different policy responses when the critical factor holding people in agriculture is not the requirement to use land in order to maintain ownership.

One way to distinguish between these competing explanations is to include interaction terms to our regressions controlling for household credit and investment. This investigates whether certification induced more migration amongst households where liquidity constraints and low investment were more prominent. Hence, if either of these explain our results, then we would observe smaller effects of certification amongst households with access to credit and investments on their farms. We test these hypotheses by estimating the following regression:

$$Migrate_{ijt} = \alpha_i + \beta_1 Certified_{jt} + \beta_2 Certified_{jt} \times Z_{ijt} + \delta_j + \mu_t + \epsilon_{ijt} \quad (2)$$

Where Z_{ijt} is an indicator for whether the household is accessing credit or investing in certain technologies on their farm. An estimate of $\beta_2 < 0$ would be evidence that one of these alternative variables is the mechanism linking land rights to migration.

Table 8: Alternative mechanisms linking land rights and migration

	(1)	(2)	(3)	(4)
Certified	0.0266	0.0402**	0.0402	0.0245*
	(0.0252)	(0.0139)	(0.0303)	(0.0122)
Land rights X HH has access to credit	0.00532			
	(0.0593)			
Land rights X HH uses improved seeds		-0.0152		
		(0.0231)		
Land rights X HH uses soil conservation			-0.0158	
			(0.0430)	
Land rights X HH uses irrigation				0.00706
				(0.0710)
Constant	0.275***	0.275***	0.275***	0.277***
	(0.00508)	(0.00435)	(0.00505)	(0.00520)
Year FE	✓	✓	✓	✓
Village FE	✓	✓	✓	✓
Sample Mean	0.197	0.194	0.197	0.198
Observations	2971	2805	2971	2955
R^2	0.046	0.046	0.046	0.047

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Robust standard errors are presented in parentheses with asterisks indicating *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

6.2 Heterogenous treatment effects

We also estimated heterogenous treatment effects along three dimensions. The estimation results are presented in the appendix, but we discuss the results briefly here. First, we wanted to determine if the migration result was stronger in villages that had greater levels of tenure insecurity prior to the program. As a measure of between village security, we used a question from the survey indicating the presence of land disputes with neighbors. We indeed find that the migration effect of certification is more for households in villages where land disputes were prevalent.

Second, we explored heteoregeneity with respect to the length of ownership and the modes of acquisition for household plots. We posit that households that have owned their land for longer periods of time have stronger informal rights over their land in the social and political context of their communities. Likewise, it may be that inherited land – wherein it's ownership can be traced through a longer family lineage – is less susceptible to expropriation. Again, we suspect that the measured effect of certification on migration should be subdued for households that have stronger informal rights over their land prior to program implementation. Finally, we explored the possibility of heterogeneous treatment effects based on the age and gender of the household head, but we found no significant differences across these demographics and therefore, do not report the results.

6.3 Instrumental Variables Results

Although the estimates in Tables (5)-(7) suggest a robust positive relationship between certification and migration, we cannot rule out the possibility of endogeneity bias due to non-random sampling. We will now address this concern using a two stage least squares approach that exploits differences in the timing of certification due to a delay of harvests in some villages because of exogenous unseasonal rainfall in October 2006.

The two major seasons in the Ethiopian crop calendar are the Belg and the Meher which receive rainfall from March to May and from June to September, respectively. The meher season generally ends around mid-September in the Amhara region and the harvesting of crops usually starts at the beginning of October. Reports by the Food and Agricultural Organisation of the United Nations and World Food Programme (FAO/WFP, 2007) mention

that unseasonal rainfall in October can encourage late, opportunistic planting of short-cycle pulse crops in this region (such as chickpeas and grass peas). This opportunistic planting typically delays the meher harvest. The important implication being that the land certification program was always implemented after the end of the meher harvest in each village, in order to avoid disrupting the main activities of the farm-households. This allows us to exploit the fact that exogenous unseasonal rainfall in October 2006 would have delayed the certification program in some villages by delaying the meher harvest, through which we can attempt to identify the causal effect of land certification on migration responses. A first look at the data confirms that there exists indeed a strong correlation (0.36) between the SPEI index in year 2006 and the likelihood to be tenured in year 2007: more moisture than usual in October 2006 correlates with a lower probability of being tenured in year 2007.

