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Impacts of Large Scale Foreign Land Acquisitions on Rural Households: Evidence from Ethiopia

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Abstract

The impact of large-scale foreign land acquisitions (“landgrabs”) on rural households in developing countries has proven a highly contentious question in public discourse. Similarly, in the academic literature, “evolutionary” theories of property rights and “enclosure” models make diametrically opposed predictions about the impacts on holders of informal property rights of increased demand for land. The current paper uses a multi-method approach to provide much-needed empirical evidence on the impacts of large-scale land acquisitions in Ethiopia. We use basic economic theory to structure evidence from disparate sources, including: a survey of existing qualitative evidence; original legal analysis of specific foreign land-acquisition contracts; and original econometric analysis of new World Bank household survey data. The evidence from all three methods suggests large-scale foreign land acquisitions are associated with losses of land and resource rights for rural households. While there is some compensating evidence of increased household expenditure, it is difficult to say whether this increase is caused by growth in incomes or in implicit prices.

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**THE IMPACT OF LARGE SCALE FOREIGN LAND ACQUISITIONS ON RURAL
HOUSEHOLDS: QUALITATIVE AND QUANTITATIVE EVIDENCE FROM
ETHIOPIA**

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Abstract

The impact of large-scale foreign land acquisitions (“landgrabs”) on rural households in developing countries has proven a highly contentious question in public discourse. Similarly, in the academic literature, "evolutionary" theories of property rights and "enclosure" models make diametrically opposed predictions about the impacts on holders of informal property rights of increased demand for land. The current paper uses a multi-method approach to provide much-needed empirical evidence on the impacts of large-scale land acquisitions in Ethiopia. We use basic economic theory to structure evidence from disparate sources, including: a survey of existing qualitative evidence; original legal analysis of specific foreign land-acquisition contracts; and original econometric analysis of new World Bank household survey data. The evidence from all three methods suggests large-scale foreign land acquisitions are associated with losses of land and resource rights for rural households. While there is some compensating evidence of increased household expenditure, it is difficult to say whether this increase is caused by growth in incomes or in implicit prices.

Keywords: Ethiopia, large-scale land acquisitions, LSMS-ISA, smallholder farmers, coarsened exact matching

Highlights

- Legal and economic theory show that benefits to smallholders depend crucially on property rights over the land sought by foreign investors.
- Qualitative evidence highlights the potential uncompensated expropriation of existing informal property rights of smallholders in Gambella.
- The quantitative analysis suggests that LSLAs are associated with the short-term decrease in field area in the two treated regions.
- The relative loss of land title certificates is evident in the quantitative analysis for the region of Benishangul-Gumuz.

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‘One of the highest development priorities in the world must be to improve smallholder agricultural productivity, especially in Africa’

(Deininger et al., 2011)

‘Since the majority of the LDCs population live and work in rural areas, rural development is the main driver of poverty reduction and will be essential to achieving the Sustainable Development Goals in these countries’

(UNCTAD, 2015)

1. Introduction

The present study concerns the impact of foreign large-scale land acquisitions (LSLA) on rural households in Ethiopia. LSLAs have become an increasingly important determinant of rural development in recent years. To date more than 56 million hectares of land are known to have been allocated to large-scale investors in developing countries, of which approximately 42 millions have been allocated to investors from a third country (The Land Matrix Global Observatory, 2016)¹.

The impact of these LSLAs on the local populations who were previously using the land has proven a highly contentious question in both public discourse and academic literature. Deininger et al. (2011) argue that foreign land acquisitions can be expected to facilitate rural development by creating employment, increasing productivity, and improving market access. Others further argue that foreign investment in land contributes to infrastructure development (Herrmann & Grote, 2015), export opportunities and energy security (Mitchell, 2011). A similarly positive conclusion is summarised by Platteau (1996) as the traditional law & economics approach to property rights in the spirit of Demsetz (1967)². What he defines as the ‘evolutionary theory of property rights’ predicts that the rise in commercial pressure on land

¹ These figures concern the amount of land that has been transferred to an investor for which a final agreement has been concluded. Proof of the information on the investment and the status of the agreement are collected by the Land Matrix before being included in the database.

²In his 1967 foundational work, *Towards a Theory of Property Rights*, Demsetz illustrates how new property rights emerge when, thanks to technological advancements or changes in the market structure, the gains deriving from the internalization of externalities become larger than the costs of internalization.

generated by land acquisitions should lead to a stronger land tenure system, increased investments in agriculture and more efficient production.

On the other side of the debate, theories of ‘enclosure’ predict that the large-scale acquisition of land frequently entails the expropriation of customary right-holders. Enclosure-type arguments have found much support in the qualitative literature on LSLA, where it has been noted that the problem of expropriation of customary rights is greatly compounded by the deployment of discretionary measures against natives of the host country, especially when the local administration is susceptible to corruption (Cotula, Vermeulen, Leonard, & Keeley, 2009; Nolte, 2013). An example of such measures is provided by reports of forced villagization of ethnic minorities in the Gambella region in Ethiopia, allegedly connected to the clearing of land for the arrival of foreign investors (Horne & Bader, 2012; Horne & Mousseau, 2011).

Due to the scarcity of data, the vast majority of studies of the phenomenon of large-scale land acquisitions are qualitative case studies (Gerlach & Liu, 2010; German, Schoneveld, & Mwangi, 2013; Schoneveld, German, & Nutako, 2011). These contributions are overwhelmingly critical of foreign land acquisitions, with numerous authors characterizing them as ‘land grabs’ (Borras, Hall, Scoones, White, & Wolford, 2011; Ince, 2014; Kugelman & Levenstein, 2009). In particular, case studies in different African countries have drawn attention to some recurrent negative outcomes of land acquisitions on the livelihood of rural populations. Besides the evidence of increased vulnerability of rural populations to land expropriation (Anseeuw, Wily, Cotula, & Taylor, 2012; Cotula et al., 2009; German et al., 2013), different studies have raised concerns about the access to food and water (Robertson & Pinstrup-Andersen, 2010; Rulli, Savioli, & D’Odorico, 2013), as land acquisitions are reported to target resource-rich areas with a focus on export-oriented production (De Schutter, 2011) which could leave local inhabitants lacking basic resources.

The current paper seeks to make a conceptual and empirical contribution to the literature on the impacts of LSLAs on local, rural populations. We begin by briefly providing a conceptual framework to better organise the many sources and types of evidence on the impact of LSLAs. We take an economic approach

to identifying the potential pathways through which LSLAs can be understood to impact the economic welfare of rural households.³ We note the divergent theories and claims in the existing literature regarding these impacts. It is clear that this is an area in need of more systematic evidence.

