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Agribusinesses, smallholder tenure security, and plot-level investments

Evidence from rural Tanzania

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Abstract: The last decade has witnessed an increase in the interest in agricultural land in developing countries. While a great deal of attention has been paid to understanding the impacts of this increased interest in agricultural land, very little is known about how local smallholder communities are affected when agribusinesses decrease or cease their operations. A large number of agribusinesses that acquired agricultural land in many sub-Saharan African countries have reduced or ceased their operations in recent years. This paper introduces a new dimension to the literature by investigating how a decrease in the share of land held by an agribusiness in a village affects smallholder plot-level tenure security and investments in rural Tanzanian villages. Drawing on a panel of 5,101 plots, we find that a decrease in the share of land held by an agribusiness significantly increases the probability that a plot has tenure security. Moreover, our results reveal that a decrease in the share of land held by agribusinesses significantly raises the time spent on the plot. This result is primarily driven by the number of household members employed in the agricultural sector but not through changes in tenure security.

Keywords: tenure security, smallholders, agribusiness, Tanzania, property rights
JEL classification: Q12, Q13, Q1

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1 Introduction

The rise in the demand for agricultural land and its consequences on surrounding communities has been widely debated in recent years. In the last 16 years, 1,004 agricultural deals covering an area of 26.7 million hectares have been concluded globally. This area is much larger when one considers the area taken up by intended and failed agricultural investments (Nolte et al. 2016). While a lot of attention has been paid to the impacts of these growing agricultural investments on their surrounding communities, very little is known about how local communities are affected once an investment has ceased or reduced its operations.

It is now acknowledged that not all large-scale agricultural ventures are successful. There are a number of reasons why agricultural investments fail. Most prominently, a number of international firms speculated on the recent global fuel crisis by acquiring vast amounts of land in developing countries for the production of biofuels. However, these firms did not consider the subsequent global recession and fall in the price of fossil fuels that led many of them to abandon their agricultural ventures (Mujenja and Wonani 2012; Sulle and Nelson 2013; Sulle 2015). In addition, the rapid scale of these investments, coupled with widespread activism on 'land grabs' forced many governments to reconsider their investment friendly policies. As a result prolonged negotiations with national governments, financial constraints, as well as changes in the policy environment further contributed to the withdrawal of agricultural investments (Nolte et al. 2016).

Large-scale agricultural investments have been heavily criticized for their adverse impacts on the tenure security of smallholders living in adjacent communities (HLPE 2011). The impacts of these investments on tenure security are particularly pertinent for smallholders in rural regions of sub-Saharan Africa, where formal title is largely absent and customary tenure is prevalent (Cotula 2011; HLPE 2011).

The importance of tenure security has been widely recognized by a vast literature (see for instance: Besley 1995; Braselle et al. 2002; Besley and Ghatak 2010; Fenske 2011). In addition to protecting land users from expropriation, tenure security is a key determinant of smallholders' plot investments and technical efficiency (Njikam and Alhadji 2017). Secure tenure has been found to enhance smallholder investments in the following ways: first, a lower probability of land expropriation provides an incentive for smallholders to undertake longer-term investments that yield higher returns. Second, if tenure security has been strengthened through, for example, the adoption of title, plots gain collateral value that can be used to obtain credit. Finally, if legally recognized property rights are available and an active land market exists where land can easily be sold or rented out, smallholders will have a higher plot valuation and incentive to invest in improving the quality of their plots. Braselle et al. (2002) refer to these three respective channels as the assurance, collateralization, and realizability effects. Of the three channels, it is the first that has received the most attention from development scholars. They have analysed how several factors such as political connectivity (Goldstein and Udry 2008; Markussen and Tarp 2014), inheritance customs (Dillon and Voena 2017), migration-induced population pressures (Grimm and Klasen 2015), and land reform programmes (Banerjee et al. 2002; Holden and Yohannes 2002; Deininger and Ali 2008; Leight 2016; Zikhali 2010) influence tenure security and investments.

Despite this vast literature, the relation between tenure security and smallholders' investments remains inconclusive, particularly when one considers the case of sub-Saharan Africa. Positive associations have been found between tenure security, fallow, agricultural productivity, and soil conservation (Besley 1995; Deininger and Ali 2008; Lovo 2016) while Migot-Adholla et al. (1991) find little support for the role of tenure security in enhancing productivity. This paper contributes to the literature by investigating how a reduction in the share of land held by agribusinesses and plantations in smallholder villages affect tenure security and plot-level investments. More specifically, we investigate the spill-over effects from a decrease in the share of land held by agribusinesses or plantations on smallholders *de jure* and *de facto* plot-level tenure security and investments in rural Tanzania.

Tanzania makes a good case for a study on the impacts of decreasing areas held by agribusinesses on adjacent smallholder communities. It was amongst the top 20 countries targeted for agricultural land investments in the late 2000s; however, recent data show that this is no longer the case (Nolte et al. 2016). The country also experienced a large influx of biofuel investments in the mid-2000s that later ceased their operations (Arndt et al. 2011; Sulle and Nelson 2013; Sulle 2015). Drawing on two waves of plot-level data from the Tanzania National Panel Survey (TZNPS) and adopting a plot and year fixed effects approach, we find that a decrease in the share of land held by agribusinesses significantly increases tenure security. Moreover, we find that the share of land cultivated by agribusinesses positively and significantly increases the time spent on plots but has no significant effect on fallow and other cash-intensive investments. Analysing other possible transmission mechanisms, we find that agribusinesses have a positive and significant impact on the number of household members employed in the agricultural sector.

Our findings provide insights for two important strands of literature; first they add a new dimension to the growing literature on the impacts of large-scale agricultural investments on neighbouring smallholder communities. This is the first paper to rigorously analyse the impacts of agribusinesses on smallholder tenure security and the first to investigate how smallholders are affected when agribusinesses cease or decrease their operations. Second, we contribute to the already existing but inconclusive literature on the impacts of tenure security on land-related investments.

The remainder of this paper is organized as follows: Section 2 provides an overview of the Tanzanian land tenure system and discusses the relation between agribusinesses and tenure security. Section 3 discusses the conceptual framework and hypotheses, while section 4 introduces the data and summary statistics. The econometric approach is presented in section 5. The results are presented in section 6 and section 7 concludes.

2 Tanzanian land tenure and agribusinesses

2.1 Land tenure system

The Tanzanian land tenure system has its roots in the 'villagization' programme that was introduced in the 1960s to encourage rural peasants and pastoralists living in chiefdoms and individual settlements to move into centrally planned *Ujamaa* villages (Collier et al. 1986; Odgaard 2006; Knight 2010). The villagization programme was expected to facilitate the use of modern agricultural techniques and ease the provision of goods and services. It was grounded in equity enhancing principles that allocated uniform plot sizes to households (Thiele 1986; Odgaard 2006). Similar land reforms were undertaken

across other sub-Saharan African countries such as Ethiopia (Kebede 2002). Despite this socialist backdrop, the programme had a distorting effect which was fuelled by the mass expropriation of land, forced resettlement, as well as uncertainty over the loss of family land (Knight 2010). In response to these distortions, the government of Tanzania initiated and tasked the Shivji commission with investigating and making recommendations on how these land issues could be addressed. The recommendations influenced the formulation of the 1995 National Land Policy as well as the enactments of the Land Act (responsible for the governance of urban land) and the Village Land Act in 1999. Following these acts, land tenure in Tanzania is classified into three main categories that comprise village land at 70 per cent, reserved lands at 28 per cent (set aside for forests, game reserves, public utilities, and land designated under the town and country planning ordinance), and general land (unassigned public land held by the Commissioner of Lands) which covers 2 per cent of all land (Odgaard 2006; Knight 2010; Byamugisha 2014).

