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Land Reform and Rural Transformation: Linking Land Tenure Security to Labour Reallocation, International Migration, and Nutritional Outcomes in Sub-Saharan Africa

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Land Reform and Rural Transformation: Linking Land Tenure Security to Labour Reallocation, International Migration, and Nutritional Outcomes in Sub-Saharan Africa

Solomon Haddis*

Abstract

This study examines whether land-tenure reforms—specifically rural land certification—facilitate labour diversification, international migration and improvements in household nutritional outcomes in rural Ethiopia. Utilising village-level variation in the rollout of the land certification programme and household and district-year fixed effects, the analysis shows that land certification is positively associated with the share of hours spent on non-agricultural activities, primarily unpaid apprenticeships, while being negatively associated with the share of hours spent on agricultural work. Despite this shift, the programme increases the total number of hours allocated to non-agricultural activities, particularly non-farm businesses and unpaid apprenticeships, without reducing time spent on agriculture. Additionally, land certification significantly is associated with a greater likelihood of casual employment and international migration. This suggests that enhanced tenure security mitigates the risks associated with labour mobility and enables households to pursue more diverse livelihood strategies. These economic shifts are accompanied by improvements in household nutrition: a certified households is associated with a young children consuming a greater number of meals per day, as well as significantly greater dietary diversity among men, women and children. These findings emphasise that secure land tenure is associated with structural transformation through labour reallocation and migration, thereby improving household food access and nutrition. This study contributes to existing literature on the non-agricultural and food system impacts of land policy by emphasising the importance of secure land rights in facilitating rural structural transformation and food security in low-income, agrarian settings.

Keywords: Land reform, Land certification, Structural transformation, International migration, Nutritional outcomes

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1. Introduction

Historically, structural transformation—the reallocation of labour from agriculture to higher-productivity non-agricultural sectors—has been central to the development path of advanced economies. Such transitions were usually preceded by an agricultural revolution, driven by technological innovation and institutional reform, which increased land and labour productivity (de Janvry and Sadoulet 2016). One such institutional reform with persistent developmental relevance is strengthening land tenure security. By reducing the risk of expropriation and encouraging long-term investment, secure land rights can enhance agricultural productivity and enable rural households to reallocate labour towards more diverse, higher-return economic activities (Besley 1995; Deininger and Jin 2006; Holden, Deininger, and Ghebru 2009; Fenske 2011; Melesse and Bulte 2015).

In many developing countries, particularly in sub-Saharan Africa (SSA), the process of structural transformation has progressed slowly (Enache, Ghani, and O'Connell 2016). A large share of the labour force is still concentrated in low-productivity agriculture, often constrained by insecure land rights, imperfect factor markets, and rising exposure to climate shocks. With fixed cultivable land and rapidly growing rural populations, farm households face pressure to diversify their livelihoods. Yet without formalised tenure, many are reluctant to diversify their sources of income, leave agriculture, or engage in land rental transactions, fearing potential loss-of-use rights (Besley 1995; Deininger and Jin 2006; Holden, Deininger, and Ghebru 2009; Fenske 2011; de Janvry et al. 2015; Melesse and Bulte 2015). These constraints limit mobility, productivity growth, and economic resilience (Holden, Deininger, and Ghebru 2009; Deininger and Jin 2006; Besley 1995; Lovo 2016). A growing body of research suggests that strengthening land tenure, through formal land registration and certification, can improve agricultural productivity, activate land-rental markets, and support broader rural development (Melesse and Bulte 2015; Gebreegziabher et al. 2020; Navarro-Castañeda et al. 2021). However, beyond productivity, land tenure security may also facilitate household transitions into non-agricultural labour markets and migration, both domestically and internationally.

Recent attention has focused on whether land tenure security can help rural households manage environmental risks, reallocate labour, and improve food security. While secure tenure can incentivise land investment and long-term planning (Deininger et al. 2008; Ghebru and Holden 2015), it may also facilitate migration and non-farm employment by strengthening trust between people and institutions (Teraji 2008; Bezabih, Köhlin, and Mannberg 2011), as well as improve access to credit. However, the effects of tenure security on labour allocation, migration decisions and household nutritional outcomes are context-dependent and remain empirically under-explored in SSA (de Brauw and Mueller 2012; de Janvry et al. 2015; Holden and Ghebru 2016b; Hadera et al. 2024).

Ethiopia provides an ideal setting for evaluating the broader economic implications of land certification. Since the early 2000s, the government has implemented one of Africa's largest land registration and certification programmes, covering millions of smallholder plots and aimed at strengthening tenure security. While previous studies have shown that certification increases tenure security and promotes land-related investment and rental activity (Deininger et al. 2008; Holden, Deininger, and Ghebru 2009;

Melesse and Bulte 2015; Bizoza and Opio-Omoding 2021), little is known about its influence on broader outcomes such as structural transformation, international migration and nutritional outcomes.

From a theoretical perspective, secure land rights can have two effects. On the one hand, they may incentivise households to remain on the land and invest in it, thereby enhancing agricultural outputs. On the other hand, secure tenure can reduce the opportunity cost and risk of leaving farming by enabling land rental or temporary migration while keeping land claims. This encourages labour mobility and income diversification (Ghebru and Holden 2015; Li, Liu, and Huo 2021). Whether the dominant effect leads to labour intensification or reallocation is ultimately an empirical question. Furthermore, secure tenure may influence migration decisions, which are becoming increasingly important in rural transformation. Migration enables households to access urban labour markets, spread income risk and finance investment through remittances. With secure land rights acting as an alternative asset, rural residents may be more willing and able to send migrants. Conversely, secure land rights could reduce migration pressures by improving rural livelihoods. However, the direction and magnitude of this relationship remain ambiguous and context-dependent.

Food security is another important yet under-explored aspect that is likely to be linked with land tenure reform. By enhancing income-generating opportunities and access to productive resources, land certification can increase food consumption (Keovilignavong and Suhardiman 2020; Hadera et al. 2024; Solomon and Kijima 2022), reduce reliance on coping strategies and expand dietary diversity. These effects may be particularly relevant in agrarian economies that are vulnerable to seasonal shortages and climate variability.

This study examines the role of land tenure security in facilitating structural transformation and improving food security in rural Ethiopia through tenure reform. Specifically, the study examines whether land certification: 1) increases the likelihood of non-agricultural employment, including casual wage work; 2) encourages labour reallocation towards agriculture and non-agricultural activities; 3) encourages internal and international migration; and 4) improves nutrition outcomes, as measured by meal frequency, dietary diversity, and reduced reliance on food-based coping strategies.

To this end, this study makes several contributions. Firstly, I examine the relationship between land property rights and key indicators of structural transformation and nutritional outcomes in this paper, exploiting village-level variation in Ethiopia's land certification programme as an identification strategy. Implementation of the programme was based not on economic performance or household characteristics, but on administrative readiness, political coordination and logistical capacity (Deininger et al. 2008; Bezabih, Köhlin, and Mannberg 2011; Muchomba 2017). Following the approval of the land proclamation by the federal and regional governments, the government intended to provide certifications for all villages. However, due to budgetary constraints, a shortage of technical staff at the district level and the restriction of fieldwork to the dry season, implementation occurred unevenly across locations (Deininger and Jin 2006; Congdon Fors, Houngbedji, and Lindskog 2019). Consequently, some villages received certification earlier than others, generating plausible exogenous variation in

exposure to the programme. This institutional context provides a credible basis for identifying the effects of land tenure security on labour allocation, migration, and food security. Throughout the analysis, however, I interpret the results as associations rather than definitive causal claims.

Secondly, although previous studies have extensively examined the impact of land certification on investment, productivity and income, evidence on how these gains translate into improved nutritional outcomes, particularly for vulnerable groups, remains limited (Holden and Ghebru 2016a; Holden 2020; Hadera et al. 2024; Solomon 2024; Keovilignavong and Suhardiman 2020). This paper contributes to the literature by establishing a link between land certification and household-level food security indicators: the average number of meals consumed per day and dietary diversity among adults and children. Furthermore, by disaggregating dietary outcomes by gender and age, the study sheds light on the intra-household nutritional effects of land tenure security.

Thirdly, the study addresses a gap in the existing literature concerning the role of land certification in labour reallocation and international migration within an African context, where structural transformation remains an urgent yet unfinished process. While existing studies from Latin America and Asia have produced mixed results, such as increased migration from Mexico (de Janvry et al. 2015) and Russia (Chernina, Castañeda Dower, and Markevich 2014), the effects have been negligible in China (Li, Zhang, and Mi 2021). However, evidence from SSA remains limited and inconclusive. For instance, Solomon and Kijima (2025) found no significant impact of land certification on seasonal migration. However, among households that had initially expected land redistribution prior to the programme, land certification had a negative effect on non-seasonal migration. In a similar context, another study found that tenure security in Ethiopia could even reduce migration (de Brauw and Mueller 2012). These contrasting results indicate that empirical studies on the impact of land certification in facilitating structural transformation remain limited and inconclusive. Moreover, we measured labour allocation in different ways: the share and total hours spent on agricultural and non-agricultural activities. For non-agricultural activities, we disaggregated these activities into casual employment, wage or salaried employment, non-farm business and unpaid apprenticeships. We also added the share of working-age family members based on their primary engagement in agriculture, industry, and services, as well as a dummy variable for casual employment and internal and international migration indicators of structural transformation.