Given the complexity of the issues involved and the variety of sources available, the current study follows a multi-method approach to analysing the impact of large-scale foreign land acquisitions on rural households. The focus of our study is Ethiopia, one of the top recipient countries for land acquisitions in Sub-Saharan Africa (Sassen, 2013). Our quantitative analysis provides rigorous evidence on the variables for which we have data, and our qualitative analysis provides richness and context to those variables, as well as evidence on many important impacts for which we do not have data.⁴

Specifically, the qualitative section combines evidence from surveys previous qualitative studies; summarises relevant features of the Ethiopian legal and policy context; and directly analyses the actual text of contracts between the Ethiopian Ministry of Agriculture and three foreign companies for the long-term lease of large parcels of land in the Gambella region. We choose the Gambella region as the particular focus of our qualitative analysis because our review of case studies on Ethiopia (Horne & Mousseau, 2011; Keeley, Seide, Eid, & Kidewa, 2014) reveals that it is the centre of both challenges and opportunities for land acquisitions in the country. More than half the land area acquired by foreign investors in Ethiopia is located in Gambella, while human rights reports have raised concerns in relation to forced villagization of local indigenous populations as a consequence of the acquisitions (Horne & Bader, 2012).

Finally, we turn to a quantitative analysis which, to the best of the authors' knowledge is the first to directly address the impact of LSLA on the wellbeing of the rural population in an affected region. Our analysis has been made possible by the World Bank's Living Standards Measurement Survey – Integrated Survey on Agriculture (LSMA-ISA), which in March 2015 published a comprehensive survey covering

³ Spiritual or emotional impacts, while potentially important, are not considered here due to a lack of any reasonable means of measuring such.

⁴ For example, we have data on the area of land under private control of the rural households, but not on the area from which they hunt, fish and gather other resources.

aspects of rural life, communities and agricultural activities on a sample of 4000 rural households in Ethiopia. It is the most recent and most comprehensive dataset currently available to researchers.

2. Linkages between LSLA and Rural Household Welfare

We begin by taking an economic approach to conceptualising the wellbeing of rural households in the target regions for large-scale land acquisitions. This economic wellbeing can be thought of as a function of how much of each factor of production the household has rights to, the (implicit or explicit) prices they can receive for those factors of production, and the (implicit or explicit) prices of goods and services they consume. In the case of rural households in developing countries, the main factors of production over which households have (explicit or implicit) rights are their own labour, and (potentially) some agricultural land. In some cases, use rights to natural resources including clean and productive aquatic and terrestrial ecosystems are even more important to wellbeing than those over agricultural land.

The above approach to conceptualising the determinants of rural household wellbeing suggests that in order to understand the impacts of large-scale land acquisitions on the economic wellbeing of local rural households we must, at a minimum, understand its impacts on:

1. The amount of land and other natural resources over which the households can be understood to have use or control rights.
2. The economic returns that can be gained per unit of land under the household's control.
3. Demand for and returns to household labour supply in both agricultural and non-agricultural sectors.
4. Prices of agricultural goods consumed by the household.

There is heated debate in policy and academic communities about the direction of influence of all four of these determinants of household wellbeing. Consider first the question of the land and resources over which households have control. Some theories assume that the increased demand for land caused by LSLAs will drive an increase in the value of land and/or the evolution of more secure property rights

systems and that this security will be inclusive (Deininger, 2011; Platteau, 1996). Such models predict that rural households gain more secure property rights over land which is more valuable. As a result, households can increase their wealth or income by selling or leasing out their property rights for more than they could have earned by working the land themselves.

LSLAs may also increase the value of the land controlled by rural households because it brings with it infrastructure investments. Roads built by large investors may help lower transport costs to and from markets for rural households. Similarly, processing centres built by large investors – for example of oil palm - may also buy from smallholders' output, allowing them access to valuable and previously unavailable export markets (Deininger & Byerlee, 2012).

Other theories make less positive predictions about the impact of LSLAs on the land under the control of rural households. Enclosure models predict that the increased value of agricultural land will prompt elites and/or the state to (explicitly or implicitly) expropriate the existing (possibly informal) property rights of rural households.⁵ The consequent un- or under-compensated transfer of land and loss of access to natural resources results in a decrease in the welfare of rural households (De Schutter, 2011). The vast majority of available evidence supports this pessimistic view of the impact of LSLAs. Studies reporting undercompensated expropriation of land rights include Anseeuw, Wily, Cotula, & Taylor (2012), Cotula, Vermeulen, Leonard, & Keeley, (2009) and German, Schoneveld, & Mwangi (2013).

There are similarly divergent views for the other potential causal pathways. LSLAs almost invariably bring an injection of capital and know-how to agricultural production. This leads to increased productivity per worker. If labour markets are functioning reasonably well, increased productivity per worker implies increased wages per worker. Thus there is the potential for LSLAs to increase returns to labour supply for rural households. There are, however, reasons this mechanism may not provide broad-based improvements in household incomes. The first is that the number of workers required per hectare may fall, in line with the increased productivity. Thus it is possible that a few lucky workers are made better off, but

⁵ Cohen and Weitzman (1975) were among the first authors to formalize the concept of enclosure into a theoretical model.

most are made unemployed. Secondly, it is possible that the few remaining jobs on the land require different skills to those of the rural householders. In this case workers from outside the region (or even country) may benefit from the newly created jobs.

Though most of the labour demand impacts of LSLAs can be expected in the agricultural sector, there may be some flow-on effects in other sectors. In particular, if LSLAs increase the incomes of at least some households in the area, then higher demand for other products and services may flow on to higher demand for labour in other sectors. Of course, if the impacts of LSLAs on returns to land and labour controlled by households are predominantly negative, there is a risk of lower demand for and returns to non-agricultural labour supply.

Finally, there is the question of the impact of LSLAs on the prices of agricultural products consumed by local rural households. Here again it is difficult to make general predictions. If the LSLA produces products consumed by the rural households, then the increased output should translate to lower prices and consequent benefits for the households. If (as is often the case) the LSLA is aimed at export production, then it will result in lower supply, and thus higher prices, of the food and other agricultural products consumed by poor rural households.

LSLAs may also increase implicit prices by forcing rural households to buy things which they previously were able to harvest from surrounding ecosystems to which they had access rights. Products to which households lose access can include those supporting basic human needs of clean water, food (e.g. fish, shellfish and game, roots and fungi) and shelter (e.g. timber, reed and grasses). These types of impacts on resource access are reported by Robertson & Pinstrup-Andersen (2010), De Schutter (2011), and Rulli, Saviori, & D'Odorico (2013).

3. Ethiopian Policy Context

3.2 The national Context

The current paper focuses on evidence from Ethiopia, particularly the region of Gambella. Ethiopia has been one of the major recipients of foreign LSLAs over the last decade, and the influence of these LSLAs has been contentious (Cotula, Vermeulen, Mathieu, & Toulmin, 2011; Horne & Mousseau, 2011; Lavers, 2012). Within Ethiopia, the region of Gambella has been one of the largest and most controversial recipients of foreign LSLAs (Horne & Bader, 2012; The Oakland Institute, 2013).