According to the Village Land Act, the main institutions responsible for the governance of village land are: (i) the village assembly that includes all village residents above the age of 18 and elects the village council every five years; and (ii) the village council which is an elected committee that administers land on behalf of the village assembly (Odgaard 2006; Knight 2010). The village council is responsible for village land categorization into communal land (publicly used and occupied); land that is occupied on an individual or family basis under customary law; and vacant land that may be availed for communal or individual occupation in the future (Odgaard 2006; Wily 2003). Unlike other sub-Saharan African countries with customary law embedded in their historical traditions, the forced relocations into *Ujamaa* villages, abolishment of chiefdoms, and strong socialist policies pursued in the 1970s did away with all forms of custom (Knight 2010; Wily 2003). This complex history dissuaded the Village Lands Act from ascribing a fixed definition of customary rights and instead allows each village to determine their own rules and practices as long as they are not discriminatory and do not contradict Tanzanian land law. Thus customary law is often based on the customs or norms that were prevalent in the village prior to the introduction of *Ujamaa* (Knight 2010).

All land in Tanzania is vested in the president, and thus only 'customary rights of occupancy' can be granted to village landowners by the village council. Customary rights of occupancy may be granted either verbally or in writing. They carry as much weight and validity as the granted rights of occupancy that apply to general lands (Knight 2010). Customary rights of occupancy accord landowners usufruct and transfer rights that include the rights to sell, gift, endow, rent, and collateralize their plots. A major contribution of the Village Lands Act has been to recognize the legality of transferable and inheritable use rights on village land. However, the Act does not clarify whether customary rights of occupancy are a prerequisite for land users to exercise their transfer rights (Odgaard 2006).

One of the key stipulations of the Village Land Act is that a village first has to be formally registered and has to have obtained a certificate of village land before any of the provisions of the Village Land Act can be brought into force. Certificates of village land can only be awarded after villages have harmonized their boundaries with neighbouring villages; demarcated their land into communal, individual, and reserve land; and undertaken a cadastral survey. The application is submitted to the district officer, who drafts the certificate for approval by the village council. Once the village council approves the certificate, it is then sent to the Commissioner of Lands for final approval. This step-wise process is purposefully designed to protect villagers' rights and to allow communities to govern themselves (Knight 2010; Byamugisha 2014).

The implementation of the Village Land Act had a slow start due to the lack of finances and administrative capacity. In 2004, former Tanzanian President Benjamin Mkapa, set up the 'Property and Business Formalisation Programme' (MKURABITA) with the assistance of Peruvian economist Hernando de Soto to hasten the process (Pedersen 2012; Ali et al. 2016; Byamugisha 2014). Several pilot land formalization projects have been carried out under MKURABITA and by 2011, the number of villages that had their land registered increased to 60 per cent. Despite the increase in the number of village certifications, the uptake of individual and household titles has been very low with only 0.4 million household and individual titles being registered in 2011 (Byamugisha 2014). One of the major factors behind this low uptake of title has been the high costs of formalization which are not affordable for poor households (Ali et al. 2016).

2.2 Agribusinesses and tenure security

The Tanzanian government actively promotes agribusinesses as one of the main pillars of its *Kilimo Kwanza* strategy (Agriculture First) that aims to make agriculture the mainstay of the economy. For instance, the government initiated the Southern Agricultural Growth Corridor of Tanzania (SAGCOT) in 2010 (SAGCOT 2011; Sulle and Nelson 2013). SAGCOT's objective is to increase the profitability of the agricultural sector by promoting clusters that incorporate all phases of the agricultural value chain, starting from agricultural research stations and large-scale farms and ranches with out-grower schemes, to processing, storage, and transport facilities (SAGCOT 2011).

Despite these efforts by the government, the number and size of agribusinesses have reduced in the last years. The current wave of agribusinesses has largely been driven by the global crisis that resulted in an increase in the demand for land to be used for the cultivation of biofuels (Arndt et al. 2011). Sulle and Nelson (2013), estimate that by 2009, over 4 million hectares of land had been requested for the cultivation of jatropha, sugar cane, and oil palm. Investments covering 2.5 per cent of this land (100,000 hectares) were granted full rights of occupancy. Many of these investments ceased their operations just a few years after being granted these rights of occupancy (Sulle and Nelson 2013; Sulle 2015). This decrease in biofuel-related investments has also occurred in other sub-Saharan African countries. In neighbouring Zambia, for instance, the global recession led many of the agribusinesses that acquired land for biofuel production, particularly jatropha to cease their operations (Mujenja and Wonani 2012).

The withdrawal of agribusinesses from village land has fuelled a discussion on their impacts on smallholder land tenure security (Sulle and Nelson 2013). Agribusinesses and other private entities are only allowed to lease land that falls under general land (Cotula et al. 2009). If an agribusiness identifies suitable village land or is shown prospective village land by the Tanzania Investment Centre, the village assembly will decide whether to allocate land to the agribusiness or not. Some of the key criteria considered are whether the agribusiness will contribute to the economy and wellbeing of locals as well as whether the area of land being requested is so extensive that it 'will impede the present and future occupation and use of village land by persons ordinarily resident in the village' (United Republic of Tanzania 1999: 108). When a decision has been made, the village council is entitled to grant a maximum of 5 hectares of land without external approval, 5 to 30 hectares with the approval of the village assembly, and more than 30 hectares with the approval of both the village assembly and the Commissioner of Lands (Knight 2010). The agribusiness will only be able to access the land after undergoing a series of negotiations with the village council, the district council land committee, and village assembly which result in the conversion to general land.

While the Village Land Act has several checks and balances that protect villagers' tenure security from outsiders, there are legal loopholes that can be used to circumvent the Act. First, the President of Tanzania retains the right to transfer land from village land to general or reserved land (compulsory acquisition) as long as it is in the interest of the public. Since agribusinesses may be deemed to be of national interest, villages face the risk of having their land expropriated for such investments. Village assemblies have the right to approve or reject the partitioning of village land but only if the area identified by the Tanzanian government is less than 250 hectares (Knight 2010).

Moreover, there is a discrepancy in the definitions of general land between the two land acts, which may result in the conversion of village land to general land without villagers' consent. According to the Village Land Act, general land is defined as 'all public land which is not reserve land or village land'. However, in the definition provided by the Land Act, general land also includes unoccupied or unused village land (Knight 2010). Since village land may often be left unused or under long durations of fallow to allow for soil replenishment or rejuvenation of pasture, considering unused village land as general land may reduce the amount of land available to smallholders. Once converted, general land is out of bounds to smallholders and cannot be accessed even after the agribusiness has ceased its operations and left the village (Sulle and Nelson 2013).