Our identification strategy ultimately relies on the assumption that conditional on the included controls migration decisions will not vary differentially across villages depending on unseasonal moisture in October of the previous year, other than because of differences in tenure certification. We bring direct evidence in favor of our identification strategy by implementing a falsification test: unseasonal water balance in year 2004 should not have an effect on migration in the year 2005 because certificates had not been rolled-out by this point. The results in Table A6 of the appendix indeed show that the SPEI index in October 2004 is not statistically linked to the likelihood of migration in the household in the year 2005. However, delayed harvests in the three years preceding the actual delivery of a land certificate (in 2007 for the tenured villages) may have impacted the whole certification process, for example, by creating delays in the formation of Land Administration and Use Committees and in organizing information meetings. These will be used as our identifying instruments which can be written as the following equation.

$$Certified_{ijt} = \delta_i + \beta_1 OctRain06_j + \beta_2 OctRain05_j + \beta_3 OctRain04_j + \theta_{ijt} \tag{3}$$

Table 9 reports results of the first-stage relationship. As before, land rights are measured by whether or not a household has received a formal tenure certificate by 2007. In the first-stage, land certification is a function of the SPEI index in October of 2004, 2005, and 2006,

as well as the usual household covariates in previous regressions. We report the results for the full sample as well as the samples of migrants and non-migrants. For each set, we estimate a first-stage using all instruments and just the weather in October of 2006. Since including instruments that are only weakly correlated with the endogenous variable can lead to non-normal sampling distributions and unreliable inferences under IV methods, it is useful to limit the instrument sets to examine the relative behavior of each instrument (Nichols, 2006).

Table 9: IV First Stage

	Full Sample		Migrants		Non-Migrants	
	(1)	(2)	(3)	(4)	(5)	(6)
oct2004	-0.125***	-0.281***	-0.125***	-0.268***	-0.123***	-0.287***
	(0.0107)	(0.0168)	(0.0190)	(0.0298)	(0.0129)	(0.0203)
oct2003		0.302***		0.274***		0.317***
		(0.0220)		(0.0400)		(0.0262)
oct2002		0.0806***		0.0741***		0.0823***
		(0.0138)		(0.0236)		(0.0171)
Constant	0.361***	0.198***	0.516***	0.323**	0.311***	0.164*
	(0.0787)	(0.0732)	(0.134)	(0.130)	(0.101)	(0.0912)
Observations	1161	1161	448	448	713	713
R^2	0.177	0.315	0.186	0.285	0.178	0.342
Includes HH controls	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Robust standard errors are presented in parentheses with asterisks indicating *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

The estimates clearly confirm that more moisture in October leads to a lower probability of having a tenure certificate. Also reported are a variety of diagnostic tests: specifically, the Sanderson-Windmeijer test of overall identification, which is a distributed test under the null hypothesis of an underidentified regression. The Sargan overidentification test examines the validity of the instruments by examining the sample analog of the moment conditions in the estimation process (Verbeek, 2008), and is distributed under the null hypothesis that the instruments are not correlated with the residuals in the first-difference regressions. Lastly, the Cragg-Donald weak instrument test examines the relationship between the instruments and the endogenous regressor and follows an F distribution in the case with one endogenous regressor.

Column (1) in Table (7) reports the first TSLS result which doesn't control for varying characteristics at the household level. The Sanderson-Windmeijer statistic suggests that the null hypothesis of underidentification can be rejected, whilst the Sargan test would be rejected at the 10 percent significance level, suggesting that there is some minor evidence to question the exogeneity of the instruments. The Cragg-Donald test comfortably passes the Stock and Yogo benchmark critical value of 10, suggesting that there are no issues of a weak instrument problem.