Ever since the new ‘land rush’ (Arezki, Deininger, & Selod, 2013) started, the Ethiopian government has been promoting the arrival of foreign investments in agriculture, focusing in particular on the developing regional states of Benishangul-Gumuz and Gambella (Figure 1), both characterized by the lack of intensive agriculture and by agro-pastoralist systems (Keeley et al., 2014). In January 2009 an Agricultural Investment Support Directorate (AISD) was established to serve as the principal agency for negotiating lease agreements for lease areas greater than 5000 hectares. It has identified around 4.8 million hectares of land as conducive for commercial agriculture in four administrative regions: Gambella; Benishangul-Gumuz; Southern Nations, Nationalities, and People (SNNP); and the Afar region (Makki, 2012). The new strategy for attracting foreign investors led to the establishment of particular tax exemptions for both national and foreign investors in regions such as Gambella and Benishangul-Gumuz (Part II, s4(7), Council of Minister’s Regulations No. 84/2003).

3.2 The Gambella Region

Located in Western Ethiopia (Figure 1) 780 km from Addis Ababa, the Gambella region is the biggest recipient of land acquisitions in Ethiopia (see Figure 1 below). Recent studies have estimated that 600,000 hectares of land have already been alienated to large and small investors, with large investors owning around 535,000 hectares of land. It has been calculated that 100,000 hectares of forest have also been the object of land acquisitions in recent years. As deforestation is usually necessary to set up the investment’s agricultural production, land acquisitions are considered a potential threat to the rich regional biodiversity

(Makki, 2014). The amount of investments is bound to grow as state officials have classified an estimate 32% of land in the region as suitable for investment (Horne & Mousseau, 2011).

Several ethnic minority groups reside in the Gambella region, and are heavily dependent on the

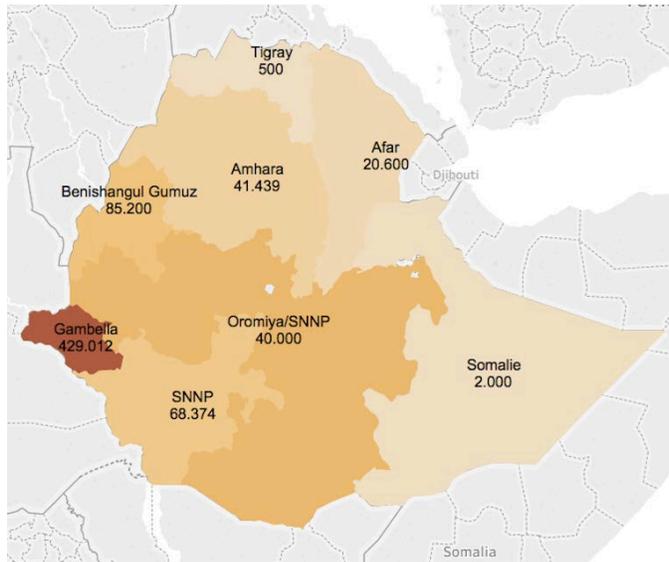


Figure 1 Area in hectares leased to foreign investors per region in Ethiopia. Source: the Land Matrix Database, 2016

ecosystem, in particular the Anuak (population 100,000), the Nuer (population 113,000) and the Majangir (population 60,000) (Rahmato, 2011). A 2005 case study on Gambella by Evers, Spierenburg, & Wels(2005) mentioned that the total land area that was settled and claimed by the Anuak made up 70% of the region's land size, while the majority of the

Nuer lived in two districts covering 24%. Interviewed in 2010 about the situation in

Gambella, an indigenous Anuak named Nyikaw Ochalla stated that 'all of the land in the Gambella region (was) utilized. Each community had and looked after its own territory and the rivers and farmlands within it. It is a myth propagated by the government and investors to say that there is wasted land or land that is not utilized in Gambella' (Vidal, 2010).

4. Qualitative Evidence

In this section we consider the available qualitative evidence on the four potential pathways of influence of LSLAs considered in the previous section. The sources of evidence considered in this section include existing literature, media reports, and actual LSLA contracts from the study region.

Given the scarcity of direct sources on the conditions of rural populations in areas targeted by foreign investors, a precious (and rare since negotiations are often led behind closed doors) element of analysis is provided by the text of a few land acquisition contracts that have been published since November 2015 on

a dedicated website by Columbia Centre for Sustainable Investment ⁶. We use three contracts of large-scale land acquisition taking place in the region of Gambella (Table 1 here). All three contracts concern the lease of large parcels of land for cotton production and are signed by the Ethiopian Ministry of Agriculture and the foreign investors.

Table 1 Summary of land contracts analysed. Source: Openlandcontracts.org

Year of signature	Investor name	Investor country	Location	Contract size (ha.)	Type of crop
2011	Tekron group	Turkey	Gambella Region, Goge District	6000	Cotton, Soja beans
2011	Saber Group	India	Gambella Region, Dima District	25000	Cotton, Soja beans
2012	JVL Overseast PTE LTD	India	Gambella Region, Dima District	5000	Cotton

We identify several elements in the contracts that illustrate how the conditions under which land is leased to foreign investors affect the four key determinants of rural households wellbeing that we listed above: economic control of land, returns to land, returns to labour and access to agricultural goods.

4.1 Rural Households Property Rights Over Land

Starting from the first determinant of rural household wellbeing, we collected evidence at the national, regional and local level on rural populations’ access to land in the region of Gambella.

At the national level, the Constitution of the Federal Democratic Republic of Ethiopia, both in the 1975 and in the reformed version of 1995, established a de facto state monopoly of both rural and urban land, as well as natural resources (Article 40.3). At the rural level, this measure was meant to protect the right to the use of land of farmers and pastoralists, as it recognized the right of each Ethiopian farmer to receive free inheritable use rights to a piece of land (Article 40.4). By declaring the land belonging to the state and

⁶ The website openlandcontracts.org is managed by the Columbia Center on Sustainable Investment in partnership with the World Bank Group and UKaid

the people of Ethiopia, the government took upon itself the responsibility to ensure that the land distribution would rightfully happen.

While the constitutional provision remained unchanged, in 1997 a federal proclamation allowed each region to individually regulate local land policies, leading to a diversification of situations within the country (Deininger, Ali, Holden, & Zevenbergen, 2008). This allowed in particular for land certification programs to be implemented since 1998 in the main regions in Ethiopia. Such programs led to the creation of local registers which would keep track of occupation of land and would facilitate - among other things - its transfer and inheritance (Deininger et al., 2008). Unfortunately, while the cited article provides thorough information on the certification programs in Tigray, Amhara, Oromia and the Southern Nations, Nationalities and People's Region (SNNPR) it offers no insight on the Gambella region. The only evidence we could find on the status of land certifications in Gambella comes from a report by Human Rights Watch (Horne & Bader, 2012), which cited interviews with former regional and district government employees declaring that no formal land registration system was accessible to rural populations as of 2011.