3 Conceptual framework and hypotheses

3.1 Plot-level tenure security and decreasing agribusiness sizes

The first part of the empirical analysis is concerned with how a decrease in the share of land cultivated by agribusinesses in a village may affect smallholder plot-level tenure security. As noted in the previous section, the Tanzanian land tenure system protects smallholders' land rights and uncertainty over land tenure security mostly arises after the agribusiness has failed and smallholders are not able to reclaim their land. The heightened uncertainty that comes with the failure of agribusinesses may increase smallholders' needs to secure their plots by acquiring individual title. Based on this, we formulate the following hypotheses:

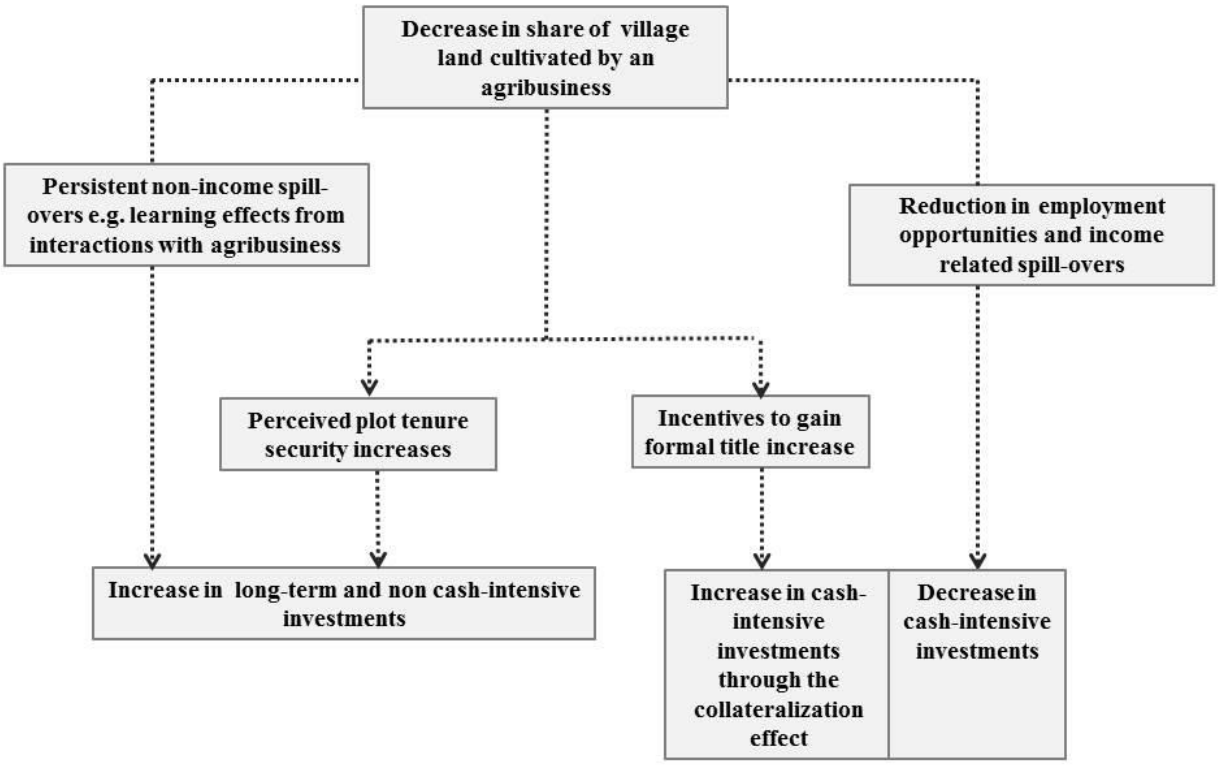
Hypothesis 1a: *A decrease in the share of land held by an agribusiness at the village level increases smallholders' incentives to gain* de jure *tenure security.*

Our definition of *de jure* tenure security is not restricted to customary rights of occupancy but also includes other forms of recognized title such as letters from the village assembly, letters of inheritance, and agreements certified by the local court which are less costly.

Hypothesis 1b: *A decrease in the share of land cultivated by an agribusiness at the village level increases smallholders' plot-level* de facto *tenure security.*

Smallholders' perceptions of plot security are taken as the *de facto* measure of tenure security. It is expected that once the agribusinesses decrease the share held or leave a village smallholders perceive that their plots are more secure.

Figure 1: Conceptual framework



Source: Author's illustration.

3.2 Plot-level tenure security and decreasing agribusiness sizes

The impacts of a decrease in the area held by agribusinesses on plot-level investments are more ambiguous. Theoretical works show that a decrease in tenure security reduces agricultural investments (Besley 1995; Besley and Ghatak 2010). Based on this, it is likely that if a decrease in the area cultivated by agribusinesses increases smallholders *de jure* tenure security, smallholders will have collateral that can be used to obtain credit and increase cash-intensive investments. This is the collateralization effect (Braselle et al. 2002; Maiangwa et al. 2004). Moreover, if a decrease in the area cultivated by agribusinesses increases smallholders' perceived tenure security; it may raise their incentives to invest in long-term cash-intensive investments through the assurance effect.

Another strand of literature on large-scale agricultural investments provides evidence for positive spill-overs from agricultural investments to nearby smallholder communities (for example, Sipangule and Lay 2015; Deininger and Xia 2016). If agribusinesses increase smallholders' employment opportunities and raise income levels, smallholders are more likely to engage in cash-intensive investments. When agribusinesses cease their operations, these cash-generating opportunities dissipate (Sulle and Nelson 2013). However, if the presence of an agribusiness results in smallholder learning effects, a decrease in the area held by agribusinesses will not reduce smallholders' non-cash-intensive plot-level investments.

Thus, as shown in Figure 1, it is likely that agribusinesses can affect plot-level investments both negatively and positively and that the net effect will depend on the cash intensiveness of the smallholder plot-level investments.

Based on this we posit the following:

Hypothesis 2a: *Due to a learning effect, a decrease in the share of land cultivated by an agribusiness does not reduce smallholders' non-cash-intensive investments.*

Hypothesis 2b: *Due to a rise in smallholders' tenure security, a decrease in the share of land cultivated by an agribusiness increases smallholders' cash-intensive investments.*

Hypothesis 2c: *Due to a reduction in smallholders' employment and income generating activities, a decrease in the share of land cultivated by an agribusiness reduces smallholders' cash-intensive investments.*