Table 10 then presents the IV estimates of land certification on the four different measures of migration previously presented. The magnitude of the results are somewhat similar to the baseline results presented in Tables 5 and 6; however, we only find a significant effect for land certification on the more general definition of migration. In this version, the probability of a household sending a migrant increases by 9.7 percentage points after certification as compared to the 7.6 percentage points estimate of our baseline results.

Table 10: IV Second Stage

	HH has migrant	HH has work migrant	No. Migrants	No. work migrants
	(1)	(2)	(3)	(4)
Land rights	0.0971*	0.0244	0.219*	0.0228
	(0.0580)	(0.0501)	(0.118)	(0.0798)
Constant	-0.195**	-0.233***	-0.524***	-0.390***
	(0.0860)	(0.0742)	(0.175)	(0.118)
Observations	1161	1161	1161	1161
R^2	0.131	0.135	0.182	0.145
Includes HH controls	Yes	Yes	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Robust standard errors are presented in parentheses with asterisks indicating *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

In sum, we have exploited differences in the timing of land certification across villages due to a delay in harvests triggered by unseasonal moisture in October of the previous year to identify the causal effect of land certification on migration. The IV estimates confirm the baseline results that land certification increases migration.

7 Land Certification, Water Scarcity and Migration Responses

We now turn to investigate the relationship between weather anomalies and farm-household migration decisions. The objective is to study whether (i) shocks to weather increase or decrease the likelihood of out-migration from agriculture, and (ii) whether having formal land tenure accentuates or diminishes the impact of weather shocks on migration. Hence, we exploit the exogenous nature of weather shocks for identification – comparing the same households over time subject to different water availability. We estimate the following equation:

$$M_{ijt} = \alpha_i + \beta_1 C_{jt} + \beta_2 W_{ijt} + \beta 3 C_{jt} \times W_{ijt} + \delta_j + \mu_t + \epsilon_{ijt} \tag{4}$$

where M is the usual migration outcome variable, C reflects whether the household received formal tenure, and W measures the water availability at the farm-household location. We do regressions of equation (4) using a variety of measures for weather; in particualr, we have monthly data for each village on prevailing temperatures, rainfall totals and water balance as measured by the SPEI. Our preferred measure is to use the SPEI as this considers the combiend effects of rainfall, temperature and potential evapotranspiration in the area – thus capturing the full impact on farming. The index varies between -2 and 2, with values below zero reflecting less water available than would be evaporated from the soil at prevailing temperatures. Whilst we have studied the effect of these variables in raw form on equation (4), our preferred method is to follow the recent literature on water scaricty and define anomalous weather events (see for example Harari and La Ferrara (2014)). Our benchamark indicator of weather shocks is defined as the fraction of months during the two main rainy seasons during which the SPEI index was either below or above it's mean by one standard deviation. Figure 4 of the appendix illustrates where

these cutoffs are imposed on the SPEI data. By focusing on periods of both abnormally low and abnormally high water balance, we are characterising our weather shocks simply as anomalous events.

Table 11 presents results for the impact of weather shocks on migration outcomes. We control for contemporaneous shocks, consecutive years of water balance and also temporal lags of the index in the growing seasons. Table 11 confirms a strong and significant effect of the SPEI shock index on migration decisions showing that weather anomalies greatly decrease the likelihood of migration; possibly because households can't generate enough resources to fund migration or if bad weather increases the practical challenge of migrating or lowers potential opportunities. Interestingly, from columns (2)-(5) we also see that households that have tenure certifcates are much less likely to reduce the take-up of migration following a weather shock. Hence, tenure security seems to dampen the effect that weather shocks have on household members choosing not to migrate.