The same report denounced an on going villagization program by the federal government, which started in 2010, officially aiming at providing better services and infrastructure to rural populations. In an interview with an Ethiopian newspaper (Tariku, 2013) the chief of the Gambella region, Umod Ubong Olom, confirmed that 30,000 scattered households had already been resettled at the time of the interview, while 10,688 more households would be resettled in 2013. In the first year, 2010-2011, villagization has occurred in five districts (*Woredas*) of the Gambella region: Gambella, Godere, Gog, Abobo and Dimma. These districts are for the most part Anuak, and are closest to the major infrastructure of the region, such as the main roads and the largest towns (Horne & Bader, 2012).

While Umod Ubong Olom claimed that the resettlements take place with the support of rural populations, several reports have questioned the way these programs are carried out. Evidence of surprise resettlement in Gambella, leading to relocation to areas with poor or no farming potential (Rahmato, 2011) are

accompanied by accounts of human rights violations, connecting the relocation programs with suppression of dissent, arbitrary arrest, detention and sexual violence (Horne & Bader, 2012).

The Ethiopian government has denied that villagization programs in Gambella are connected to large-scale land acquisitions but the cited report from Human Rights Watch claims villagers were told by local government officials that this was ‘an underlying reason for their displacement’ (Horne & Bader, 2012).

While we could not find any evidence of rural populations having access to legal tools to challenge villagization or to seek compensation for forced displacement, the conditions under which foreign investors access land in Gambella are particularly favourable. In fact, the provisions on rural land tenure under article 40 of the Ethiopian constitution are regarded in the literature as a tool facilitating the arrival of foreign investors, because only national and regional authorities are entitled to negotiate the land acquisitions. This feature significantly lowers transaction costs for foreign investors (Makki & Geisler, 2011).

Particularly, our analysis of three contracts for the large-scale lease of land in Gambella reveals that the Ethiopian Ministry of Agriculture and a registered Ethiopian office of the foreign company are the signatories and only actors mentioned in each of the contracts. No subnational authority or local representative is mentioned. The land is leased for 25 years with possibility of renewal, which allows for an indefinitely long duration of the lease. The contracts further grant the investors the ‘full and exclusive use’ of a defined parcel of rural land, as well as the right to build infrastructure such as dams, water boreholes, power houses, irrigation systems, roads, bridges etc.

The Human Rights Watch report noted how the land leased under such conditions by the Ministry of Agriculture was the only type of land tenure benefitting from a formal registration system in the region of Gambella (Horne & Bader, 2012).

Overall, the qualitative evidence available on the access to land of rural populations in Gambella suggests that, since the arrival of LSLA in the region, there has not been an improvement in the type of land rights

that households have access to. Similarly, given the reports of villagization and the lack of legal tools to seek compensation for the loss of land, the qualitative evidence we could access suggests there should be no increase in the value of land owned by rural households as a consequence of land acquisitions.

4.2 Returns to Land Controlled by Rural Households

We turn at present to the economic returns that can be gained per unit of land under the household's control. In order to better understand the linkage between LSLA and returns to land for rural households, we compare evidence on the traditional land use with information contained in the LSLA contracts.

Reports from NGOs on the Gambella region provide some qualitative evidence on the type of agricultural system that was in place before the arrival of foreign investors. While several indigenous populations live in Gambella we choose to focus on the Anuak, as the contracts that we analysed all deal with land located in their territory.

We know from Horne and Bader (2012) that that the upland Anuak live in small settlements of several families, practicing a non-intensive type of cultivation of maize and sorghum with little use of technology and low productivity levels. Their agricultural methods are characterized by a continuous shift from a field to the next, with cycles of up to 10 years before going back to the first field. The riverside Anuak on the other hand lead a more sedentary life depending heavily on the rivers for their subsistence. The scarcity of their agricultural output is balanced by fish and forest products, which is why deforestation and other changes in the landscape are reported as heavily affecting the indigenous populations livelihood, as they impact their access to food and medical plants (The Oakland Institute, 2013).

Given the precarious, underdeveloped agricultural practices in use among the Anuak it is relevant to mention the famous analysis of the phenomenon of land acquisitions by the then United Nations Special Rapporteur on the right to food Olivier De Schutter (2011), who warned us that the opportunity cost of giving land away to investors might result in a type of farming that would be less beneficial against poverty reduction 'than if access to water and land were improved for the local farming communities'.

On the contrary, intensive export-oriented production has been set as a priority for the Ethiopian government, and the region of Gambella is advertised as particularly profitable to foreign investors as it is not as saturated in terms of agricultural production as other areas in the country (Mesfin, 2011).

Our analysis of large-scale acquisition contracts confirms the competitive price at which land in Gambella is leased to foreign investors: 158 birr per hectare/year (approximately 7.4 dollars), which is a flat rate that has been put in place since 2009. The low prices for land in Gambella are advertised in an investment brochure of the Ministry of Agriculture espouses that these lease rates are ‘insignificant compared to comparable countries’ (Makki, 2012). The price of land in Gambella is competitive also at the national level, where standard lease prices are calculated based on the type of plot and on its proximity to Addis Ababa. While Gambella is 780km from the capital, plots located at 500 km from Addis were leased at 992 birr Per hectare, approximately six times more expensive (Mesfin, 2011). On top of the beneficial leasing price, a section of the contracts under payment procedure grants a three-year grace period before the lessee is required to pay the rent.

The available qualitative evidence seems to suggest that the arrival of land acquisitions in Gambella does not increase the returns to land controlled by rural households. This is due to the fact that we could not find evidence of a dialogue taking place between rural households, investors and the ministry of agriculture on how the traditional agricultural practices can be combined with the arrival of industrial agricultural production for the benefit of all parties.

4.3 Returns to Rural Household Labour Supply

We were not able to identify any sources of qualitative evidence on the impacts of LSLAs on the returns to rural household labour supply.

4.4 Prices of Agricultural Products Consumed by Rural Households

De Schutter (2011) also predicts a shift in the agricultural production towards crops for export markets, which would in turn increase ‘the vulnerability to price shocks of the target countries’.

This claim is supported by the information available on the type of agricultural production that is set up by foreign investors in the region of Gambella. The Ethiopian Government has given explicit priority to investors interested in the production of industrial crops such as cotton, sugar cane and rubber (Mesfin, 2011). In particular, a land area of 2.6 million hectares has been classified as fit for the cultivation of cotton. By 2011 only 93,985 hectare of land were employed for cotton cultivation, most of which held by local farmers. If the goal of 2.6 million hectares is met, Ethiopia will match the production area of Pakistan, the fourth-largest cotton producer in the world (Mesfin, 2011).

The three foreign land acquisition contracts that we analyse in the study all deal with the lease of land for cotton production in the Gambella region.

5. Quantitative Evidence

5.1 Data

The main sources of data used in the current research are the Land Matrix database and the Living Standard Measurement Survey - Integrated Survey on Agriculture (LSMS-ISA). This section provides additional information on both datasets, as well as on the variables from each that are used in the current study.