Fourthly, this study employed nationally representative panel data from the Ethiopian Rural Socio-Economic Survey (ERSS), a rare resource in the existing literature. For instance, a recent study by Adamie (2021) used this dataset to explore the link between land certification and uptake of agricultural extension packages and water management programmes. Fifthly, from a policy perspective, the findings offer valuable insights into the part played by tenure reform in promoting structural transformation, mitigating vulnerability and enhancing household welfare. These issues are particularly significant to countries such as Ethiopia and others in SSA, where portions of the population rely on low-productivity agriculture and are vulnerable to land insecurity and climate risks.

The following sections provide background information on Ethiopia's land certification programme and the conceptual framework of the study, as well as reviewing the relevant literature. This is followed by a description of the data and empirical strategy, a discussion of the main findings and a conclusion with policy implications.

2.Background: Ethiopian Land Certification Programmes

Land tenure systems in Ethiopia have changed significantly over time and have a long and complex history. Prior to the 1974 revolution, land ownership was characterised by a feudal system in which landlords held large areas of land, and tenants or sharecroppers worked under exploitative conditions. This system resulted in significant disparities in land access, triggering demands for reform (Kebede 2002).

In 1975, the socialist Derg regime introduced a radical land reform policy under the proclamation "Land to the Tiller," which eliminated private ownership of rural land. The State assumed ownership of all land and redistributed it to farmers who were willing to cultivate it themselves. Although this policy aimed to address historical injustices, it also had unintended consequences (Holden, Deininger, and Ghebru 2011a). The frequent land redistributions that followed the initial reforms affected tenure security, discouraged long-term investment in agricultural productivity, and hindered private-sector participation in agriculture (Fenske 2011; Deininger, Ali, and Alemu 2011; Holden, Deininger, and Ghebru 2009; Melesse and Bulte 2015). Farmers faced uncertainty over future land reallocations, which made it difficult for them to plan long-term improvements such as soil conservation, irrigation and tree planting (Gebreegziabher et al. 2020; Deininger et al. 2008; Gebremedhin and Swinton 2003).

Following the fall of the Derg regime in 1991, Ethiopia adopted a new constitution in 1995. This constitution maintained state ownership of land, but decentralised land administration to regional governments. This allowed for the formulation of region-specific land policies with varying approaches across regions. Tigray was the first region to endorse a land administration proclamation in 1997, outlining the rights and obligations of landowners (Deininger et al. 2008; Holden, Deininger, and Ghebru 2009). One notable feature of this reform was the introduction of a land registration and certification programme. In an effort to enhance tenure security and promote agricultural investment, Tigray launched a large-scale land registration and certification programme in 1998, followed by other regions (Amhara, Oromia and SNNP) between 2003 and 2005. The programme aimed to formalise land rights, reduce disputes and encourage farmers to invest in land improvements.

The initial implementation of Ethiopia's rural land certification programme has been widely recognised for its cost-effectiveness and administrative simplicity, especially when compared to conventional land-titling approaches in other developing countries (Deininger et al. 2008). The programme adopted a low-cost, rapid and participatory method for documenting land rights, avoiding expensive cadastral surveys and high-tech mapping systems. Instead, land demarcation was carried out using basic tools such as measuring ropes, and the process relied on low-cost local labour, including the temporary mobilisation of students during school holidays, to assist in fieldwork. This approach enabled the government to

register millions of parcels at minimal cost. The simplicity and inclusiveness of the process not only reduced financial barriers but also helped build local trust and legitimacy. As a result, Ethiopia's experience became a widely cited model for scalable, pro-poor land certification in low-income agrarian economies.

3.Conceptual Framework

This study conceptualises land tenure security as the institutional arrangements that strengthen land rights, support sustainable land use, and promote household resilience. These arrangements can facilitate rural transformation in SSA. In many agrarian economies in this region, insecure tenure remains a significant obstacle to economic diversification, migration decisions, and household resilience (Deininger and Feder 2009). By enhancing tenure security, land certification programmes can reduce uncertainty over land access, encourage long-term investment and planning, and facilitate labour mobility and improvements in household food systems—key processes that support structural transformation.

Improved land tenure security influences household behaviour through several interrelated pathways. Firstly, by reducing the risk of expropriation and strengthening the perception of ownership, secure land rights increase the incentive to invest in land and conservation practices in the long term (Deininger et al. 2008; Holden, Deininger, and Ghebru 2011b; Ghebru and Holden 2015; Higgins et al. 2018; Thennakoon et al. 2020). Over time, these productivity gains may enable households to release surplus labour from agriculture. Secondly, secure tenure facilitates engagement in land rental markets, enabling households to rent out their land without losing their claims (Deininger et al. 2008; Ghebru and Holden 2015). This flexibility creates opportunities for labour reallocation toward non-agricultural employment.

Thirdly, secure land rights offer a form of economic security, encouraging households to consider internal or international migration by providing a reliable backup asset. This "security effect" can reduce the perceived risk of migration and improve access to finance for migration-related costs. Lastly, land certification can play a significant role in improving household food security through multiple interrelated pathways. By strengthening land tenure security, certification encourages households to engage in non-agricultural income-generating activities beyond agriculture. This diversification of income sources reduces dependence on a single, climate-sensitive livelihood and improves household purchasing power, thereby enhancing access to food. Furthermore, households with more stable and secure livelihoods are less likely to rely on social coping mechanisms such as borrowing food, skipping meals or reducing food portions during periods of stress.

Therefore, the potential for rapid economic development in developing countries increases with the speed of structural transformation. However, transitioning from agriculture—a low-productivity sector—to high-productivity sectors such as industry and manufacturing is challenging. On the one hand, rural households in developing countries are highly exposed to climate change. The total amount of land available for cultivation is fixed, yet the population is growing rapidly. Land allocation through the rental market may not provide households with sufficient land to achieve an efficient land-to-labour

ratio. Households therefore try to reduce income risk by allocating labour to non-agricultural or off-farm activities. Conversely, with insecure land tenure and limited access to financial markets, it is difficult to engage in non-farm income diversification strategies, which may largely confine households to agricultural activities.

Taken together, the framework hypothesises that land tenure security influences three primary outcomes: structural transformation, migration, and nutritional outcomes. This study empirically tests these relationships using nationally representative panel data from Ethiopia. The focus is on changes in labour allocation, migration behaviour, and the average number of meals and variety of foods consumed as indicators of welfare and rural transformation.

4.Literature Review

Agriculture remains the main economic activity for most of the population in East Africa, with around 80 percent of people depending on it for their livelihoods (Waithaka et al. 2013). However, structural constraints, such as underdeveloped credit, insurance, and land markets, continue to undermine productivity and restrict rural households' ability to transition out of subsistence farming. These market failures limit agricultural productivity and prevent rural households from diversifying their livelihoods or transitioning out of subsistence farming (Hill 2010; Benni, Berno, and Ho 2020). Therefore, addressing these institutional barriers is critical to facilitating rural transformation and inclusive economic growth.

In addition to these structural barriers, insecure land tenure has long been recognised as an additional key constraint on rural development. In response, an increasing number of low-income countries have introduced land certification programmes to formalise land rights, increase tenure security and encourage investment. Supported by multilateral institutions such as the World Bank and various UN agencies, these programmes aim to reduce the risk of expropriation and encourage the more efficient and sustainable use of land resources (Deininger and Feder 2009). In Ethiopia, for example, land certification has been shown to enhance perceived tenure security. This, in turn, is associated with increased investment in land improvements, including soil and water conservation (Deininger et al. 2008; Holden and Ghebru 2016a), as well as greater participation in land rental markets, particularly among households lacking land (Ali, Dercon, and Gautam 2011).

Although there is a substantial body of literature exploring the impact of land tenure security on investment, land-market participation and gender dynamics (Deininger et al. 2008; Bezabih, Holden, and Mannberg 2015; Holden, Deininger, and Ghebru 2011b), few studies have examined its broader labour-market implications, particularly with regard to labour reallocation (de Brauw and Mueller 2012; de Janvry et al. 2015). In theory, stronger tenure security could increase on-farm investment and reduce the incentive to migrate, thereby strengthening household ties to agriculture. Conversely, by reducing uncertainty and enhancing land value, certification could facilitate migration by providing a secure asset base and reducing the opportunity cost of temporarily leaving agriculture (Deininger, Jin, and Nagarajan 2009; Holden and Ghebru 2016a). The direction and magnitude of these effects are likely to depend on

household characteristics, local labour markets and broader economic conditions. However, empirical research on how land certification influences non-agricultural employment and internal and international migration remains limited.

This study is motivated by key gaps in the literature: Firstly, we consider the nutritional outcomes of vulnerable groups as an additional dimension of welfare, an area that is often overlooked in land tenure research. We examine whether secure land rights improve access to food, reduce reliance on coping mechanisms (e.g., borrowing food) and enhance dietary diversity, particularly among children. Secondly, much of the existing research focuses on short-term agricultural and investment outcomes, while the long-term labour reallocations that are central to structural transformation have received little attention. Thirdly, the interaction between land-tenure reforms and wider macroeconomic or policy contexts, such as the proportion of labour in different sectors of the economy, has not been sufficiently explored.

This study seeks to contribute to this emerging area of inquiry by analysing whether land certification that improves land tenure security influences labour allocation between agricultural and non-agricultural activities, as well as the likelihood of internal and international migration. In doing so, it provides new empirical insights into the role of land tenure policy in facilitating structural transformation in rural Ethiopia and contributes to broader policy debates on land governance in settings undergoing economic, demographic and political transition.