Table 11: Weather Shocks and Migration

	HH has work migrant				
	Year (t)	**Year (t, t-1)**	**Year (t, t-1, t-2)**	**Growing (t-1)**	**Growing (t-2)**
	(1)	(2)	(3)	(4)	(5)
SPEI shock	-0.251**	-0.301***	-0.408***	-0.0484	-0.165**
	(0.0894)	(0.0824)	(0.0620)	(0.0441)	(0.0545)
SPEI shock X Certified	-0.0283	0.186*	0.273***	0.187**	0.173**
	(0.0679)	(0.0841)	(0.0772)	(0.0692)	(0.0708)
Year FE	✓	✓	✓	✓	✓
Village FE	✓	✓	✓	✓	✓
Sample Mean	0.205	0.205	0.205	0.205	0.205
Observations	2733	2733	2733	2733	2733
R^2	0.045	0.044	0.044	0.044	0.045

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Robust standard errors are presented in parentheses with asterisks indicating *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

8 Conclusion

Improving agricultural land rights has been the focus of a number of recent titling initiatives carried out in the developing world. Previous theory has suggested that such programs can enhance agricultural productivity and economic growth through expanded access to credit markets and improved investment incentives (Besley, 1995). This paper contributes to the previous literature by identifying another channel through which property rights can enhance economic welfare: in cases where rights are tied to productive use of land, improving tenure security can enable outmigration from agricultural communities. I provide evidence on these occurrences using household level panel data from the Sustainable Land Management Survey over the period 2005-2007. The period followed a legacy of unpredictable land policy in the preceding decades in a context where household perceptions of tenure security is likely to have varied considerably.

Variations in the timing of land certification allow for a causal link between property rights and migration to be made. We first show that formally defined property rights increase the likelihood of households having a work migrant by around 3 percent – a result that is robust to a variety of fixed effects specifications. Then we demonstrate that alternative mechanisms that are likely to influence migration such as credit access and investment incentives, do not appear to play a strong role. Finally, we take a two-stage least squares approach in which unseasonal rainfall in the late harvesting period is used as an identifying instrument. Our preferred results suggest that switching from an informal system of use-based property rights to a formal certificate-based system increases the propensity of work-related migration by around 15 percent.

The results of this study suggest that improvements in land rights can be a pathway through which the poor are able to diversify income sources and enhance productivity levels by reallocating labor outside of the agricultural sector. The key role of agriculture in explaining income differences across countries suggests that enhancing land rights could have large effects on growth through its impact on agricultural productivity (Caselli (2005); Restuccia et al. (2008); De Janvry et al. (2015)). The results presented here demonstrate that addressing the deficiencies in rural property rights and providing institutional arrangements for long-term credibility in the land tenure system is one way to improve efficiency,

stability and growth in one of the world's poorest countries.

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9 Appendix A

Table A1: Parallel Trends Falsification Test

	HH has work migrant		
	(1)	(2)	(3)
Certified	0.0458	0.0530	-0.00941
	(0.0493)	(0.0530)	(0.0241)
Constant	0.0507*	0.0840***	-44.30***
	(0.0232)	(0.00954)	(9.117)
Year FE	Yes	Yes	Yes
Village FE	Yes	No	Yes
Household FE	No	Yes	No
District x time FE	No	No	Yes
Observations	3009	3009	3009
R^2	0.045	0.049	0.057

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Robust standard errors are presented in parentheses with asterisks indicating *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table A2: Different Clustering Methods

	HH has work migrant	
	(1)	(2)
Certified	0.0286**	0.0286***
	(0.0131)	(0.00982)
Constant	0.275***	0.275***
	(0.00506)	(0.00462)
Year FE	✓	✓
Village FE	✓	✓
Clustering	Kebele (Small sample)	Kebele-Year
Sample Mean	0.197	0.197
Observations	2973	2973
R^2	0.046	0.046

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Robust standard errors are presented in parentheses with asterisks indicating *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table A3: Heterogenous effects based on how and when land was acquired