5.1.1 LSMS-ISA

The Living Standard Measurement Study – Integrated Survey on Agriculture (LSMS-ISA) is a household survey project established with a grant from the Bill and Melinda Gates Foundation and implemented by the LSMS team of the World Bank. The aim of the project is to collect data on rural development at the household level in eight countries in Sub-Saharan Africa, in collaboration with national statistics offices.

In Ethiopia, the LSMS-ISA survey was implemented by the Central Statistical Agency of Ethiopia and collected information on approximately 4,000 households in rural areas and small towns around the country.

The survey was organized in two waves, the first taking place between late 2011 and early 2012 and the second between late 2013 and early 2014, so each household participated in the survey twice with a two-year break. We exploit the panel nature of the data in our econometric analysis. The short nature of the panel, however, means that our analysis will provide evidence of the short-term impacts of LSLAs only.

The LSMS-ISA survey was divided into five components: Household, Community, Post Planting, Post Harvesting and Livestock. The resulting dataset on Ethiopia provides a huge number of potential measures of household wellbeing. From these, we select those which best represent the potential impacts of large-scale land acquisitions discussed in Section 2. They are:

- **Area of fields:** Field area (in hectares) owned and/or managed by the respondents was recorded using GPS by the enumerators conducting the survey. Based on the qualitative evidence in Section 4, there are three possibilities for the impact of large-scale foreign land acquisitions on field area. The first is that the government rents predominantly unused land to foreigners, in which case we would see very little impact on rural households' land area. The second is that rural households' land is rented to the foreign firms, and that the government compensates the households more than the land was worth to the household. In this case LSLA is associated with a decrease in land-holdings, but an increase in wealth for the households (at least in the short term). Our qualitative research has not been able to identify any evidence of such compensation being paid in Ethiopia. The third possibility is that the households' land is taken and insufficient (or no) compensation is paid. In this case we would see a decrease in land-holdings and decrease in welfare for rural households.
- **Land value:** Survey respondents were asked to evaluate for how much they would rent their land to others for a period of twelve months (in birr). Again the impact of LSLAs on the value of land controlled by rural households is unpredictable. All else equal, LSLAs should drive up land scarcity and thus increase rental rates. However, in the Ethiopian context, we have seen that LSLAs are granted by the government at very low rental rates. These low-rent LSLAs may crowd

out investors who might have been willing to pay higher rental rates to rural households, thus having a downward effect on rents received by the households.

- **Certification:** Survey respondents were asked if they were in possession of a certificate for each of the land parcels they owned. The variable used is the total number of certificates held by the household. If LSLAs were a driver of improved property rights at the regional level, we would expect to see an increase in the relative number of certificates in the regions experiencing the most LSLA. On the other hand, if LSLAs encouraged government elites to expropriate rural households' existing property rights, we would see a relative decrease in certificates in the regions most affected by LSLAs. As was the case for the area-of-land variable, the impact of a loss of certificates on household welfare depends on the amount of compensation which accompanied the transfer of property rights.
- **Food expenditure:** Was collected as the amount (in birr) spent to purchase food consumed by the household in the previous week. An increase in food expenditure may indicate an increase in the price of food, as well as an increased dependence on purchased c.f. self-grown food. All else equal, either of these reasons for increased food expenditure would indicate lower welfare for the household. However, an increase in food expenditure may also occur due to an increase in household income. This, of course, would suggest increases in household welfare. In order to help distinguish the income driver from price and dependency drivers of increased food expenditure, we also study non-food expenditure.
- **Non-food expenditure:** Is the amount (in birr) the household estimates it spent in the previous 12 months on non-food items. Increased disposable household income should be evident in an increase in non-food expenditure.
- **Agricultural work (non-wage):** Hours of work per week spent collectively by the household members in agricultural activities (for the household). This variable provides an alternative to the area-of-land variable as a measure of a potential shift away from land-holding and agricultural-based lifestyles.

- Hours of work per week spent collectively by the household members in non-agricultural activities (for the household); and
- Hours per week spent collectively by the members of a household in work for a wage, which includes both agricultural and non-agricultural activities for an employer.

Only data collected in rural areas were included in the dataset. Data on small towns and larger cities (introduced for 2013-2014) were excluded.

Given the lack of quantitative papers analysing specifically the effect of land acquisitions on rural livelihood, we looked at more general quantitative studies on agricultural production in Ethiopia (Deressa & Hassan, 2009; Holden & Yohannes, 2002) in order to select the following control variables from the Ethiopian LSMS-ISA survey: size of the household; gender and education level of the head of the household; distance of the household from the nearest market; elevation; and annual precipitation.

Summary statistics for all the variables are tabulated by year (2011 or 2013) in the Appendix. Statistics are additionally separated for Gambella and Benishangul-Gumuz as these regions are our primary ‘treatment’ areas for the large-scale foreign land acquisitions discussed below.

5.1.2 Land Matrix

The Land Matrix is a global and independent land monitoring initiative. The database is constantly updated and collects information on land deals from a variety of sources: research papers and policy reports, field-based research projects, official government records, company websites and media reports. Each deal is accompanied by information on the data source.

The Land Matrix collects information on large-scale land acquisitions of over 200 ha. For the purpose of the current research, the following information were collected on large scale land acquisitions in Ethiopia:

- Year of signature of the contract, ranging from 2000 to 2013;
- Location of the land acquired (at the regional level);
- Size of land acquisition in hectares;

- Nationality of the acquirer (only acquisitions by non-Ethiopian nationals were retained);

Only concluded agreements were included in the dataset. Contracts without region-specific information, without a specified date and with unconfirmed status were could not be used, as those were the basic information necessary for the analysis.

5.1.3 Others

We integrated the data from the LSMS-ISA database and from the Land Matrix database with regional land-use data from the Central Statistical Agency of Ethiopia's (CSA) regional reports summarizing the results of the 2001 Ethiopian Agricultural Sample Enumeration (CSA, 2006). The data retained in our dataset refers to total land (ha) used for the cultivation of both permanent and temporary crops by private peasant holdings. The data combines the information collected during the two main Ethiopian crop seasons, *Meher* and *Belg*. For rural areas, the data on land use was collected without size limitation for land holding, so as to include smallholder farmers.

5.2 Empirical analysis

The Land Matrix dataset provides information on LSLAs by region and year, while the LSMS data set provides information at the household level for a panel of two years – 2011 and 2013. Accordingly, our fundamental approach to the analysis is to examine the relationship between regional-level measures of land acquisitions from 2011-2013 and changes in household-level outcomes from 2011 to 2013.

In focusing only on land acquisitions since 2011, we are forced to ignore the information on earlier land acquisitions. This is a necessary evil if we wish to exploit the panel nature of the LSMS in order to ameliorate the otherwise potentially substantial selection bias on our estimates.