5.Data and Descriptive Statistics

5.1 Data

This paper uses unique, nationally representative panel data from the Ethiopian Rural Socio-Economic Survey (ERSS). The ERSS forms part of the World Bank's Living Standards Measurement Study – Integrated Surveys on Agriculture (LSMS-ISA). The survey was conducted in three waves: 2011/12 (3,969 households), 2013/14 (3,776 households) and 2015/16 (3,699 households), covering all regions of Ethiopia. To complement the household survey data and improve understanding of the institutional and operational context of land certification, I visited Ethiopia in March 2025 to examine the programme's implementation across the regional states of Amhara, Oromia, Southern Nations, Nationalities and Peoples (SNNP), and Tigray. However, due to ongoing security concerns, direct field visits were limited to government offices in Addis Ababa and Hawassa. During these visits, key informant interviews were conducted with land administration directors and experts, providing valuable insights into the rollout process, institutional arrangements and practical challenges encountered during implementation. These qualitative observations informed the development of the empirical identification strategy and provided critical context for interpreting the quantitative results, particularly with regard to understanding regional variation in certification practices and their effects.

Three years of panel data were used to examine whether land certification, which increases land tenure security, affects the likelihood of being employed in casual jobs and how hours are allocated between agricultural and non-agricultural activities. To examine the impact of land certification on internal and

international migration, two years of panel data were used due to incomplete information on these types of migration at Wave 1 (in 2011/12).

5.2 Descriptive analysis

This section presents descriptive statistics comparing land-certified (treated) and non-certified (control) households across key variables relating to characteristics, hours worked (both share and total), migration and food security. These comparisons are based on data collected during the three-year survey periods of 2011/12, 2013/14 and 2015/16.

Table 1 shows the mean differences in household characteristics. As shown in the table, households in the treated villages consistently had higher levels of human capital and productive assets than those in the control villages across all three years. Literacy rates among household heads are also consistently higher in the treated group. This significant difference may indicate a stronger capacity to engage in non-agricultural or off-farm opportunities, which are key drivers of structural transformation. Land-related variables also show meaningful differences. Treated households report owning more land per adult; however, they own fewer livestock.

Table 1: Household Characteristics by Treatment Category by Year Surveyed

Variable	**2015**			**2013**			**2011**		
	Treated	**Controlled**		**Treated**	**Controlled**		**Treated**	**Controlled**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Male head of household	0.730	0.759		0.751	0.772		0.788	0.798	
Age of head of household	47.982	46.363	***	46.568	45.168	**	45.139	42.891	***
Head of household is married	0.739	0.756		0.756	0.787	*	0.801	0.824	
Household head can read and write	0.426	0.350	***	0.412	0.327	***	0.407	0.329	***
Number of adult male household members	1.966	2.066	*	1.866	1.861		2.064	2.089	
Number of adult female household members	2.054	2.003		1.919	1.833	**	2.016	2.025	
Land area in hectares per adult	0.340	0.293		0.392	0.357		0.353	0.234	***
Number of parcels per household	10.084	6.121	***	10.684	6.569	***	12.305	7.301	***
Number of livestock	4.531	6.193	***	0.287	0.409	***	0.309	0.402	***
log other income	2.178	2.006		2.250	1.885	***	2.133	1.901	*
HH distance in km to nearest major road	14.353	23.118	***	14.775	20.424	***	14.549	21.076	***
*Annual mean temperature (deg. C * 10)*	185.892	224.086	***	185.630	214.944	***	185.184	211.173	***
Potential wetness index	12.445	13.251	***	12.415	12.939	***	12.433	12.944	***
Number of households	**2830**	**746**		**2407**	**1023**		**1911**	**1041**	

Moreover, as shown in Table 1, households in the treated villages reside significantly closer to roads. This proximity may make it easier for them to access non-agricultural labour markets and migration networks, and to engage in economic diversification. Additionally, treated households are consistently located in cooler, drier areas than control households. Similarly, the potential wetness index, which indicates land moisture and water retention capacity, is consistently lower for treated households. Together, these differences suggest that households that receive land certification are better positioned to engage in processes aligned with structural transformation.

Table 2, together with Figures 1 and 2, provides an overview of the allocation of household labour hours to agricultural and non-agricultural activities by treatment status and year. While agricultural labour remains dominant, the data reveal that certified (treated) households consistently allocate a smaller share of total labour hours to agricultural work than control households, particularly in 2011 and 2015. This pattern suggests that certification may encourage the initial stages of labour reallocation away from subsistence farming. Conversely, certified households spend a higher share of labour hours on non-agricultural activities in these same years, reflecting greater engagement in off-farm economic activities.

Figure 2, as well as the lower panel of Table 2, further disaggregates non-agricultural labour hours into four categories: household non-agricultural business, casual labour, wage or salaried employment, and unpaid apprenticeships. Households in certified villages report significantly more hours spent on unpaid apprenticeships, particularly in 2011, suggesting a greater inclination towards long-term skill development or pathways into non-farm employment. For instance, in 2011, households that had been treated reported spending 8.99 hours on an unpaid apprenticeship, compared to 3.24 hours among control households. We have recognised that the unpaid apprenticeship indicator is likely to be subject to some measurement error. By comparing the mean value in 2011 with those in 2013 and 2015, we found that the amount was higher in 2011. Having checked the data and the questionnaire, I found that the definition had not changed in 2011, which could be one limitation of using an indicator. While certified households also engage in slightly more casual labour, the differences are not statistically significant. Conversely, control households report spending more time on wage or salaried employment in later years, which may be due to localised labour opportunities that are not directly tied to land tenure status.

Finally, total labour hours are generally lower among certified households, with a notable difference in 2015: treated households reported an average of 53.4 hours per week, compared to 60.0 hours among control households. This reduction may reflect greater labour efficiency or diversification, enabling household members to allocate their time to higher-return or less time-intensive activities. Taken together, these patterns suggest that land certification is associated with a meaningful shift in labour allocation, potentially away from traditional farming and towards more diverse, often skill-based, non-agricultural employment. This highlights the role of land certification in facilitating early-stage structural transformation in rural Ethiopia.

Table 2: Share and Total Hours Spent Outcome variables by Treatment Category by Year Surveyed

Variable	**2015**			**2013**			**2011**		
	Treated	**Controlled**		**Treated**	**Controlled**		**Treated**	**Controlled**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Share of hours spent, agricultural	0.779	0.792		0.827	0.769	***	0.671	0.744	***
Share of hours spent on all types, non-agricultural	0.221	0.208		0.173	0.231	***	0.329	0.256	***
Share of hours spent, non-farm	0.117	0.109		0.107	0.127	*	0.200	0.174	**
Share of hours spent, casual	0.051	0.042		0.032	0.038		0.023	0.027	
Share of hours spent, paid	0.051	0.054		0.032	0.063	***	0.017	0.017	
Share of hours spent, unpaid	0.003	0.003		0.002	0.002		0.089	0.038	***
Hours spent, agricultural and non-agricultural	53.435	60.019	***	60.782	65.887	**	88.346	70.728	***
Hours spent, agricultural	40.890	46.861	***	49.041	50.269		55.990	50.085	***
Hours spent on all types, non-agricultural	12.545	13.158		11.741	15.618	***	32.356	20.643	***
Hours spent, non-agricultural	6.699	6.571		7.618	8.427		19.387	13.365	***
Hours spent, casual	2.686	2.343		1.958	2.643		2.179	1.988	
Hours spent, paid	2.977	4.013	*	2.061	4.405	***	1.801	2.051	
Hours spent, unpaid	0.183	0.231		0.104	0.143		8.990	3.239	***
Number of households	**2830**	**746**		**2407**	**1232**		**1911**	**1728**	