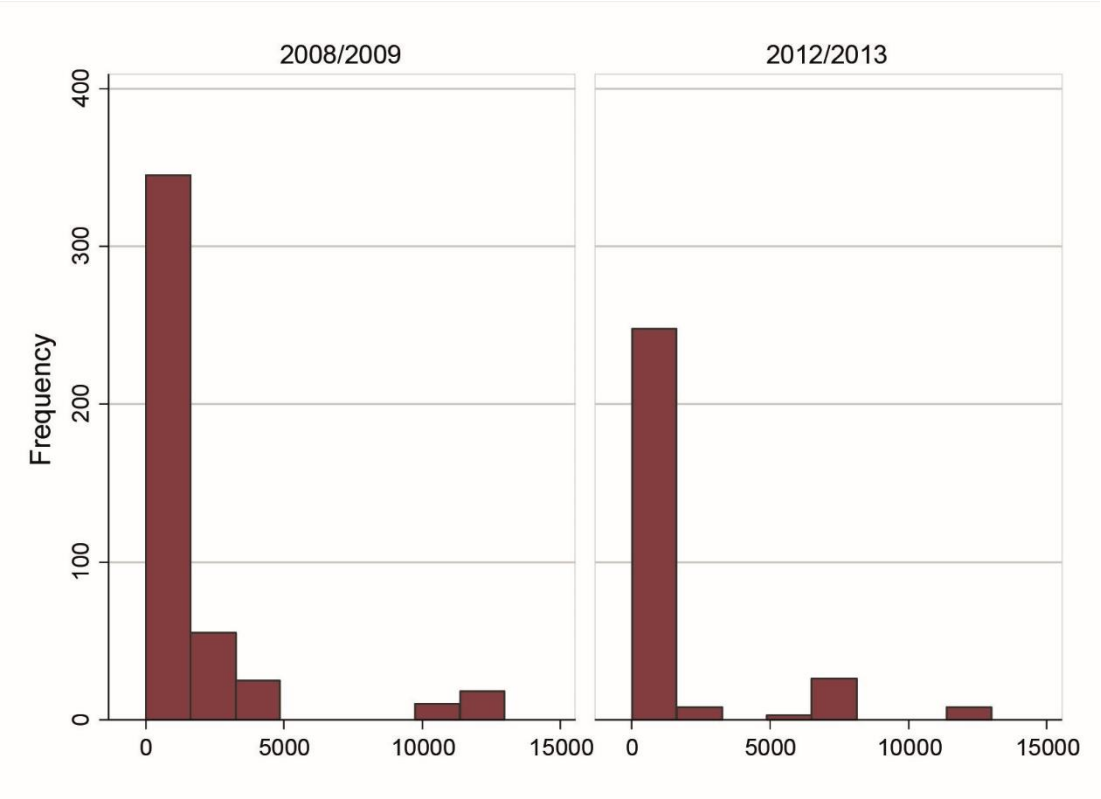
4 Data and summary statistics

The data used in this paper are sourced from the first and third rounds of the Tanzania National Panel Survey (TZNPS). The TZNPS is collected by the Tanzania National Bureau of Statistics as part of the Living Standards Measurement Study Integrated Surveys on Agriculture (LSMS-ISA) (United Republic of Tanzania n.d.). The first round of the TZNPS was collected between October 2008 and September 2009 and the third between October 2012 and November 2013. The first round visited 3,265 households across 409 enumeration areas across rural and urban areas in Tanzania and Zanzibar. The third wave interviewed 5,015 households. The surveys have a low attrition rate of 4.84 per cent. The TZNPS are ideal for our analysis as they contain detailed information at the household, plot, and village levels. We restrict the sample to plots that have been cultivated in rural areas during *Masika*—the long rainy season. The 2008/2009 dataset originally contains 5,128 plots which reduce to 2,554 plots after we impose these restrictions. We use the data from the same plots in 2012/2013 and end up with a panel of 5,101 plots.

The information on the land held by agribusinesses in each wave is taken from the community questionnaire. The community questionnaires were administered at the enumeration area level to village chairpersons, executive officers, and several sub-village chair people. In rural areas, enumeration areas roughly follow village boundaries and can thus be considered as providing village level information. There are 746 plots in villages that report having experienced an increase in the area cultivated by agribusinesses over the study period; 1,409 report a decrease while 2,946 report no change in the area cultivated by agribusinesses at the village level.

Figure 2 shows the distribution of the acres cultivated by agribusinesses in villages in 2008/2009 and 2012/2013. It is clear that both the frequency and size of the land cultivated by agribusinesses have reduced over the last four years. This is in line with other literature that points out that many of the agribusinesses that were allocated agricultural land cultivation did not come into fruition or ceased their operations (Sulle and Nelson 2013; Sulle 2015).

Figure 2: Acres held by agribusinesses in 2008/2009 and in 2012/2013



Source: Author's calculations based on TZNPS data (United Republic of Tanzania, n.d.).

The locations of the villages that report that they have agribusinesses are shown in Figures 3a and 3b. In 2008/2009, 29 per cent of the villages (represented by the green pins) reported that they had an agribusiness or plantation cultivating land in their village. By 2012/2013 the number of villages reporting that part of their land was being cultivated by an agribusiness reduced to 18 per cent. From Figure 3a, it is clear that agribusinesses tend to be clustered in some parts of Tanzania while other regions do not have any villages that report that they have an agribusiness cultivating land.

A key question that emerges is how the locations of agribusinesses are determined. Since agribusinesses are profit orientated, it is likely that their locations are not determined at random. Literature on the determinants of large-scale agricultural investments has found that weak land governance and institutions are amongst the most important determinants of the location of large-scale agricultural investments (Nolte 2014; Arezki et al. 2015). If village level tenure security influences the likelihood that an agribusiness is set up in that village, our analysis may be prone to endogeneity bias.

Figure 3a: Agribusiness locations in 2008/2009

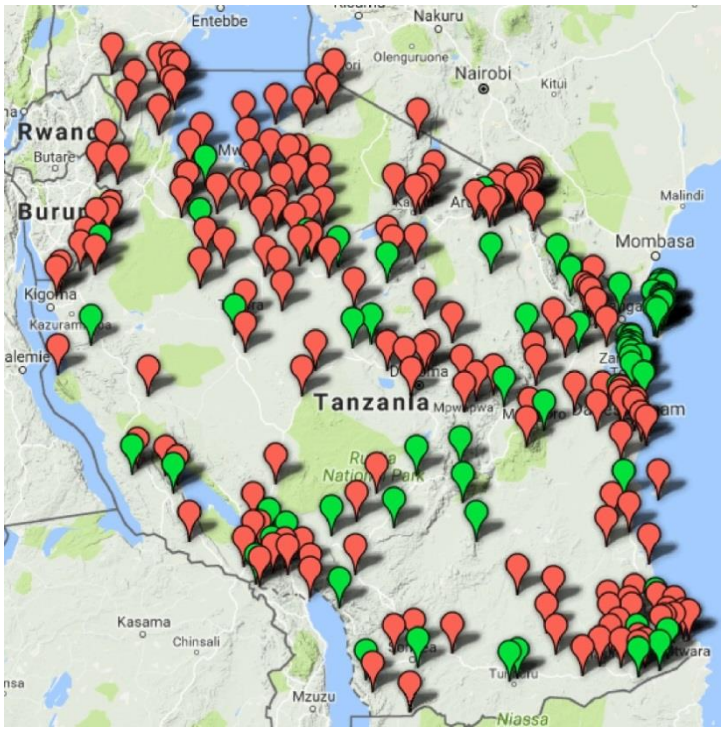
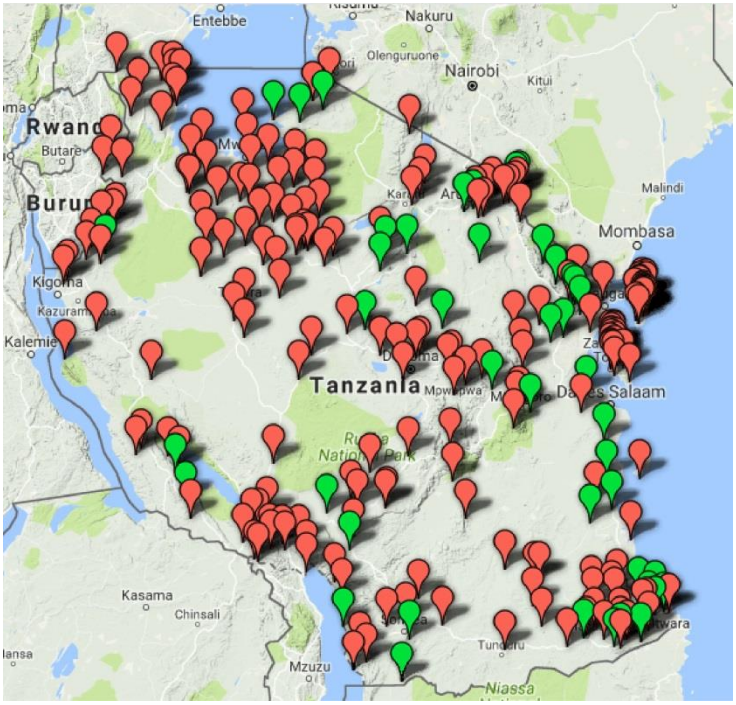