Another feature of our analysis is that we attempt to provide preliminary evidence about the distributional impacts of the LSLAs. Variables which are close to log-normally distributed (food and non-food expenditures, land area, land value) we examine the changes both in levels and in logarithms.⁷ Taking the

⁷ We add 0.001 to any zero observations before taking logs.

log of a variable means that the analysis will be more influenced by smaller values than it would be in studying the levels. Thus differences in the findings based on the levels and logs may reflect different effects on households in the upper and lower parts of the distributions. Other variables (working hours in agricultural, non-agricultural household activities, and wage work, number of certificates) show a large proportion of zero observations. For these variables which examine both the levels and a binary indicator that the value is greater than zero.

5.2.1 Preliminary observations

Before proceeding with formal econometric analysis, we begin with a visual summary of the data. We do this by graphing changes in household outcomes – averaged by region - against the size of land acquisitions from 2011-2013. Thus x-axis for all the graphs in Figures 2 and 3 measures the LSLAs from 2011-2013 as a fraction of the total area of land under peasant farming as of 2007. The first thing to observe on this axis is the extent to which Gambella and Benishangul-Gumuz stand out from the other regions in terms of relative size of recent land acquisitions. Because of this stark difference, our analysis will consider these two regions as two separate “treatment” groups and the remainder of the regions as “controls”.

The y-axis of each graph in Figures 2 and 3 plots the regional average of household-level changes in one of the outcome variables. Consider first the top left graph in Figure 2, showing the average changes in field area by region. As we might expect, Benishangul-Gumuz and Gambella are two of the only three regions where smallholder field area has decreased on average for rural households. The pattern is similar for the log of the field area (middle graph of the top row of Figure 2).

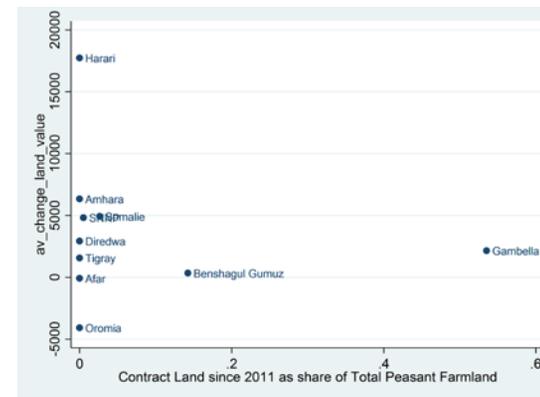
Loss of field area is not necessarily a negative outcome for smallholders. It may, for example, result from a willing sale of land which left the small-holder better off. Our qualitative analysis presented earlier suggests, however, that any loss of land-area in Ethiopia attributable to LSLAs was unlikely to have been compensated.



Field Area



Log Field Area



Land Value



Log Land Value



Non-Food Expenditure



Log Non-Food Expenditure

Figure 2 Graphs on Field Area, Land Value and Non-Food Expenditure

Regional summary statistics for the average change in the area of land parcels owned by a household, the value of the land as estimated by the head of the household and the annual household expenditure at the regional level against the size of land acquisitions from 2011-2013 as a fraction of peasant farming



Food Expenditure



Log Food Expenditure



Agricultural Work Hours



Agricultural Work Hours > 0



Non-agricultural Work Hours



Non-agricultural Work Hours > 0

Figure 3 Graphs on Food Expenditure, Agricultural Work and Non-Agricultural Work

Regional summary statistics for the average change in household weekly food expenditure and in number of hours spent by the combined members of the household in agricultural activity or non-agricultural activity for the household (without receiving a wage) at the regional level against the size of land acquisitions from 2011-2013 as a fraction of peasant farming



Wage Work Hours



Wage Work Hours > 0



Number of Certificates



Number of Certificates > 0

Figure 4 Graphs on Wage Work and Number of Certificates

Regional summary statistics for the average change in the area of land parcels owned by households, the value of the land as estimated by the head of household and the annual household expenditure at the regional level against the size of land acquisitions from 2011-2013 as a fraction of peasant farming

One of the effects of LSLA predicted by the evolutionary theory of property rights (Platteau, 1996) is that land value should increase due to the increased demand. The graphs top row right and bottom row left of figure 2 show the average changes in estimated land rental value (per hectare). They provide little evidence of LSLAs being associated with increased land rental value. Indeed, Benishangul-Gumuz had one of the lowest increases in land value over the study period.

An important measure of household wellbeing is consumption. The LSMS survey, unfortunately, contains only expenditure measures. Change in expenditure and consumption will not necessarily move in the same direction when there are changes in prices and/or changes in the range of goods produced in the household (c.f. bought at market prices). In the context of LSLAs, there is obvious potential for food expenditure changes to be affected by these issues. To the extent that LSLAs restrict or prevent household's access to areas previously used for collecting materials such as wood for fuel or housing construction, it may also increase expenditure on non-food items without actually reflecting improved welfare. Thus it is difficult for us to make normative conclusions based on the expenditure results. All we can say is that non-food expenditure has increased in the two treatment regions more than in most others.

A similar story is evident for food expenditure in Benishangul-Gumuz. Changes in food expenditure in Gambella appear roughly in line with those in many other regions.

Figures 3 and 4 summarise the regional average of household-level changes in agricultural, non-agricultural and wage work hours, as well as the number of land title certificates. We can see from the graphs in figure 3 that Benishangul-Gumuz and Gambella are among the regions with the most negative average change in both total agricultural work hours and having any agricultural work hours. These results are consistent with the findings for the changes in field area in Figure 2.

Examining the bottom row of Figure 3, we see little evidence of the decrease in agricultural work leading to an increase in other household work activity. Both treatment regions are around the middle of the distribution of other regions in Ethiopia in terms of changes in non-agricultural work hours and the indicator for any non-agricultural work. There is, however, weak evidence of a relative increase in wage

work hours and probability of having some wage work. Only two other regions show increase on these measures that is equal or greater than that in the treatment regions.

The final row of Figure 4 summarises the results for the number of land title certificates and whether the household has any land title certificate. This outcome measure is the one most directly related to much of the law and economics theory about the impacts of LSLA on property rights for small-holders. As discussed earlier, there are highly divergent predictions about whether smallholders with informal or weak property rights have them improved or effectively expropriated when there is increased external demand for the land they use. Our results reflect this divergence. While Gambella households have enjoyed among the largest increase in titling certificates, those in Benishangul-Gumuz have seen among the greatest losses of such for any region.

5.3 Econometric approach

The graphs in Figures 2, 3 and 4 highlight the difference between Benishangul-Gumuz, Gambella and the other regions of Ethiopia in terms of the magnitude of recent LSLAs compared to the existing area of smaller-holder agricultural land. These sharp distinctions motivate our use of a treatment effects approach, rather than analyzing the LSLA area as a continuously varying variable.