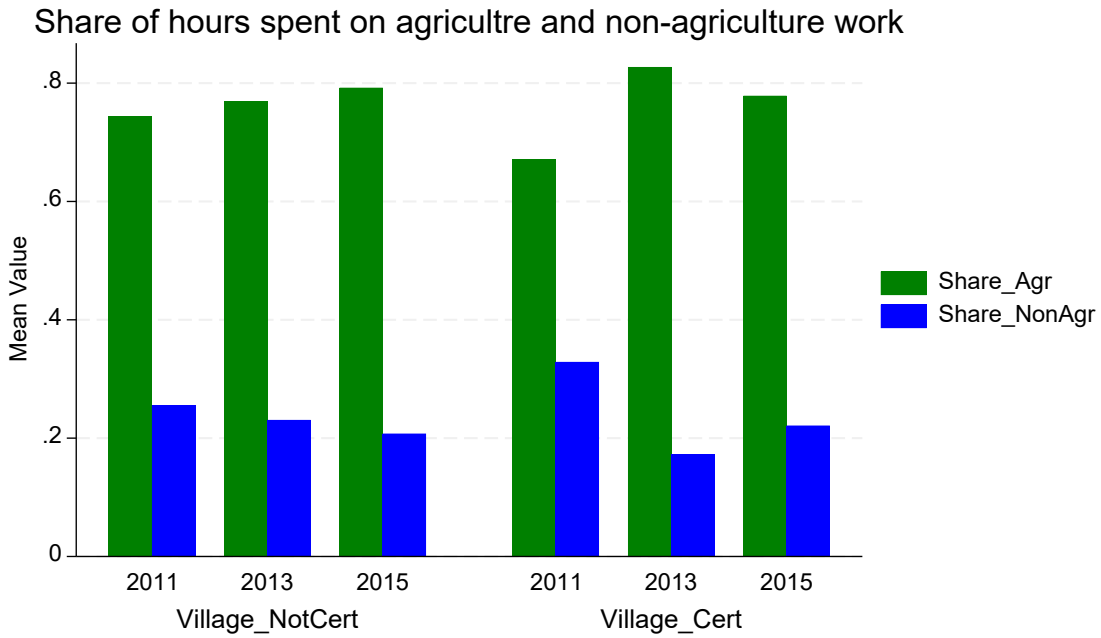

Figure 1: Share of Hours Spent on Agricultural and Non-agricultural Work

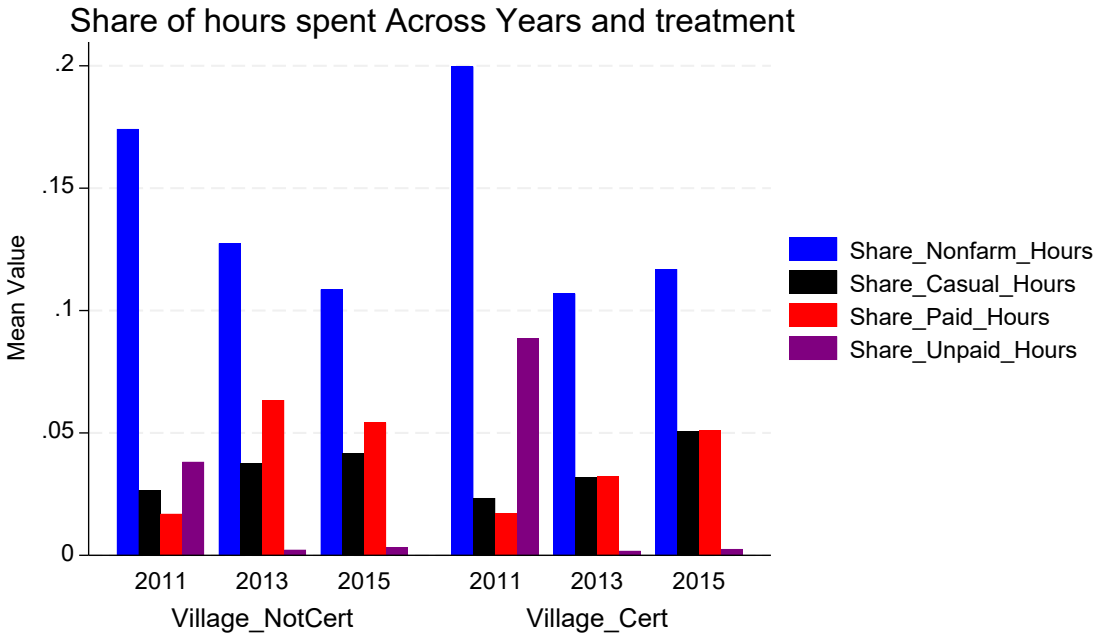

Figure 2: Share of Hours Spent on Non-farm, Casual, Paid and Unpaid Apprenticeships

Similarly, Table 3 presents the descriptive statistics for the share of working-age family members, as well as the credit and migration outcome variables. As would be expected in a rural context, the share of working-age family members employed in agriculture remains high in both groups. However, households in certified villages have shown a slight decrease in their reliance on agricultural labour over time. For instance, in 2011, the share of working-age family members allocated to agriculture was 6.4% for treated households, compared to 5.8% for the control group. A statistically significant difference emerges in 2013 (16.3% versus 14.7%), though this diminishes by 2015. While these differences are not consistently significant, they suggest that land certification may be associated with gradual shifts in labour allocation, particularly compared to changes in non-agricultural engagement. These trends are illustrated further in Figures 3 and 4. Figure 3 shows that the share of working-age family members allocated to agriculture decreases over time for both groups. Figure 4 shows that the share of working-age family members employed in industry and services is growing, particularly among certified households. This supports the idea that certification is linked to greater engagement in non-agricultural sectors.

Table 3: Share of Working Age Family Members, Credit and Migration Outcome Variables by Treatment Category by Year Surveyed

Variable	**2015**			**2013**			**2011**		
	Treated	**Controlled**		**Treated**	**Controlled**		**Treated**	**Controlled**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Share of working age family members in agriculture	0.107	0.108		0.163	0.147	*	0.064	0.058	
Share of working age family members in industry	0.006	0.002	*	0.001	0.003		0.002	0.001	
Share of working age family members in service	0.020	0.018		0.011	0.015		0.006	0.007	
Employed in a casual job	0.167	0.122	***	0.333	0.186	***	0.164	0.151	
Receiving loans	0.224	0.275	***	0.314	0.180	***	0.290	0.164	***
Internal migrant	0.030	0.020		0.059	0.027	***	-	-	-
International migrant	0.008	0.011		0.020	0.014		-	-	-
Number of households	**2830**	**746**		**2407**	**1232**		**1911**	**1728**	