Figure 3b: Agribusiness locations in 2012/2013



Note*:* The green pins indicate the villages with agribusinesses while the red ones are villages without agribusinesses.

Source: Author's illustration using TZNPS data (United Republic of Tanzania n.d.).

In the preceding sections, we outlined the various rounds of negotiation that need to be completed before an agribusiness is granted village land. This tedious process acts as a deterrent to agribusinesses and protects smallholders' interests. The exception is when the state uses its powers to obtain untitled village land under the Compulsory Acquisition Act. However, since all land is vested in the president, village tenure security levels should not play a major role in determining which villages have their land expropriated by the Compulsory Acquisition Act. It is more likely that the state considers market accessibility, the availability of agricultural land, and agro-climatic conditions when enacting the Compulsory Acquisition Act. The TZNPS does not contain information on the mode of land acquisition followed by agribusinesses. Thus we draw on data from the 2007/2008 Agricultural Sample Census on Large Scale Farms (Tanzania National Bureau of Statistics 2009). The 2007/2008 Agricultural Sample Census covers a total of 1,006 large-scale farms (968 for the mainland and 38 for Zanzibar). It provides a good estimate of the land acquisition process of agribusinesses in our sample as the data collection phase coincides with the first wave of the TZNPS. The information presented in Table 1 confirms that most land acquired by private agribusinesses is obtained via leasehold on general land. This proves that agribusinesses prefer already titled land and are less likely to be located in villages with low tenure security. We revert to this discussion after we have introduced the empirical specification in the next section.

Table 1: Modes of land acquisition by large-scale farms (hectares)

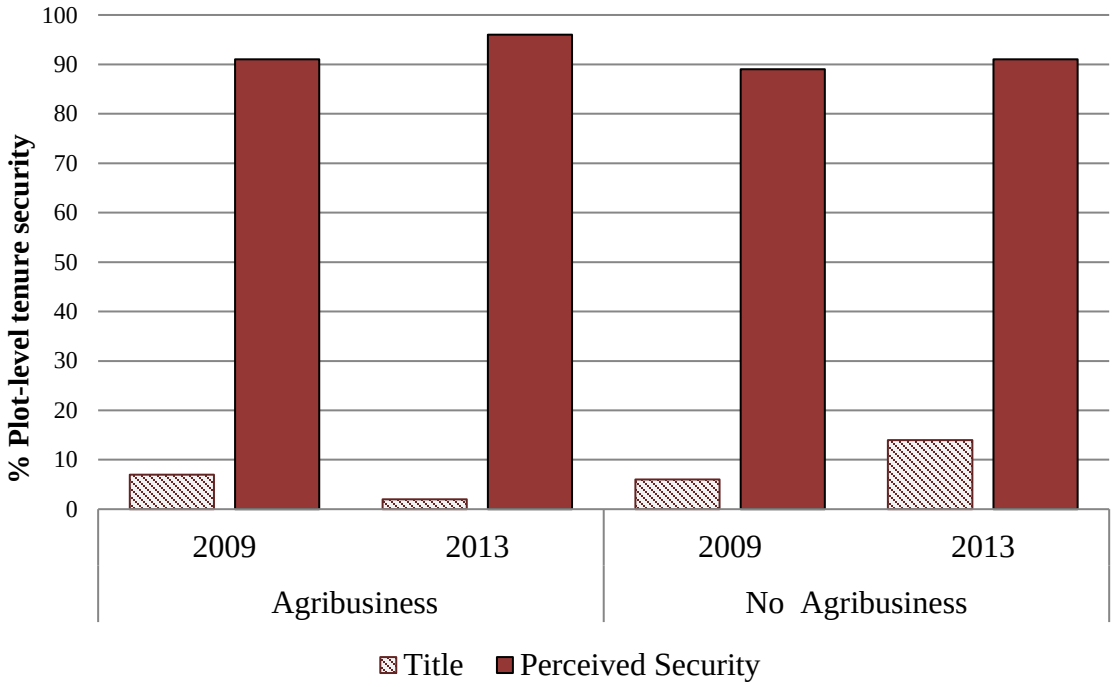
	Lease	Customary	Purchase	Rent	Borrow	Compulsory	Total
State	422,987	15	117	5	217	26,953	450,294
Private	600,868	3,866	13,360	2,135	779	2,109	49,202
Other	18,454	11,541	4,708	735	1,717	3,324	40,479
Total	1,042,309	15,422	18,185	2,875	2,713	32,386	1,653,865

Source: Author's calculations using data from the 2007/2008 Agricultural Sample Census on Large Scale Farms (Tanzania National Bureau of Statistics 2009).

To analyse plot-level tenure security, we rely on two measures from the TZNPS. The first provides information on all plots that have title (*de jure* tenure) while the second is based on a question that asks whether plot cultivators are comfortable with leaving their plot fallow for several months without worrying that it will be lost, which indicates whether a plot is perceived as secure (*de facto* tenure). Figure 4 graphs the distribution of these. From this graph we observe that in 2008/2009, villages with agribusinesses had slightly more title than villages without agribusinesses. In both villages, perceived security is already quite high at approximately 90 per cent in 2008/2009; still, villages with agribusinesses experience a slight increase in 2012/2013.

Table 2 compares the socio-economic and plot-level characteristics of smallholders in villages with and without agribusinesses over the two study periods. From the table, we can see that the number of plots in villages with agribusinesses reduces considerably over the study period. In 2008/2009 households in villages with agribusinesses tend to have significantly more assets and a lower number of heads with primary education. In addition, plots in villages with agribusinesses tend to be smaller and to have lower ownership rates as compared to villages without agribusinesses. These plots are also less likely to have suffered from erosion and have a higher value per acre in 2008/2009. However in 2012/2013, many of these differences no longer exist. The only significant differences that persist are that household heads in villages with agribusinesses tend to be younger and tend to apply more kilograms of fertilizer per acre on their plots.

Figure 4: Distribution of plot-level tenure security across villages and time



Source: Author's calculations using data from TZNPS (United Republic of Tanzania n.d.).