	(1)	(2)	(3)	(4)
Certified	0.0555	-0.0309***	0.00455	-0.000773
	(0.0418)	(0.00922)	(0.0502)	(0.00109)
Land rights X Over 50 percent of land allocated	-0.0802			
	(0.0619)			
Land rights X Over 50 percent of land inherited		0.118***		
		(0.0339)		
Land rights X Over 50 percent of land acquired before 1990			-0.00344	
			(0.0535)	
Land rights X Over 50 percent of land acquired after 1990				0.119*
				(0.0622)
Constant	0.186***	0.186***	0.186***	0.186***
	(0.00419)	(0.00419)	(0.00419)	(0.00419)
Year FE	✓	✓	✓	✓
Village FE	✓	✓	✓	✓
Sample Mean	0.197	0.197	0.197	0.197
Observations	2974	2974	2974	2974
R^2	0.047	0.048	0.045	0.046

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Robust standard errors are presented in parentheses with asterisks indicating *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table A4: Probit and Logit Specifications

	HH has work migrant	
	(1)	(2)
Certified	0.0296**	0.0283*
	(0.0144)	(0.0159)
Year FE	✓	✓
Village FE	✓	✓
Sample Mean	0.0774	0.0774
Observations	2973	2973

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Robust standard errors are presented in parentheses with asterisks indicating *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

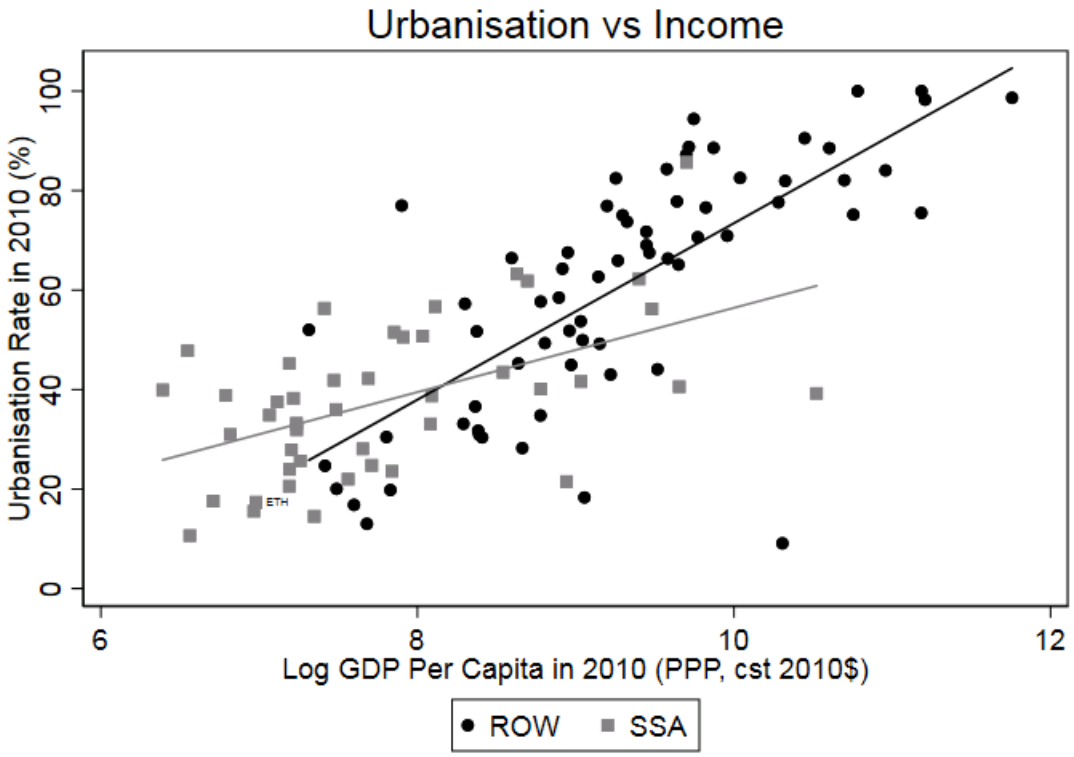
Table A5: Verification for satisfaction of exclusion restrictiond