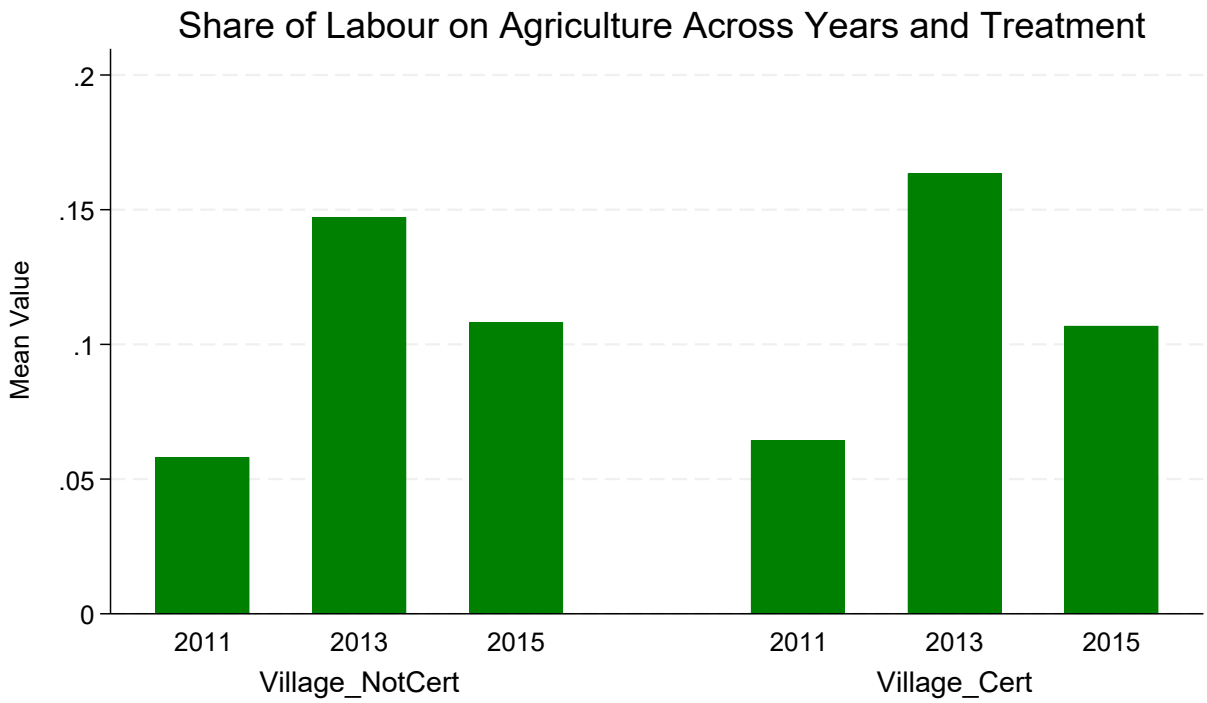

Figure 3: Share of Working-Age Family Members Engaged in Agricultural Activities

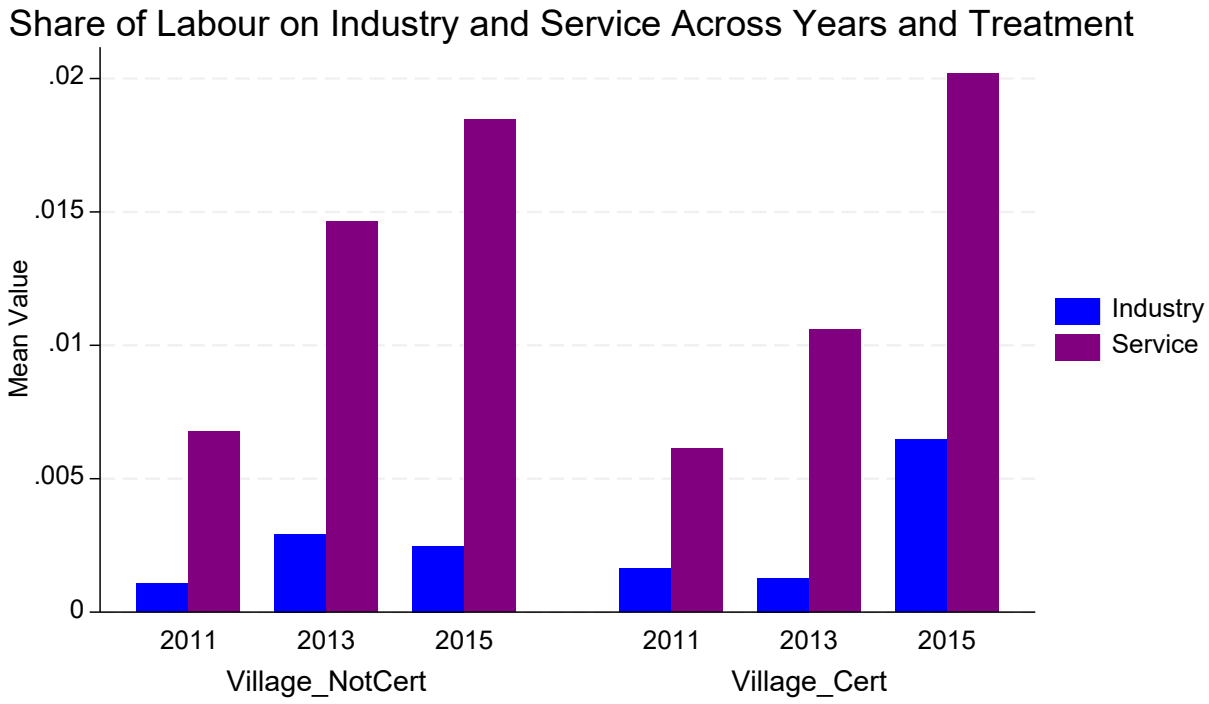

Figure 4: Share of Working-Age Family Members in Industry and Service

Table 3 also reveals a striking difference in casual employment, which is a key indicator of non-agricultural activities. In all three survey years, households that received treatment reported significantly higher levels of engagement in casual employment. This gap persists across years, suggesting a potential link between tenure security and informal labour engagement. Additionally, when examining time use, treated households consistently report spending fewer hours on agricultural activities in all years except 2011. Conversely, hours spent on non-agricultural activities are higher among treated households in 2011 and 2015. These results reinforce the hypothesis that land certification facilitates labour reallocation away from subsistence farming. Similar patterns emerge in the migration outcomes shown in Table 3. Internal migration was more prevalent among treated households in 2013. The international migration rate was also higher among treated households in 2013. These patterns are consistent with the hypothesis that secure land tenure facilitates labour mobility by reducing the risk of losing access to land while away.

Several of the food security indicators in Table 4 show consistently better outcomes for households that have been treated. For instance, treated households report fewer days of relying on food borrowing or assistance in every year. This suggests a reduced reliance on social coping mechanisms, possibly due to more stable income sources. In terms of meal frequency, adults in certified households (aged five and above) consumed an average of more meals per day than those in non-certified households throughout the study period. Although children under five did not consistently show significant differences in meal frequency, they experienced greater dietary diversity in treated households. In both 2011 and 2013, children in certified households were significantly more likely to consume a more diverse diet, suggesting that land certification may have positive nutritional benefits. Dietary diversity was also significantly higher for adult men and women in treated households, suggesting an intra-household nutritional benefit.

Table 4: Statistical Mean of Food Security Outcome Variables by Treatment Category by Year Surveyed

Variable	**2015**			**2013**			**2011**		
	Treated	**Controlled**		**Treated**	**Controlled**		**Treated**	**Controlled**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Number of days household borrowed food or relied on help from friends/relatives	0.099	0.308	***	0.104	0.127		0.138	0.166	
Avg. daily meals (5+ yrs)	2.886	2.692	***	2.762	2.711	*	2.790	2.685	***
Avg. daily meals (<5 yrs)	1.952	2.106	*	2.156	2.153		2.200	2.403	**
=1 if men consumes a more diverse (or less diverse) variety of foods.	0.026	0.031		0.034	0.023		0.041	0.014	***
=1 if women consumes a more diverse (or less diverse) variety of foods.	0.015	0.007	*	0.012	0.015		0.018	0.011	
=1 if child consumes a more diverse (or less diverse) variety of foods.	0.042	0.039		0.058	0.027	***	0.060	0.023	***
Food insecurity: Insufficient food to feed household in the last 12 months	0.263	0.365	***	0.348	0.299	***	0.304	0.262	**
Number of households	**2830**	**746**		**2407**	**1023**		**1911**	**1728**	

Overall, the descriptive statistics suggest that land certification is associated with greater labour diversification, higher levels of casual employment, increased migration and better food security outcomes. These patterns align with the theoretical expectations set out in the conceptual framework, which motivates the subsequent empirical analysis.

6. Empirical Strategy

In this paper, I examine the relationship between land property rights and indicators of structural transformation and nutritional outcomes, using village-level land certification as an identification strategy. The implementation of land certification programmes at the village level was not based on economic criteria (Deininger et al. 2008; Bezabih, Köhlin, and Mannberg 2011; Muchomba 2017). As indicated in Figure 5, Ethiopia's land certification programme was initiated following federal and regional approval of the Land Proclamation. The intention was to provide land certification for all villages. However, some literature notes that they were unable to reach all the villages at the same time due to budgetary constraints and insufficient human resources at the district level. In addition, fieldwork was only carried out during the dry season when agriculture is limited, which also created discontinuity. Thus, some villages received the land certification programme while others did not (Congdon Fors, Houngbedji, and Lindskog 2019; Deininger and Jin 2006). There is no evidence that selection into early or late certification status was driven by household characteristics, productivity levels, or local labour-market dynamics. Consequently, the implementation of the programme at the district[1] (*woreda*) and village levels is plausibly exogenous.

[1] The term 'district' is equivalent to *woreda*, which is the primary local government unit responsible for delivering public services, governance and development activities, including issuing land tenure certification in Ethiopia.

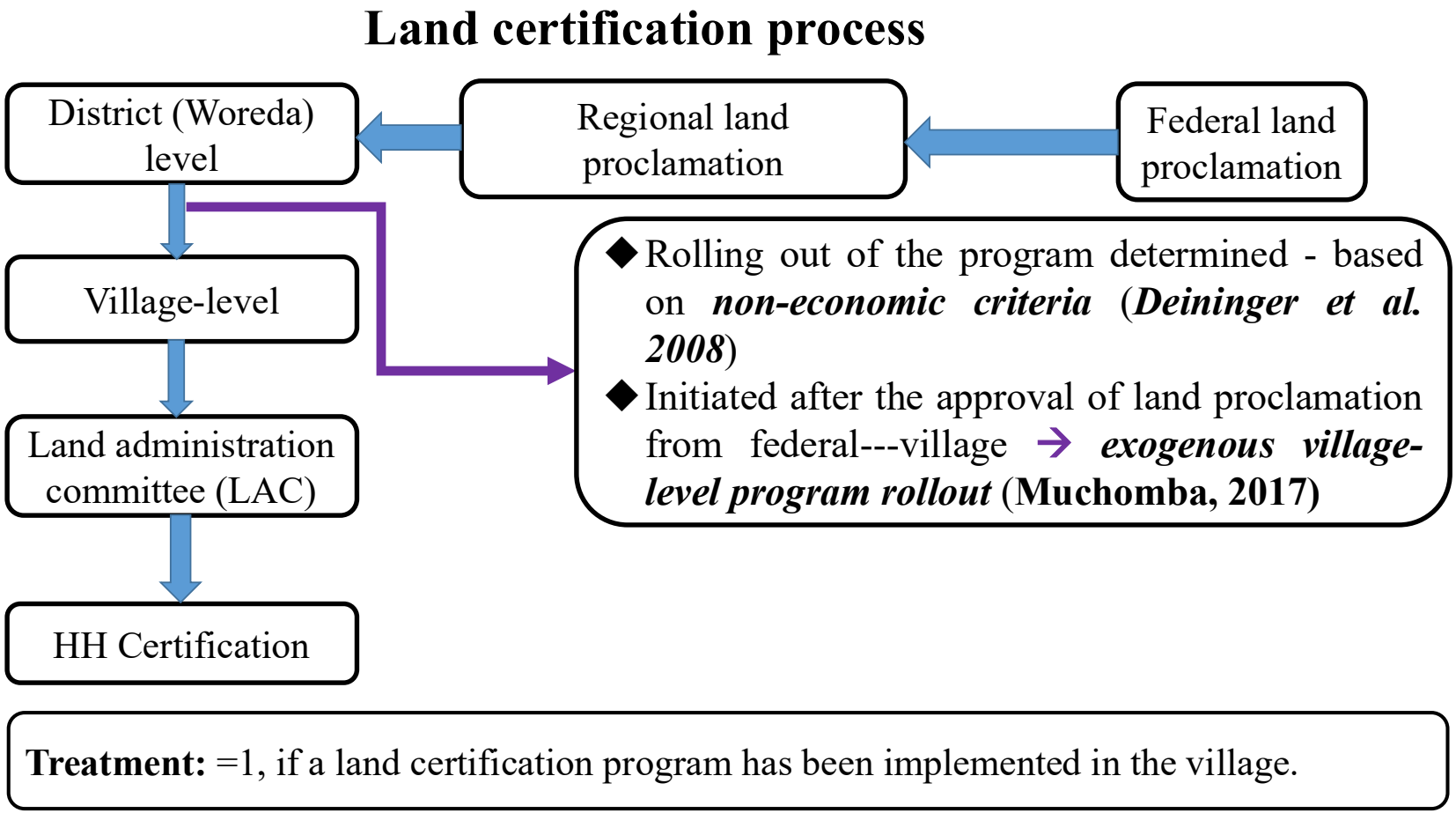

Figure 5: The Process Utilized by the Land Certification Programme in Ethiopia

To capture observable differences between programme and non-programme villages, we controlled for household and district-year fixed effects to account for changes in the outcome variable over time due to different district characteristics correlated with the timing of land certification (Congdon Fors, Houngbedji, and Lindskog 2019; Bezabih, Köhlin, and Mannberg 2011). To identify the impact of a land certification programme without confounding it with other factors in the process of structural transformation, we used fixed effects models to control for unobserved, time-invariant characteristics in addition to village-level treatment. Some literature has considered this an exogenous measure compared to household-level treatment (Deininger et al. 2008; Bezabih, Köhlin, and Mannberg 2011; Muchomba 2017). For instance, we control for district-specific characteristics that remain constant over time, such as geographical location and cultural factors that may influence labour migration from the agricultural to the non-agricultural sector.