Table 2: Socio-economic and plot-level characteristics of smallholders in villages with and without agribusinesses

	2008/2009				2012/2013			
	Agribusiness		No agribusiness		Agribusiness		No agribusiness	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Household characteristics								
Age of household. head	**47.76**	**14.16**	**46.63**	**14.89**	**47.94**	**15.14**	**50.52**	**14.74**
Female household head	0.18	0.38	0.19	0.39	0.13	0.34	0.21	0.41
No. of household members	5.62	2.52	5.82	3.04	5.79	1.84	6.14	3.22
Head with primary education	**0.49**	**0.50**	**0.70**	**0.46**	0.74	0.45	0.63	0.48
Hh expenditure per hh member*	380,829	228,825	402,705	278,706	561,314	231,985	592,017	396,887
Asset_index	**0.08**	**0.06**	**0.07**	**0.07**	0.21	0.10	0.21	0.12
Plot characteristics								
Acres	**1.67**	**3.57**	**2.58**	**5.78**	2.12	2.63	2.40	4.43
Years plot cultivated	18.46	13.95	17.57	13.51	19.45	13.83	20.35	14.21
Plot owned by hh	**0.75**	**0.43**	**0.90**	**0.30**	0.92	0.27	0.86	0.35
Female head owns plot	**0.12**	**0.32**	**0.16**	**0.36**	0.11	0.32	0.18	0.39
Female head decides	0.12	0.33	0.15	0.36	0.13	0.34	0.20	0.40
Plot wetness index	13.17	3.18	13.57	4.66	13.43	1.68	13.87	4.09
Soil eroded	**0.10**	**0.30**	**0.16**	**0.36**	0.11	0.32	0.11	0.32
Plot value per acre	**1,096,132**	**5,358,897**	**982,225**	**5,318,945**	629,728	722,201	1,315,742	489,1109
Plot-level investments								
Intercropping	**0.28**	**0.45**	**0.43**	**0.49**	0.42	0.50	0.41	0.49
Fallow duration	0.18	0.73	0.23	1.50	0.04	0.19	0.04	0.29
Days spent on plot	**123.12**	**108.23**	**107.58**	**109.30**	80.92	75.89	76.42	76.51
Fertilizer kg per acre	58.05	366.31	88.65	594.02	**215.15**	**656.54**	**81.27**	**490.42**
Observations	**703**		**1,475**		**53**		**2,122**	

Note: *Expenditures in Tanzanian Shillings. Statistically significant p-values in bold. The p-values are based on two-sided Mann-Whitney tests, the continuous variables and chi-squared tests for the binary variables.

Source: Author's calculations using data from TZNPS (United Republic of Tanzania n.d.).

5 Econometric approach

This section presents the econometric specifications that test the hypotheses stated in the preceding section. We estimate the determinants of plot-level tenure security as follows:

$$T_{pht} = \beta_1 A_{vt} + \beta_2 X_{phvt} + \omega_{ph} + \theta_t + \varepsilon_{1phvt} \quad (1)$$

where T_{pht} is a dichotomous variable that takes the value of one if the plot p of household h in time t has title (*de jure* tenure security) or the cultivator can leave the plot fallow for several months without fear of expropriation (*de facto* tenure security). A_{vt} represents the share of land cultivated by the agribusiness in each village. In results reported in the Appendix, A_{vt} takes on the form of a dichotomous variable that is equal to one if a village has an agribusiness. X_{phvt} is a vector of time varying plot, household, and village level controls that include, amongst others, soil quality, years that the plot has been owned, the number of household members, and the age of the household head. ω_{ph} are plot fixed effects; θ_t are year fixed effects and ε_{phvt} is an error term.

To examine whether the share of land held by an agribusiness affects smallholder investment decisions at the plot-level, we estimate regressions of the following form:

$$I_{pht} = \delta_1 A_{vt} + \delta_2 \tau_{pht} + \delta_3 A_{vt} * \tau_{pht} + \delta_4 X_{phvt} + \omega_{ph} + \theta_t + \varepsilon_{2phvt} \quad (2)$$

In this case, I_{pht} represents the land investment choice; τ_{pht} is a tenure index for the plot created by taking the first component from a principal component analysis. $A_{vt} * \tau_{pht}$ is an interaction between the share of land held by an agribusiness and the index of tenure security. ε_{2phvt} is the error term. The dichotomous dependent variables in Equations 1 and 2 are estimated using linear probability models while the continuous variables in equation 2 are estimated using Honoré's (1992) trimmed least absolute deviations panel tobit estimator that controls for censoring of the dependent variable that arises from not all cultivators reporting that they have undertaken plot-level investments. This is executed using the pantob command in the Stata statistical software package. Linear probability models are favoured as fixed effects are not compatible with panel probit models.

Both regressions are estimated using plot and year fixed effects to allow for comparability and to control for time invariant unobservables that may bias the results. As the unobserved differences across plots may not be random or uncorrelated with the predictor and independent variables, fixed effects are better suited to control for this. A Hausman test also rejects the null hypothesis that the errors are correlated with the regressors confirming that plot-level fixed effects are a better fit.

As discussed in the previous section, the results obtained after estimating equation 1 would be biased if the location of an agribusiness was determined by the village level tenure security. To check for this bias, we employ a probit model to analyse the determinants of agribusiness locations in 2008/2009. Based on studies that have analysed the determinants of agribusiness locations at more aggregated levels (see Arezki et al. 2015), we adopt the following specification:

$$A_v = \alpha_1 T_v + \alpha_2 C_v + \alpha_3 D_v + \alpha_4 X_v + \varepsilon_{3v} \quad (3)$$

where C_v is a vector of village agro-climatic variables; D_v is a vector of distance variables, and X_v is a vector of other village specific characteristics.

6 Results

This section presents the study results. We start by presenting marginal effects of the probit model on the determinants of agribusiness locations. From Table 3, we can see that the main determinants of agribusiness locations in 2008/2009 are the distance to the market and district headquarters as well as rainfall patterns. None of the measures of village level tenure security (percentage of plots with *de jure* and *de facto,* the possession of a village certificate) are significant. This confirms the evidence presented in section 4 and makes us confident that endogeneity is not a major problem for our analysis.

Table 3: Determinants of agribusiness locations in 2008/2009

VARIABLES	(1) Probit
Distance to market (ln)	0.128***
	(0.045)
Distance to district headquarters (ln)	-0.100**
	(0.045)
Annual village rainfall (ln)	0.308**
	(0.135)
Annual village temperature	0.354
	(0.327)
Village has certificate (1 = Yes)	-0.105
	(0.092)
Plots with title (%)	-0.003
	(0.003)
Plots perceived as secure (%)	-0.002
	(0.003)
Village Infrastructure	0.306
	(0.210)
Village head is educated	0.045
	(0.053)
Total village size (ln)	-0.002
	(0.026)
Observations	217
Regional FE	YES

Note: Marginal effects from probit model reported in table. Standard errors in parentheses.
Statistical significance *** p<0.01, ** p<0.05, * p<0.1.

Source: Author's calculations using data from TZNPS (United Republic of Tanzania n.d.).

We now proceed to analyse how a decrease in the area cultivated by an agribusiness affects plot-level security. The results are presented in Table 4. Columns 1 and 3 present parsimonious specifications, while columns 2 and 4 report the full models with household, plot, and village time variant observables.