	(1)	(2)	(3)	(4)
oct2002	-0.000362	0.0263	0.0106	0.0159
	(0.0136)	(0.0242)	(0.0111)	(0.0159)
Constant	-0.0776	-0.345***	-0.146**	-0.248***
	(0.0741)	(0.132)	(0.0607)	(0.0870)
Observations	1233	1233	1233	1233
R^2	0.117	0.131	0.122	0.117
Includes HH controls	Yes	Yes	Yes	Yes

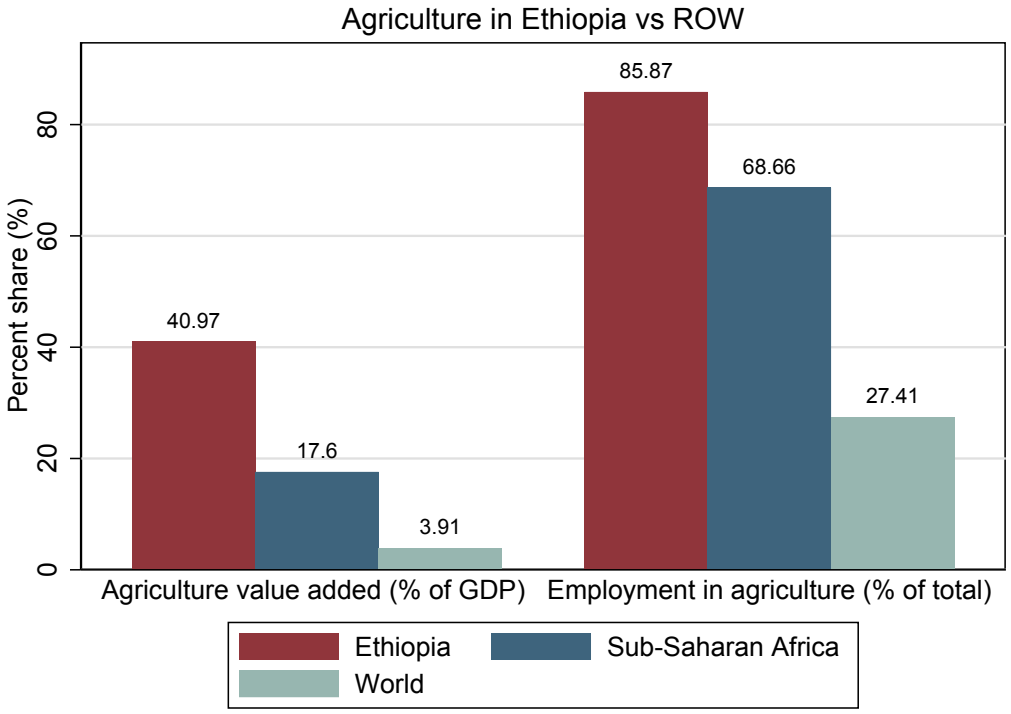
Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Robust standard errors are presented in parentheses with asterisks indicating *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.


Urbanisation vs Income
Urbanisation Rate in 2010 (%)
0
20
40
60
80
100
6
8
10
12
Log GDP Per Capita in 2010 (PPP, cst 2010$)
ETH
ROW
SSA

10 Figures


Agriculture in Ethiopia vs ROW
Percent share (%)
0
20
40
60
80
40.97
17.6
3.91
85.87
68.66
27.41
Agriculture value added (% of GDP)
Employment in agriculture (% of total)
Ethiopia
Sub-Saharan Africa
World


Tigray
Afar
Amhara
Addis Ababa
Dire Dawa
Harari
Gambella
Oromia
Somali
SNNP
N
0 50100 200 300 400
Kilometers
Survey Districts
District Boundary
Regional Boundary
International Boundary