Therefore, the two-way fixed effects (TWFE) model is used to examine the relationship between land certification and indicators of structural transformation and nutritional outcomes:

$$\mathrm{Y_{ivwt}} = \alpha + \beta_1 \mathrm{Cert_{vwt}} + \beta_2 \mathrm{X_{ivwt}} + \theta_h + (\vartheta_w * \tau_y) + \varepsilon_{\mathrm{ivwt}} - - - - - - - - \quad (1)$$

where $\mathrm{Y_{ivt}}$ is the outcome variable of interest (e.g., an indicator of structural transformation and nutritional outcomes). $\mathrm{Cert_{vwt}}$ is equal to 1 if village v in district w received the land certification programme by year t. Using the village-level treatment addresses concerns that individual households may self-select into certification based on unobserved characteristics. The coefficient β_1 tells us how households in villages with a certification differ, on average, in their structural transformation and nutritional outcomes $\mathrm{Y_{ivwt}}$ compared to households in villages with no certification. $\mathrm{X_{ivwt}}$ is a vector of household-level covariates. θ_{h} controls for differential household characteristics. $(\vartheta_w * \tau_y)$ is a set district-year fixed effect to control time-variant district characteristics. $\varepsilon_{\mathrm{ivwt}}$is the error term. The standard errors are clustered at the village level to account for possible within-village correlations in the outcomes.

7. Results and Discussion

This analysis primarily uses a three-wave panel dataset from 2011/12, 2013/14 and 2015/16, as detailed in the Data section. However, to examine the relationship between land certification and migration outcomes, the analysis is restricted to the 2013/14 and 2015/16 waves, as information on migration was not included in the 2011/12 survey.

7.1 Hours Spent on Agricultural and Non-Agricultural Activities

Tables 5 and 6 present the estimation results for the relationship between land certification and household labour allocation, in terms of both the share and total number of hours spent on agricultural and non-agricultural activities. The models account for household and woreda-year fixed effects, as well as a set of controls for households and the environment.

As shown in Table 5, land certification is significantly associated with a decrease in the share of household labour hours devoted to agricultural activities and an increase in the share allocated to non-agricultural work. This consistent finding suggests that secure land tenure enables households to reallocate labour away from farming towards more diverse income-generating activities. When disaggregated by type, the only statistically significant positive effect observed is for unpaid apprenticeships, indicating that certified households are more likely to invest labour in long-term skills development or vocational training. The coefficients for non-agricultural business, casual labour and wage employment are all positive, but not statistically significant. This may reflect differences in access to these opportunities or limitations in formal employment markets.

Table 5: Estimation Results, Share of Hours Spent

	Share of hours spent on agricultural activities	**Share of hours spent on Non-agricultural Activities**				
		Non-agricultural activities (all types)	**Non-agricultural business**	**Casual, part-time, or temporary labour**	**Wage or salaried employment**	**Unpaid apprenticeship**
$Cert_{village}$	**-.025***	**.025***	.001	-.009	.006	**.028*****
	(.015)	(.015)	(.013)	(.007)	(.007)	(.005)
Household FE	Yes	Yes	Yes	Yes	Yes	Yes
District*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Other cont.	Yes	Yes	Yes	Yes	Yes	Yes
# of Obns.	7586	7586	7586	7586	7586	7586
R-squared	.627	.627	.607	.446	.574	.474

All models control for household head age, male household head dummy, number of adult women and men, marital status of the household head, literacy status of the household head, household distance to the nearest main road, annual mean temperature, potential wetness index, land per adult and other income sources. Standard errors, clustered at the household level, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 6 supplements the share-based results by analysing the total number of hours worked per week. The results suggest that land certification is associated with an overall increase in labour hours, indicating that households may be allocating unused or underutilised labour to productive work. While the effect on agricultural hours is negative, it is not statistically significant, suggesting that the overall reduction in farm work may be limited. The strongest association is observed in the total number of hours spent on non-agricultural activities, with an estimated increase of 6.17 hours per week. Disaggregated results show that this increase is primarily driven by non-agricultural household businesses and unpaid apprenticeships. These findings are consistent with the share-based results, reinforcing the conclusion that having secured land tenure is associated with incentivising households to diversify their labour portfolios towards non-agricultural income sources, including entrepreneurial activities and skill development.

Table 6: Estimation Results, Total Hours Spent

	Total hours spent on both agricultural and non-agricultural activities	**Hours spent on agricultural activities**	**Hours spent on non-agricultural Activities**				
			Non-agricultural activities (all types)	**Non-agricultural business**	**Casual, part-time, or temporary labour**	**Wage or salaried employment**	**Unpaid apprenticeship**
$Cert_{village}$	**5.129***	-1.045	**6.174*****	**3.611*****	-.79	.436	**2.918*****
	(2.692)	(2.04)	(1.619)	(1.257)	(.549)	(.674)	(.444)
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other cont.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of Obns.	8641	8641	8641	8641	8641	8641	8641
R-squared	.557	.583	.552	.555	.446	.526	.435

All models control for household head age, male household head dummy, number of adult women and men, marital status of the household head, literacy status of the household head, household distance to the nearest main road, annual mean temperature, potential wetness index, land per adult and other income sources. Standard errors, clustered at the household level, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Combining the results from Tables 5 and 6 provides robust evidence that land certification is associated with labour-market reallocation, primarily through increased time spent on non-agricultural activities. Notably, the positive effect on unpaid apprenticeship hours suggests that secure land tenure may also promote intergenerational investment in human capital, particularly among young people. This is an important pathway for rural structural transformation, where formal job opportunities are limited and entry into the non-farm economy often begins with informal or unpaid training. Furthermore, the net increase in total labour hours indicates that land certification could mitigate labour underemployment, particularly among household members who were previously confined to low-return subsistence farming due to tenure insecurity. Taken together, these findings support the hypothesis that land tenure systems facilitate economic diversification, which is critical for poverty reduction and resilience in rural settings.

7.2 Share of Working-Age Family Members on Agricultural and Non-Agricultural Activities and Migration Outcomes

This section presents the results of a regression analysis examining the association between land certification and key structural transformation outcomes, such as the share of working-age family members engaged in agriculture, industry and services, engagement in casual employment, having access to credit, and internal and international migration. The analysis controls for household fixed effects, district-year fixed effects and relevant covariates. Variables measuring the share of working-age family members engaged in agriculture, industry and services are constructed based on the reported main occupation of the parents of the children. Specifically, the share engaged in agriculture is defined as households in which the parents' main occupation is agriculture. The share engaged in industry includes households where the parents' main occupation falls under mining, manufacturing, electricity or construction. The share engaged in services is derived from occupations categorised as professional, scientific or technical activities; transportation; buying and selling; financial services; personal services; education; health; and public administration. However, it is important to note that, since these variables are based solely on the main occupation of the parents rather than the actual time use or employment status of all working-age household members, they may not fully capture the dynamic nature of labour reallocation or broader household engagement in different sectors. This introduces a limitation when using these indicators as direct measures of structural transformation.

The analysis in Table 7 reveals that land certification is not statistically significantly associated with the share of labour in agriculture, industry or services. This suggests that labour shares across sectors remain relatively stable following certification, and that overall sectoral labour shares are not immediately altered. However, land certification increases the likelihood of casual employment by 3.1 percentage points. This is consistent with the hypothesis that secure tenure enables households to take on casual work by reducing the risks associated with temporarily leaving the land.

Table 7: Estimation Results, Working-Age Family Members Labour Allocation

	Share of working age family members in			**Employed in a casual position**	**Access to credit**	**Internal migrant**	**International migrant**
	Agriculture	**Industry**[1]	**Service**[2]				
$Cert_{village}$	.008	-.002	-.002	**.031***	.028	.003	**.011***
	(.008)	(.002)	(.003)	(.019)	(.021)	(.011)	(.007)
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other cont.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of Obns.	8378	8378	8378	8641	8641	5968	5968
R-squared	.629	.504	.633	.472	.498	.568	.571

All models control for household head age, male household head dummy, number of adult women and men, marital status of the household head, literacy status of the household head, household distance to the nearest main road, annual mean temperature, potential wetness index, land per adult, and other income sources. Standard errors, clustered at the household level, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

[1] Mining, manufacturing, electricity, construction

[2] Professional/scientific/technical activities, transportation, buying and selling, financial services, personal services, education, health, public administration

With regard to migration, the land certification programme has a positive and statistically significant effect on international migration, shown in the last two columns of Table 7, whereas its effect on internal migration is positive but not statistically significant. This suggests that secure land tenure could provide economic security, reducing the risk of sending household members abroad, which is consistent with the "security effect" discussed in the conceptual framework. The positive correlation between certification and international migration indicates that secure land tenure reduces the threshold for undertaking costly, long-distance migration. This finding is similar to prior studies (Valsecchi 2014; de Janvry et al. 2015). These results also imply that land certification could alleviate liquidity or risk constraints, enabling households to send members abroad, potentially through increased access to credit. While the estimated effect of the land certification programme on access to credit is positive, it is not statistically significant in the main specification. However, robustness tests presented in the next section provide evidence of a significant relationship when the analysis is restricted to the 2011 and 2015 survey waves. These supplementary results indicate that, under this two-period panel specification, the land certification programme is significantly associated with improved access to credit.