From Table 4 we can see that if the share of land held by agribusinesses increases by one unit, the probability that plots have both *de jure* and *de facto* tenure security reduces. This reduction is significant for all specifications except the restricted model on perceived tenure security in column 3. Inversely interpreted, a one-unit decrease in the share of land held by an agribusiness results in a 33 to 39 per cent increase in the probability that a plot has *de jure* tenure security and a 13 per cent increase in the probability that a plot has *de facto* tenure security. This increase is significant both in economic and statistical terms and is indicative of the smallholders' response to the high uncertainty that arises from the departure of an agribusiness. Based on this we find evidence in favour of Hypotheses 1a and 1b. As a robustness check, we use a dichotomus variable that is equal

to 1 if a village has an agribusiness. The results are reported in Table A1 in the Appendix. We find a similar increase in *de jure* tenure security but nor for *de facto* tenure security.

Table 4: Regression analyses of plot-level tenure security and the share of land cultivated by agribusinesses

VARIABLES	(1) Land title	(2) Land title	(3) Perceived tenure	(4) Perceived tenure
Agribusiness share	-0.330***	-0.388***	-0.042	-0.133*
	(0.080)	(0.090)	(0.076)	(0.070)
Age of household head		0.004*		0.000
		(0.002)		(0.002)
Number of household members		0.000		-0.000
		(0.005)		(0.004)
Head has primary education = 1		0.025		0.037
		(0.030)		(0.025)
Female household head		-0.027		-0.088*
		(0.038)		(0.052)
Log of expenditure		0.042**		-0.014
		(0.018)		(0.014)
Log off-farm income		-0.000		0.001
		(0.002)		(0.002)
Log plot size		-0.014		-0.010
		(0.022)		(0.017)
Age of plot		-0.000		0.000
		(0.001)		(0.001)
Soil quality		0.005		0.005
		(0.013)		(0.010)
Log of plot value		0.016*		0.004
		(0.008)		(0.006)
Plot owned by household		-0.219*		0.061
		(0.112)		(0.067)
Village certificate = 1		0.001		-0.006
		(0.016)		(0.014)
Log of total village area		0.004		0.002
		(0.002)		(0.002)
Constant	0.143***	-0.713**	0.910***	1.035***
	(0.007)	(0.333)	(0.005)	(0.247)
Observations	4,345	4,067	4,995	4,074
R-squared	0.039	0.057	0.001	0.015
Number of plot_ident	2,395	2,352	2,554	2,354
Crop controls	YES	YES	YES	YES
Year	YES	YES	YES	YES

Note: Robust standard errors in parentheses, statistical significance*** p<0.01, ** p<0.05, * p<0.1.

Source: Author's calculations using data from TZNPS (United Republic of Tanzania n.d.).

To better understand this result, we take advantage of our dataset that allows us to distinguish between plots that are located in villages that have experienced an increase and decrease in the area cultivated by agribusinesses over the study period. In Table 5, we can see that the results reported in columns 1 and 2 of Table 4 are mostly driven by a decrease in the share of land cultivated by agribusinesses. We observe that plots in villages that have experienced a reduction in the share of land cultivated by agribusinesses have significantly more title. Comparing these results with Figure 4, we can see that perceived security is already quite high across plots (above 90 per cent) so that a slight increase does not make a significant difference.

Table 5: Regression analyses of plot-level tenure security and changes in the share of land cultivated by agribusinesses

VARIABLES	(1) Land title	(2) Perceived tenure
Increase in agribusiness share	0.001	0.003
	(0.014)	(0.013)
Decrease in agribusiness share	0.037***	0.006
	(0.012)	(0.010)
Constant	0.124***	0.906***
	(0.008)	(0.007)
Observations	4,345	4,995
Number of plot_ident	2,395	2,554
Crop controls	YES	YES
Year	YES	YES

Note: Robust standard errors in parentheses. Statistical significance *** p<0.01, ** p<0.05, * p<0.1.

Source: Author's calculations using data from TZNPS (United Republic of Tanzania n.d.).

Table 6: Regression analyses of non-cash-intensive investments and the share of land cultivated by agribusinesses

VARIABLES	(1) Days on plot	(2) Fallow
Agribusiness share	96.504***	7.086
	(33.276)	(13.329)
Tenure_index	14.544	-0.607
	(15.284)	(6.373)
Tenure and Agri_share	-46.734	3.233
	(39.995)	(9.065)
Age of household head	-0.029	-0.000
	(0.659)	(0.273)
Number of household members	7.890***	-1.647
	(2.476)	(1.772)
Head has primary education	-0.938	0.818
	(11.040)	(12.087)
Female household head	9.893	-5.094
	(13.893)	(0.000)
Log of expenditure	-1.413	-2.065
	(7.209)	(3.423)
Log off-farm income	2.868***	0.689
	(0.893)	(0.550)
Log plot size	27.397***	2.796
	(10.593)	(8.555)
Age of plot	-0.214	-0.036
	(0.346)	(0.044)
Soil quality	10.556**	-0.321
	(4.473)	(1.133)
Log of plot value	4.815	0.916
	(3.859)	(1.385)
Plot owned by household	1.545	2.379
	(31.098)	(0.000)
Village certificate	3.415	-8.862***
	(6.224)	(3.336)
Observations	4,067	4,067
Crop Controls	YES	YES
Year	YES	YES

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Source: Author's calculations using data from TZNPS (United Republic of Tanzania n.d.).

Having established that a decrease in the share of land held by agribusinesses positively affects the probability that a plot has tenure security, we now proceed to analyse how plot-level investments are affected. Table 6 reports these results. We find a significant and positive relation between the share of land held by an agribusiness and the total days that household members spend on the plot but do not find any significant effect for fallow. Recalling Figure 3, over 90 per cent of the plot cultivators reported that they are not afraid of leaving their plots fallow, thus it is not surprising that the effect on fallow duration is not significant.

Subsequently, we analyse whether the share of land held by agribusinesses affects cash-intensive investments. We analyse the impact on the use of improved seeds, irrigation, fertilizer, and the total days spent by hired labourers on a plot. The TZNPS does not include information on plot demarcation or fencing that are also typically analysed in the literature. We do not find any evidence that suggests that the share of land held by an agribusiness or tenure security significantly affects cash-intensive investments. The results are reported in Table A2 in the Appendix.

In the conceptual framework (Figure 1), we showed that agribusinesses may also affect smallholders' plot-level investments through spill-overs that persist even after the agribusinesses have ceased their operations. Table 4 shows that agribusinesses raise the number of days spent on the plot through channels other than tenure. To investigate these transmission channels, we employ a household and year fixed effects specification to analyse how the share cultivated by an agribusiness affects households' engagement in contract farming, the number of household members employed in the agricultural sector, and household expenditure. The results are reported in Table 7.

Table 7: Regression analyses of transmission channels and the share of land cultivated by agribusinesses

VARIABLES	(1) Contract_farm	(2) Employment	(3) Expenditure
Agribusiness share	0.010	0.907***	-0.157
	(0.014)	(0.223)	(0.125)
Age of household head	-0.003	-0.004	0.036***
	(0.002)	(0.016)	(0.010)
Age of head squared	0.000	0.000	-0.000***
	(0.000)	(0.000)	(0.000)
Number of household members	0.001	0.038***	0.095***
	(0.002)	(0.014)	(0.009)
Head has primary education = 1	0.006	-0.056	0.073*
	(0.005)	(0.077)	(0.044)
Female household head	0.013	0.146	-0.121*
	(0.014)	(0.140)	(0.064)
Constant	0.069	0.011	12.903***
	(0.045)	(0.415)	(0.263)
Observations	2,815	2,815	2,810
R-squared	0.007	0.064	0.405
Number of hh_id	1,410	1,410	1,410
Year	YES	YES	YES

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Source: Author's calculations using data from TZNPS (United Republic of Tanzania n.d.).