The fundamental challenge when trying to identify the impacts of any treatment is to separate out the effects of the treatment, from those of confounding variables which both affect the probability of treatment and the outcome itself. For example, any analysis of the impact of LSLAs on the property rights of rural households, must account for the fact that LSLAs may be more likely where property rights are already weak. The summary statistics in Tables 3 and 4 in the Appendix suggest that our two treatment regions do differ from the average of other parts of Ethiopia on some potentially important determinants of both household wellbeing and LSLAs.

Thankfully, the panel nature of the LSMS-ISA data provides us with an excellent means of addressing any selection bias which might be caused by systematic differences between the treatment and control areas. By focusing on the changes in household outcomes, we are able to remove the effects that initial levels of variables might have on the probability of substantial LSLAs in a region. The graphs in Figures 3 and 4 – which show regional averages of household-level changes are the first step in our difference-in-differences approach.⁸

Despite the strengths of the difference-in-differences approach, we may still be concerned that some of the features of the treatment area affect not only the probability of treatment and level of the outcome variables, but also the changes in outcome variables. For example, trends in certification may differ between areas where land title was already mostly formalized, and those where it was almost non-existent. Similarly, global agricultural price changes might mean that land value is increasing in exactly the same climatic areas in which foreign large-scale investments are most likely. Alternatively migration and other structural changes in the economy may cause trends in household outcomes which are stronger in the same sorts of areas where it is easiest for government to expropriate rural land-holders. We address these potential sources of bias by using a matching technique to produce a balanced dataset of treated and non-treated households.

We match households using the coarsened exact matching (CEM) algorithm described in Blackwell, Iacus, Porro and King (2011). CEM non-parametrically matches cases and controls by generating strata from the intersection of a set of characteristics. In order to ensure that there are sufficient matches between cases and controls, variables describing the required characteristics are coarsened into bins, much like in the construction of a histogram. The strata generated contain only observations which share the same bin for all of the different (coarsened) variables. The algorithm then calculates weights to be applied to each strata on the basis of the number of treatment and control observations it contains. Regressions using these

⁸ The graphs also go somewhat beyond a basic difference in difference by excluding from the calculated averages any urban households and any households located in terrain types which are not present in our two treatment regions.

weights simulate regressions on a dataset which is balanced in terms of the characteristics of the treatment and control groups.

We conduct the matching separately for Gambella and Benishangul-Gumuz (and in each case exclude the other ‘treatment’ region). We define the matching strata on the basis of household size in 2011 (number of people), a binary indicator of whether the household head has had any schooling up until 2011, a binary indicator of whether the household possessed any land title certificate in 2011, and - following the literature on the determinants of agricultural profitability in Ethiopia (Deressa & Hassan, 2009; Holden & Yohannes, 2002) - average rainfall (high or low) and terrain (plains, high-altitude plains, low plateaus, mid-altitude plateaus, and mid-altitude mountains).

Once matching is achieved, the analysis is completed by weighted regression of the change in the dependent variable on the dummy indicator for the treatment area. Weighted ordinary least squares is used for all variables except those for which the undifferenced variable is binary. Since differences of binary variables make take on values of -1, 0, or 1, these variables are analyzed using ordered logit with the CEM weights applied. Robust standard errors are calculated in all cases.

5.4 Results

The results of our econometric analysis are summarized in Table 2. Columns 1 and 2 report results when Gambella is the treatment area and all other areas except Benishangul-Gumuz are the control group (while Benishangul-Gumuz households are excluded from the dataset). Columns 3 and 4 report results when Benishangul-Gumuz is the treatment area and all other areas except Gambella are the control group (while Gambella households are excluded from the dataset).

Columns 1 and 3 in Table 2 report results where the dependent variable was the change in the level of the original variable collected by the survey (e.g. hectares of agricultural land, hours of agricultural work per week). In the top panel of the table, columns 2 and 4 report results where the dependent variable is the change in the log of the original variable. In the bottom panel of the table, columns 2 and 4 report results

where the dependent variable is the change in a dummy which indicates that the original variable was greater than zero (e.g. household has at least one land title certificate).

Table 2 Comparison of outcomes in the treatment regions with those in other parts of Ethiopia, Difference-in-difference regressions with coarsened-exact-matching weights

	(1)	(2)	(3)	(4)
	Gambella		Benishangul-Gumuz	
	Level	Log	Level	Log
Field area	-0.0162 (0.0230)	-0.142 (0.203)	-0.0702*** (0.0224)	-0.419*** (0.134)
Land unit value	1216.3 (1845.1)	0.942* (0.480)	-3967.4*** (1035.3)	-0.481 (0.509)
Food expenditure	79.67 (48.93)	0.234 (0.393)	155.0** (70.97)	0.201 (0.281)
Non-food expend	915.4** (459.8)	-0.208 (0.386)	685.2** (326.5)	0.440 (0.272)
	Gambella		Benishangul-Gumuz	
	Level	Binary Indicator	Level	Binary Indicator
HH agric. work	-13.70** (6.846)	-0.265 (0.392)	-11.01* (5.734)	-0.447 (0.352)
HH non-ag. work	1.036 (4.044)	0.178 (0.288)	-4.345 (3.203)	-0.518** (0.251)
HH wage work	1.336 (3.097)	0.182 (0.527)	1.776 (1.862)	0.512* (0.300)
Field certificates	0.157 (0.174)	0.365 (0.427)	-0.527*** (0.107)	-3.457*** (0.747)

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

The results in Table 2 broadly support the picture painted by the graphs in Figures 2,3 and 4. The LSLA ‘treatment’ was generally associated with a relative fall in household field area and associated decrease in weekly hours of agricultural work – though the differences are not always statistically significant.

In contrast to the potentially negative impact of loss of field area, the treatment areas appear to have enjoyed a relative increase in non-food expenditure, though only when the variable is not analysed in logs. This difference between results for logs and levels of expenditure may suggest that the increase was concentrated among the (elite) households who initially had the highest expenditures. A similar pattern is evident for food expenditure, though the relative increase is only statistically significant for Benishangul-Gumuz (again only when the dependent variable is not logged).

The remainder of the results diverge for the two treatment areas. The measures of both non-agricultural household work and wage work show very weak and not statistically significant relative increases for

Gambella. Meanwhile in Benishangul-Gumuz, the probability of doing any non-agricultural household work falls while the probability of having some wage work rises.

The more significant impacts on work patterns for Benishangul-Gumuz than Gambella may be related to evidently more significant changes in field area, land value and title security. While land rental value and land title certification shows weak and statistically insignificant gains in Gambella relative to other regions, both of these variables show significant relative falls in Benishangul-Gumuz.

6. Conclusion

The rapid expansion of large-scale land acquisition (LSLA) by foreign investors in developing countries over the past 15 years has precipitated a heated debate over the impacts on rural households in the recipient regions. LSLA brings often much-needed investment to agriculture in developing countries, potentially raising productivity, and creating rental and labour opportunities from which rural households can benefit. Legal and economic theory shows, however, that these benefits to smallholders depend crucially on the strength and distribution of property rights over the land sought by foreign investors. As emphasized by enclosure theories, there is a substantial danger that LSLA leaves smallholders worse off if they have weak property rights at the time of acquisition.