7.3 Food Security Outcomes: Average Meals Per Day and Diversity of Foods

Table 8 shows the effect of land certification on household food security. While the effect on the number of days households borrowed food or relied on external assistance is modest and not statistically significant, other indicators demonstrate substantial positive effects. The findings reveal statistically significant improvements in food consumption and dietary diversity among certified households. Specifically, land certification is associated with a significant increase in the average number of meals consumed by children under five. This suggests that secure land rights enhance household food access and stability, enabling families to better meet the nutritional needs of young children, who are particularly vulnerable to food insecurity. While descriptive statistics in Table 4 show that, on average, households in the treatment group had fewer meals per day than the control group over three years, regression analysis controls for important confounding factors. Once these factors have been taken into account, the regression analysis isolates the change within households over time that can be attributed to land certification, compared to households that were not treated. The positive and significant coefficient then suggests that, holding other factors constant, certification improved food access for household members aged five and less, even if the treated group started from a slightly lower baseline. Furthermore, land certification is associated with significant improvements in dietary diversity across all household members. Specifically, the likelihood of consuming a more diverse range of foods increases by 2.4% for men, 2.7% for women and 2.5% for children. This suggests that enhanced tenure security contributes to better nutritional quality and intra-household food allocation.

Table 8: Estimation Results, Food Security

	Number of days household borrowed food or relied on help from friends/relatives	**Average number of meals consumed per day**		**Household member who usually consumes a more diverse (or less diverse) variety of foods.**			**Food insecurity: Insufficient food to feed the household in the last 12 months**
		Avg. daily meals (5+ yrs)	**Avg. daily meals (<5 yrs)**	**Men**	**Women**	**Children**	
$Cert_{village}$	.008	.01	**.146***	**.024****	**.027*****	**.025****	-.004
	(.032)	(.029)	(.076)	(.01)	(.009)	(.012)	(.021)
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other cont.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of Obns.	8641	8641	8641	8641	8641	8641	8608
R-squared	.436	.463	.664	.388	.367	.392	.553

All models control for household head age, male household head dummy, number of adult women and men, marital status of the household head, literacy status of the household head, household distance to the nearest main road, annual mean temperature, potential wetness index, land per adult and other income sources. Standard errors, clustered at the household level, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

In terms of food security, certification contributes to improved household well-being through multiple channels. Increased meal frequency and greater dietary diversity indicate that land-tenure reform can have significant nutritional impacts. However, the coefficient on the number of days households borrowed food or relied on social help is positive and statistically insignificant, suggesting no measurable reduction in food-related coping strategies in the fixed effects model. Still, the consistent improvements in meal frequency and diet quality suggest that certification enhances food access through better income stability and labour diversification.

7.4 Robustness checks

To assess the validity and consistency of the main results, I conducted a series of robustness checks using alternative fixed-effects specifications and subsamples. These checks determine whether the estimated effects of land certification on labour outcomes, migration and food security are sensitive to the estimation strategy or sample period.

7.4.1 Alternative Fixed Effects Specification: Village vs. Household

In the main analysis, I used household fixed effects to control for unobserved, time-invariant heterogeneity at the household level. As a robustness test, I replaced these with village fixed effects while retaining district-year fixed effects, as shown in Tables 9, 10, 11 and 12. While these alternative fixed effects still control for time-invariant characteristics, the comparison is now made between households within the same village rather than between the same households over time. The results remain consistent with the main findings.

As shown in Table 9, land certification is associated with a significant reduction in the share of labour hours spent on agricultural activities and a corresponding increase in non-agricultural labour, particularly in the form of unpaid apprenticeships. Table 10 confirms that land certification is related to a significant increase in total labour hours, primarily driven by non-agricultural business and apprenticeship activities.

As shown in Table 11, these results are broadly consistent with the findings of the main analysis: the land certification programme is associated with a statistically significant increase in casual employment of 4.1 percentage points. This supports the hypothesis that secure land tenure facilitates off-farm labour engagement.

As shown in Table 12, land certification has a positive and statistically significant impact on the dietary diversity of women and children with regard to food security. However, the effect on reliance on social food coping mechanisms is small and negative, though not statistically significant. Therefore, the results of the main analysis in Tables 5, 6, 7 and 8 indicate that the main conclusions are not driven by household-specific unobserved heterogeneity and are robust to the use of village-level variation.

7.4.2 Two-Period Panel Estimation: 2011/12 vs. 2015/16

To further test the robustness of the results, I re-estimated the models using only the first (2011/12) and

last (2015/16) waves of the panel data. This approach avoids reliance on the mid-point survey and establishes whether the results remain consistent over a longer time horizon. The results remain largely consistent with the main findings.

As shown in Table 13, land certification is associated with a reduction of 6.1% in the share of labour hours spent on agricultural activities, and a corresponding increase in non-agricultural labour. This increase is significantly driven by unpaid apprenticeships. Table 14 shows that land certification also linked to a significant increase in total labour hours and non-agricultural activities, particularly in non-agricultural businesses, apprenticeships and wage employment.

Furthermore, Table 15 confirms a positive and statistically significant association with access to credit and casual employment, while effects on labour-sector shares are small and insignificant. Notably, certification increases casual employment by 4.1% and access to credit by 7.1%. This finding reinforces the idea that secure land tenure is associated with financial access and engagement in non-agricultural activities, which is important for economic development.
Finally, Table 16 shows that land certification is associated with improved food security outcomes. These include a significant increase in dietary diversity for men, women and children, as well as more meals consumed per day by young children. There is also a negative effect on food insecurity, though this is not statistically significant.

These findings reinforce the argument that secure land tenure facilitates labour reallocation, economic diversification and improved household nutrition, even when analysed using a restricted panel and an alternative identification strategy. Therefore, these results confirm that the study's core conclusions remain robust when different estimation strategies are employed, including the use of village versus household fixed effects and varying panel structures. The consistent significance of the key outcome variables strengthens the conclusion that secure land tenure meaningfully enables rural households to diversify their livelihoods, invest in long-term skills, and improve their welfare. These consistent patterns highlight the broader developmental potential of land-tenure reforms in agrarian, low-income settings.

8. Conclusions

This paper examines whether strengthening land property rights through land certification can be associated with structural transformation in a low-income, agrarian context. Specifically, it explores the association between secure land rights and the following: share and total hours spent on agricultural and non-agricultural activities, employment in casual work, internal and international migration and improvements in household dietary outcomes.

To identify the association, the study exploits variations in the rollout of the land certification programme across villages. Although the programme was initially designed to reach all villages, full coverage was not achieved simultaneously due to budgetary constraints, limited administrative capacity at the district level, and the requirement to conduct fieldwork during the dry season. These factors resulted in discontinuities in the timing and geographic coverage of certification. Crucially, the rollout was not influenced by local economic conditions or labour-market characteristics, strengthening the plausibility of the identification strategy and supporting the assumption of exogeneity in treatment assignment.

The findings provide robust empirical evidence of the transformative impact of land tenure reform. Land certification is significantly associated with an increased likelihood of casual employment, as well as a reallocation of household labour hours from agricultural activities to non-agricultural ones. The proportion of labour hours spent on non-agricultural work increases by 2.5 percentage points, with the most notable rise in unpaid apprenticeship activities. This suggests that tenure security is correlated with the long-term investment in skills. Furthermore, certified households spend an additional 6.17 hours per week on non-agricultural work on average, with the strongest effects observed in non-farm business and apprenticeship activities. These shifts occur without a statistically significant reduction in agricultural hours, indicating expanded labour engagement rather than simple substitution. The programme also increases international migration by 1.1 percentage points, consistent with the literature showing that secure land rights can reduce the barriers to high-cost, long-distance migration (de Janvry et al. 2015; Valsecchi 2014). Although the effect on internal migration is positive, it is not statistically significant. Additionally, access to credit increases by 7.1 percentage points when using a two-year period panel estimation, suggesting that land certification is connected with households' ability to finance informal work or migration-related expenses.

The study reveals significant improvements in household food security as a result of activating the labour-market effects. Certification is associated with an increase in the average number of meals consumed per day, particularly among children under five. It also leads to significantly greater dietary diversity among men, women and children. These outcomes reflect broader household welfare gains and are likely to stem from increased income stability and diversification. Subsample analysis supports this mechanism by revealing that certified households are more likely to access credit, which can be used to finance migration and informal work or act as a buffer against consumption shocks.

Overall, the results demonstrate that Ethiopia's low-cost, participatory land certification programme

promotes rural transformation. This is achieved by enhancing agricultural security and expanding households' economic choices. This enables them to diversify their labour, migrate, and improve their access to food. These impacts highlight the multifaceted development potential of land-tenure reforms. From a policy perspective, the findings suggest that securing land rights, particularly via scalable and cost-effective mechanisms, can facilitate labour reallocation, promote livelihood diversification, and support nutritional well-being in agrarian economies. In the context of mounting pressures in SSA from population growth, rural unemployment and climate-related stress, land governance reform offers a fundamental institutional means of enhancing resilience and promoting inclusive growth.