From Table 7, we can see that an increase in the share of land held by an agribusiness in a village increases the number of household members employed in the agricultural sector. Similarly, a decrease in the share of land held by an agribusiness reduces the number of workers employed in the agricultural sector. Columns 1 and 3 show that contract farming and household expenditure are not significantly affected by a change in the share of land held by agribusinesses. This confirms that the significant effect observed on the time spent on the plot in Table 4 is driven through a

spill-over effect that arises when smallholders are employed by agribusinesses and not tenure security. This finding is in line with Hypothesis 2a.

7 Conclusion

This paper investigates how a decrease in the share of land held by an agribusiness in a village affects smallholder plot-level tenure security and investments in rural Tanzania. Taking the literature on tenure security and plot-level investments as a starting point, we find that a decrease in the amount of land held by an agribusiness at the village level, increases smallholders' *de jure* and *de facto* tenure security. The uncertainty that arises after agribusinesses cease their operations and smallholders lose their access to village land, leads smallholders to obtain title for their plots. Since customary rights of occupancy are costly, smallholders also obtain other forms of recognized title such as letters from the village assembly, letters of inheritance, and agreements certified by the local court.

Analysing how agribusinesses affect smallholder plot investments, we find that the share of land held by agribusinesses raises the time spent by household members on their plots. This result is not driven by changes in tenure security but is likely to be driven by a learning effect that comes from employment on the agribusiness. Since employment in the agricultural sector often takes a seasonal nature, smallholders can increase the time invested on the plot while holding short-term jobs provided by the agribusinesses. Taken together, our study reveals the importance of taking a comprehensive impact assessment of agribusinesses on local populations. Agribusinesses can have productivity-enhancing effects on smallholders by increasing the time invested on plots but can also have adverse impacts such as raising uncertainty once they cease their operations. In order to mitigate these adverse impacts, the existing land framework should be revised to ensure that smallholders are able to reclaim their land if agribusinesses do not come into fruition or cease their operations. In addition, more information should be provided to smallholders via the village assemblies and councils on the implications (both positive and negative) that arise from the coming of agribusinesses.

A limitation faced by this study is that we were not able to distinguish between the crops grown and the nature of the agribusiness. It is quite likely that the impacts on smallholder tenure security differ if one considers the different agricultural models and land acquisition procedures followed by the agribusinesses. Further research is needed to analyse these effects in more detail.

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Appendix

Table A1: Regression analyses of plot-level tenure security and the presence of agribusinesses

VARIABLES	(1) Land title	(2) Land title	(3) Perceived tenure	(4) Perceived tenure
Village has agribusinesses	-0.072***	-0.087***	0.025*	-0.014
	(0.016)	(0.020)	(0.013)	(0.013)
Age of household head		0.004*		0.000
		(0.002)		(0.002)
Number of household members		-0.001		-0.000
		(0.005)		(0.004)
Head has primary education = 1		0.028		0.038
		(0.030)		(0.024)
Female household head		-0.026		-0.089*
		(0.037)		(0.052)
Log of expenditure		0.044**		-0.014
		(0.018)		(0.014)
Log off-farm income		0.000		0.001
		(0.002)		(0.002)
Log plot size		-0.011		-0.009
		(0.022)		(0.017)
Age of plot		-0.000		0.000
		(0.001)		(0.001)
Soil quality		0.005		0.005
		(0.013)		(0.010)
Log of plot value		0.014*		0.003
		(0.008)		(0.006)
Plot owned by household		-0.215*		0.062
		(0.112)		(0.067)
Village certificate = 1		-0.002		-0.005
		(0.016)		(0.014)
Log of total village area		0.006**		0.002
		(0.003)		(0.002)
Constant	0.146***	-0.711**	0.905***	1.030***
	(0.007)	(0.331)	(0.006)	(0.246)
Observations	4,345	4,067	4,995	4,074
R-squared	0.040	0.058	0.002	0.013
Number of plot_ident	2,395	2,352	2,554	2,354
Crop Controls	YES	YES	YES	YES
Year	YES	YES	YES	YES

Note: Robust standard errors in parentheses. Statistical significance *** p<0.01, ** p<0.05, * p<0.1.

Source: Author's calculations using data from TZNPS (United Republic of Tanzania n.d.).

Table A2: Regression analyses of non-cash-intensive investments and the share of land cultivated by agribusinesses

VARIABLES	(1) Improved seeds	(2) Irrigation	(3) Fertilizer	(4) Hired labour
Agribusiness share	0.115	0.014	0.109	40.547
	(0.153)	(0.079)	(0.151)	(42.363)
Tenure_index	-0.000	0.013	0.031	-11.222
	(0.049)	(0.015)	(0.032)	(14.889)
Tenure and Agri_share	-0.030	-0.141	-0.202	15.710
	(0.112)	(0.092)	(0.137)	(35.980)
Age of household head	0.000	-0.000	0.000	0.663
	(0.002)	(0.000)	(0.001)	(0.579)
Number of household members	0.002	-0.001	-0.004	-1.131
	(0.007)	(0.001)	(0.004)	(1.614)
Head has primary education	0.091***	0.014	0.007	-1.343
	(0.033)	(0.013)	(0.024)	(17.907)
Female household head	-0.005	0.026	-0.004	10.506
	(0.050)	(0.016)	(0.025)	(17.568)
Log of expenditure	0.025	0.001	0.046***	7.264
	(0.020)	(0.008)	(0.014)	(5.717)
Log off-farm income	-0.001	0.000	0.001	0.103
	(0.003)	(0.001)	(0.002)	(0.625)
Log plot size	0.006	-0.004	0.031*	25.462**
	(0.026)	(0.007)	(0.018)	(10.276)
Age of plot	-0.002**	-0.000	-0.002***	0.046
	(0.001)	(0.000)	(0.001)	(0.251)
Soil quality	0.003	-0.002	-0.018*	-2.994
	(0.013)	(0.005)	(0.010)	(4.246)
Log of plot value	0.008	0.000	-0.002	-2.074
	(0.009)	(0.003)	(0.006)	(2.565)
Plot owned by household	-0.000	-0.004	-0.045	-28.058
	(0.069)	(0.005)	(0.067)	(27.240)
Constant	-0.435	0.012	-0.466**	
	(0.319)	(0.121)	(0.209)	
Observations	3,482	3,482	3,482	3,482
R-squared	0.055	0.016	0.031	
Number of plot_ident	2,006	2,006	2,006	
Crop Controls	YES	YES	YES	YES
Year	YES	YES	YES	YES

Note: Columns 1 to 3 report robust standard errors. Column 4 reports bootstrapped standard errors obtained from Honoré's panel tobit model with plot-year fixed effects. Statistical significance *** p<0.01, ** p<0.05, * p<0.1.

Source: Author's calculations using data from TZNPS (United Republic of Tanzania n.d.).