The current study has attempted to provide some evidence to help progress the debate over the impacts of LSLAs on rural households. We have combined qualitative evidence from numerous sources, most notable through an analysis of actual contracts for LSLAs in the Gambella region. We have also used new household-level panel data made available by the World Bank to provide much-needed quantitative evidence on the impacts of LSLAs.

The results of our study provide a mixed picture of the impacts of LSLAs in Ethiopia. The qualitative evidence highlighted the potential uncompensated expropriation of existing informal property rights of smallholders in the Gambella region. Similarly the quantitative analysis suggests that LSLAs are

associated with decreased field area. Relative loss of land title certificates was also evident in Benishangul-Gumuz.

Expenditure, meanwhile, had a tendency to increase in the treatment areas. The welfare implications of this increased expenditure are, unfortunately, not clear. We do not have sufficient data to assess the extent to which the increase was concentrated among elites, or indeed, whether it was driven by higher incomes or higher prices. A lack of strong evidence of increased wage work among households in the treatment regions means that the latter is a real possibility. Future data collection which measures household consumption rather than expenditure would help resolve this question.

Future surveys would also help overcome another limitation of the current study, namely, the short-term nature of the changes observed. It is possible that the effects of LSLAs – such as generation of wage-work – take more than one or two years to emerge.

Appendix

1. Summary statistics

Table 3 Summary statistics for dependent variables in 2011

2011	Gambella	Benishangul	Other	Total
		Field area (ha)		
Mean	.1323	.1845	.1484	.1496
50 th percentile	.1062	.1398	.0945	.0974
N observations	74	87	1519	1680
		Land Value (Birr)		
Mean	2894	2028	5828	5496
50 th percentile	1500	1040	1870	1800
N observations	83	88	1570	1741
		Certification		
Mean	.0361	.0909	.9338	.8484
50 th percentile	0	0	0	0
N observations	83	88	1570	1741
		Total Expenditure (Birr/year)		
Mean	1981	1390	1851	1833
50 th percentile	1468	1023	1215	1218
N observations	96	108	1789	1993
		Food Expenditure (Birr/Week)		
Mean	187.2	103.2	165.2	162.9
50 th percentile	116.3	73.15	76.25	77.5
N observations	96	108	1789	1993
		Credit Value (Birr)		
Mean	289.1	185.9	364	350.7
50 th percentile	0	0	0	0
N observations	96	108	1789	1993
		Hours of Agricultural Work		
Mean	23.58	32.43	49.51	47.34
50 th percentile	7	22	36	35
N observations	96	108	1789	1993
		Hours of non-Agricultural Work		
Mean	7.813	15.28	16.08	15.64
50 th percentile	0	6	0	0
N observations	96	108	1789	1993
		Hours of Wage Work		
Mean	2.99	.463	2.089	2.044
50 th percentile	0	0	0	0
N observations	96	108	1789	1993

Table 4 Summary statistics for dependent variables in 2013

2013	Gambella	Benishangul	Other	Total
		Field area (ha)		
Mean	.0891	.1895	.2013	.1954
50 th percentile	.0518	.1142	.0895	.0891
N observations	95	109	1812	2016
		Land Value (Birr)		
Mean	5143	2201	7905	7465
50 th percentile	3100	1000	3000	2850
N observations	96	112	1848	2056
		Certification		
Mean	.3333	.0179	1.173	1.071
50 th percentile	0	0	0	0
N observations	96	112	1848	2056
		Total Expenditure (Birr/year)		
Mean	3807	2828	2805	2854
50 th percentile	2880	1555	1921	1932
N observations	103	120	1962	2185
		Food Expenditure (Birr/week)		
Mean	192.3	153.6	150.1	152.3
50 th percentile	127	101	91	95
N observations	103	120	1962	2185
		Credit Value (Birr)		
Mean	1194	2516	2956	2892
50 th percentile	525	850	1455	1400
N observations	14	23	510	547
		Hours of Agricultural Work		
Mean	21.64	25.09	45.52	43.28
50 th percentile	14	5	32	28
N observations	103	120	1962	2185
		Hours of non-Agricultural Work		
Mean	10.4	8.133	8.914	8.941
50 th percentile	0	0	0	0
N observations	103	120	1962	2185
		Hours of Wage Work		
Mean	7.816	4.983	3.346	3.646
50 th percentile	0	0	0	0
N observations	103	120	1962	2185

Table 5 Summary statistics for control variables in 2011

2011	Gambella	Benishangul	Other	Total
	Distance to Market (km)			
Mean	38.25	75.71	67.83	66.82
50 th percentile	23.6	74	55.55	54.65
N observations	96	108	1756	1960
	Annual precipitation (mm)			
Mean	1242	1375	993.9	1027
50 th percentile	1312	1256	931	967
N observations	96	108	1756	1960
	Household size			
Mean	4.813	4.407	5.036	4.991
50 th percentile	4	4	5	5
N observations	96	108	1789	1993
	Gender of Head of Household			
Mean	.7158	.7963	.7792	.777
50 th percentile	1	1	1	1
N observations	95	108	1766	1969
	Ever attended School			
Mean	1.632	1.673	1.677	1.675
50 th percentile	2	2	2	2
N observations	95	107	1756	1958

Table 6 Summary statistics for control variables in 2013

2013	Gambella	Benishangul	Other	Total
	Distance to Market (km)			
Mean	43.66	77.81	69.51	68.74
50 th percentile	26.9	75.2	56.6	56.4
N observations	103	120	1961	2184
	Annual precipitation (mm)			
Mean	1238	1363	989.3	1022
50 th percentile	1285	1237	931	968
N observations	103	120	1961	2184
	Household size			
Mean	5.427	4.842	5.162	5.157
50 th percentile	5	5	5	5
N observations	103	120	1961	2184
	Gender of Head of Household			
Mean	.7087	.775	.7645	.7625
50 th percentile	1	1	1	1
N observations	103	120	1962	2185
	Ever attended School			
Mean	1.544	1.567	1.66	1.649
50 th percentile	2	2	2	2
N observations	103	120	1959	2182

2. Matching Summary: Gambella region as ‘treatment’ dummy

Number of strata: 170

Number of matched strata: 37

Table 7 Gambella region as ‘treatment’ dummy 1

Number of observations	Other	Gambella
All	1490	103
Matched	417	88
Unmatched	1073	15

III. Matching Summary: Benishangul-Gumuz region as ‘treatment’ dummy

Number of strata: 223

Number of matched strata: 48

Table 8 Benishangul-Gumuz region as ‘treatment’ dummy 1

Number of observations	Other	Benishangul-Gumuz
All	1893	120
Matched	680	110
Unmatched	1213	10

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