Future research could use longer panels to assess the sustainability of these outcomes, exploring heterogeneity by gender, land size and regional exposure to climate risk. Nevertheless, the evidence presented here confirms that institutional reforms in land tenure can play a catalytic role in shaping labour markets, migration decisions and the quantity and quality of food available in low-income rural areas.

Table 9: Estimation Results, Share of Hours Spent

	Share of hours spent on agricultural activities	**Share of hours spent on non-agricultural Activities**				
		Non-agricultural activities (all types)	**Non-agricultural business**	**Casual, part-time, or temporary labour**	**Wage or salaried employment**	**Unpaid apprenticeship**
$Cert_{village}$	-.033**	.033**	.001	-.003	.011	.025***
	(.015)	(.015)	(.013)	(.006)	(.008)	(.005)
Village FE	Yes	Yes	Yes	Yes	Yes	Yes
District*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Other cont.	Yes	Yes	Yes	Yes	Yes	Yes
# of Obns.	8132	8132	8132	8132	8132	8132
R-squared	.408	.408	.314	.16	.254	.266

All models control for household head age, male household head dummy, number of adult women and men, marital status of the household head, literacy status of the household head, household distance to the nearest main road, annual mean temperature, potential wetness index, land per adult and other income sources. Standard errors, clustered at the household level, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 10: Estimation Results, Total Hours Spent

	Total hours spent on both agricultural and non-agricultural activities	**Hours spent on agricultural activities**	**Hours spent on non-agricultural Activities**				
			Non-agricultural activities (all types)	**Non-agricultural business**	**Casual, part-time or temporary labour**	**Wage or salaried employment**	**Unpaid apprenticeship**
$Cert_{village}$	6.09**	-.656	6.746***	3.463***	-.501	.937	2.847***
	(2.63)	(2)	(1.591)	(1.262)	(.535)	(.67)	(.424)
Village FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other cont.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of Obns.	9109	9109	9109	9109	9109	9109	9109
R-squared	.366	.396	.322	.276	.128	.188	.305

All models control for household head age, male household head dummy, number of adult women and men, marital status of the household head, literacy status of the household head, household distance to the nearest main road, annual mean temperature, potential wetness index, land per adult and other income sources. Standard errors, clustered at the household level, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 11: Estimation Results of Working-Age Family Members, Labour Allocation

	Share of working age family members in			**Employed in a casual position**	**Access to credit**	**Internal Migrant**	**International Migrant**
	Agriculture	**Industry[3]**	**Service[4]**				
$Cert_{village}$	.006	-.002	0	.041**	.019	.002	.011
	(.008)	(.002)	(.004)	(.018)	(.02)	(.011)	(.007)
Village FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other cont.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of Obns.	8844	8844	8844	9109	9109	6581	6581
R-squared	.347	.134	.191	.243	.188	.133	.128

All models control for household head age, male household head dummy, number of adult women and men, marital status of the household head, literacy status of the household head, household distance to the nearest main road, annual mean temperature, potential wetness index, land per adult and other income sources. Standard errors, clustered at the household level, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

[3] Mining, manufacturing, Electricity, Construction

[4] Professional/Scientific/Technical Activities, Transportation, Buying and Selling, Financial Services, Personal Services, Education, Health, Public Administration

Table 12: Estimation Results, Food Security

	Number of days household borrowed food or relied on help from friends/relatives	**Average number of meals consumed per day**		**Household member who usually consumes a more diverse (or less diverse) variety of foods.**			**Food Insecurity: Insufficient food to feed the household in the last 12 months**
		Avg. daily meals (5+ yrs)	**Avg. daily meals (<5 yrs)**	**Men**	**Women**	**Children**	
$Cert_{village}$	-.001	.011	.105	.022**	.025***	.024**	-.002
	(.031)	(.028)	(.077)	(.009)	(.008)	(.012)	(.021)
Village FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other cont.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of Obns.	9109	9109	9109	9109	9109	9109	9081
R-squared	.122	.25	.294	.173	.121	.138	.307

All models control for household head age, male household head dummy, number of adult women and men, marital status of the household head, literacy status of the household head, household distance to the nearest main road, annual mean temperature, potential wetness index, land per adult and other income sources. Standard errors, clustered at the household level, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 13: Estimation Results, Share of Hours Spent

	Share of hours spent on agricultural activities	**Share of hours spent on non-agricultural Activities**				
		Non-agricultural activities (all types)	**Non-agricultural business**	**Casual, part-time or temporary labour**	**Wage or salaried employment**	**Unpaid apprenticeship**
$Cert_{village}$	-.061***	.061***	.01	-.012	.033***	.03***
	(.022)	(.022)	(.017)	(.008)	(.01)	(.008)
Village FE	Yes	Yes	Yes	Yes	Yes	Yes
District*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Other cont.	Yes	Yes	Yes	Yes	Yes	Yes
# of Obns.	5457	5457	5457	5457	5457	5457
R-squared	.451	.451	.362	.218	.284	.317

All models control for household head age, male household head dummy, number of adult women and men, marital status of the household head, literacy status of the household head, household distance to the nearest main road, annual mean temperature, potential wetness index, land per adult and other income sources. Standard errors, clustered at the household level, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 14: Estimation Results, Total Hours Spent

	Total hours spent on both agricultural and non-agricultural activities	**Hours spent on agricultural activities**	**Hours spent on non-agricultural activities**				
			Non-agricultural activities (all types)	**Non-agricultural business**	**Casual, part-time or temporary labour**	**Wage or salaried employment**	**Unpaid apprenticeship**
$Cert_{village}$	14.586***	3.858	10.728***	5.12***	-1.036	2.481***	4.163***
	(4.06)	(3.124)	(2.348)	(1.621)	(.794)	(.87)	(.584)
Village FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other cont.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of Obns.	6169	6169	6169	6169	6169	6169	6169
R-squared	.407	.438	.354	.312	.16	.208	.38

All models control for household head age, male household head dummy, number of adult women and men, marital status of the household head, literacy status of the household head, household distance to the nearest main road, annual mean temperature, potential wetness index, land per adult and other income sources. Standard errors, clustered at the household level, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 15: Estimation Results of Working-Age Family Members, Labour Allocation

	Share of working age family members in			**Employed in a casual position**	**Access to credit**
	Agriculture	**Industry[5]**	**Service[6]**		
$Cert_{village}$	.011	-.005	-.001	.041*	.071**
	(.012)	(.003)	(.005)	(.023)	(.03)
Village FE	Yes	Yes	Yes	Yes	Yes
District*Year FE	Yes	Yes	Yes	Yes	Yes
Other cont.	Yes	Yes	Yes	Yes	Yes
# of Obns.	5961	5961	5961	6169	6169
R-squared	.325	.142	.192	.225	.199

All models control for household head age, male household head dummy, number of adult women and men, marital status of the household head, literacy status of the household head, household distance to the nearest main road, annual mean temperature, potential wetness index, land per adult and other income sources. Standard errors, clustered at the household level, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

[5] Mining, manufacturing, Electricity, Construction

[6] Professional/Scientific/Technical Activities, Transportation, Buying and Selling, Financial Services, Personal Services, Education, Health, Public Administration

Table 16: Estimation Results, Food Security

	Number of days household borrowed food or relied on help from friends/relatives	**Average number of meals consumed per day**		**Household member who usually consumes a more diverse (or less diverse) variety of foods.**			**Food Insecurity: Insufficient food to feed the household in the last 12 months**
		Avg. daily meals (5+ yrs)	**Avg. daily meals (<5 yrs)**	**Men**	**Women**	**Children**	
$Cert_{village}$	-.028	.013	.101	.054***	.054***	.062***	.019
	(.05)	(.04)	(.12)	(.013)	(.012)	(.016)	(.027)
Village FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other cont.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# of Obns.	6169	6169	6169	6169	6169	6169	6151
R-squared	.173	.322	.306	.218	.184	.169	.38

All models control for household head age, male household head dummy, number of adult women and men, marital status of the household head, literacy status of the household head, household distance to the nearest main road, annual mean temperature, potential wetness index, land per adult and other income sources. Standard errors, clustered at the household level, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

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Abstract (in Japanese)

要　約

本研究は、エチオピアの農村部において土地所有保障制度と、世帯の生計手段の多様化、国際移住、栄養状態の改善の関係を検証したものである。世帯の固定効果および行政郡・年の固定効果を考慮した分析により、村レベルでの土地所有証明の有無によって、非農業活動（特に、無償の見習い活動）に従事する時間と割合が増加すること、逆に農業活動に従事する時間は変わらないものの割合が減少することを明らかにした。また、土地所有証明が臨時雇用および国際移住の可能性を有意に高めることも明らかにした。これらの結果は、土地権利の強化が労働移動に伴うリスクを低減しつつ、世帯の生計手段の多様化を促進することを示唆している。このような経済活動の変化は、世帯の栄養状態の改善にも影響している。土地所有証明を得た世帯は、幼児の１日あたりの食事回数が多く、また全世帯員の食事の多様化することが明らかになった。これらの知見は、土地権利の強化が労働の再分配と移住を通じて産業構造転換に寄与し、それを通じて世帯の食料アクセスと栄養状態を改善することを示唆している。本研究は、低所得農村地域における構造転換と食料安全保障のプロセスを促進する上で、土地権利を保障することが重要であることを示しており、土地政策が非農業活動や食料システムに及ぼす影響に関する研究に貢献する。

キーワード：土地改革、土地所有証明、構造転換、国際移住、栄養成果