UNIVERSITY OF GOTHENBURG
SCHOOL OF BUSINESS, ECONOMICS AND LAW

WORKING PAPERS IN ECONOMICS

No 624

Do the land-poor gain from agricultural investments? Empirical evidence from Zambia using panel data

Pelle Ahlerup and Sven Tengstam

August 2015

ISSN 1403-2473 (print)
ISSN 1403-2465 (online)

Department of Economics
School of Business, Economics and Law at University of Gothenburg
Vasagatan 1, PO Box 640, SE 405 30 Göteborg, Sweden
+46 31 786 0000, +46 31 786 1326 (fax)
www.handels.gu.se info@handels.gu.se

Do the land-poor gain from agricultural investments? Empirical evidence from Zambia using panel data

Pelle Ahlerup and Sven Tengstam*

Department of Economics, University of Gothenburg

July 3, 2015

Abstract

In the context of the global land rush, some portray large-scale land acquisitions as a potent threat to the livelihoods of already marginalized rural farming households in Africa. In order to avoid the potential pitfall of studying a particular project that may well have atypical effects, this paper systematically investigates the impact on commercial farm wage incomes for rural smallholder households of all pledged investments in the agricultural sector in Zambia between 1994 and 2007. The results suggest that agricultural investments are associated with a robust moderate positive effect, but only for households with a relative shortage of land.

Keywords: Agriculture, Investments, sub-Saharan Africa

JEL-codes: Q12, O13, O16, N57

* We thank seminar participants at the NCDE 2015 for helpful comments. We are furthermore grateful for the help we received from Nick Sitko, Patrick M. Chuni, Göran Forssén, Karin Alfredsson, Chazya Silwimba, Ndulo Manenga and from Central Statistical Office, Indaba Agricultural Policy Research Institute, Zambia Development Agency, and We Effect. The study was prepared within the project "Land Grabbing or Agricultural Investments: the Two Sides of the Coin: SWE-2012-137" supported by Swedish Research Council. Pelle Ahlerup: Gothenburg Centre of Globalization and Development. University of Gothenburg, Department of Economics, Box 640, 405 30 Gothenburg, Sweden. E-mail: Pelle.Ahlerup@economics.gu.se. Sven Tengstam: University of Gothenburg, Department of Economics, Box 640, 405 30 Gothenburg, Sweden. E-mail: Sven.Tengstam@economics.gu.se.

1 Introduction

Sub-Saharan Africa (henceforth, Africa) has gradually become a more democratic, peaceful, and stable region, characterized by higher economic growth and improved social indicators. After decades of relatively scant investor interest, the net inflow of foreign direct investments to Africa has increased dramatically (UNCTAD 2011, 2012), but also domestic investments have increased. The rise in prices of agricultural commodities in 2007-2008 signaled that new profitable opportunities were opening up, and there is a growing consensus that the commercial agriculture has a strong potential (World Bank 2009). For the still largely rural and agriculture-dependent African countries, investments in agriculture have the potential to influence economic development deeply. This paper studies the impact of agricultural investments on commercial farm wage incomes for the land-poor smallholder households in Zambia.

The number and scale of land acquisitions in developing countries have accelerated dramatically during the last decade but estimates of the number of hectares involved vary greatly, from 15-20 million hectares to over 200 million hectares (Schoneveld 2014). In Zambia alone, it was in 2011 estimated that the government was planning and marketing at least 1.5 million hectares of land for agricultural purposes (Oakland Institute 2011). Considering that Zambia in 2009 had about 9 million hectares of land suitable for agriculture, with 1.7 million hectares under cultivation (GRZ 2009), this is a high figure. This reflects how agricultural investments often are highly sought after by developing country governments. At the same time, the process of large-scale land acquisitions is by many, especially by NGOs, seen as a threat to the livelihoods of the already poor or marginalized, see e.g. Richards (2013). However, FAO (2012) investigates the impact of two large-scale investments in Zambia and find evidence of some positive effects on the poor. In terms of labor market outcomes, the number of jobs created was low relative to the size of the rural labor force, and while some skilled positions where created, the rural poor were more likely to take up low-paying jobs. This suggests that, even if there can be benefits for the poor, in relative terms they may have less to gain.

Zambia has a dual land system of both communal and private land. With the pro-market 1995 Land Act, the transformation of communal to private land was facilitated, and foreigners can now own land. Brown (2005) has analyzed the effects of this reform, and found that local elites and foreign investors benefited, not the poor or marginalized. The marginalized in Zambia thus appear to have drawn the short stick after the pro-market land reform, but it is yet not well understood if they are also on the losing side when it comes to agricultural investments. Most investments in agriculture in Zambia are made on private land through the purchase of existing farms. One reason for that is that commercial entities own a lot of unused land that is generally accessible by road and rail. New money into an already existing farm makes expansion and modernization possible (FAO 2012).

The global process of large-scale land acquisitions has gained considerable media attention. The content of these deals as well as their potential outcomes have kept many NGOs and development agencies occupied, and some have been deeply worried. Land acquisitions are often portrayed as a threat to the livelihood of rural households, a group that make up a fair share of the poor and vulnerable in Africa. Critics call these deals “land-grabbing” or “water-grabbing,” and evoke arguments about neo-colonialism. Supporters see a potential for much needed foreign capital and know-how. In light of this, it is increasingly important to further our understanding of the actual economic effects for rural populations.

In this paper, we thus focus on a potential micro-level outcome from large-scale land acquisitions. Since these land acquisitions, and agricultural investments in general, mainly relates to the introduction or expansion of large-scale commercial farming, we hold that if the relatively poor rural households have anything to gain from these deals, it may be from higher wage incomes from working on commercial farms. These investments could affect rural households also through, e.g., displacement, rising land prices, employment opportunities in related sectors, improved infrastructure, technological diffusion, and spillover effects in a wide sense, but these are beyond the scope of the present paper.

Zambia makes an interesting case as it has attracted large quantities of agricultural investments during the last decade, and is planning for even more. The question we ask is in this paper is how wage incomes from commercial farms for individual smallholders in Zambia are affected by agricultural investments. There is good reason to believe that households with a relative shortage of land could benefit more from the expansion of job opportunities, for at least two reasons. First, land abundant households can produce more on their own farm, which implies that they will have less need to seek alternative sources of income. Second, the marginal productivity per worker is lower the larger the household for a given plot size. Therefore we focus on whether the effects of agricultural investments vary with respect to the individual households’ access to farmland.

To avoid pitfalls from analyzing only one or a few, possibly atypical, investments, we use data on all pledged agricultural investments gathered by Zambia Development Agency (2014). To assess the impact on rural households we use three waves of panel data from the Supplemental Survey to the Post Harvest Survey (PHS/SS) in Zambia. Our results suggest that agricultural investments have a positive effect on wage incomes from commercial farms for smallholder farmers in rural Zambia. Importantly, this effect is only found for households that have a relative scarcity of land. This suggests that agricultural investments indeed have the potential to benefit those that need it most, the rural land-poor.

The remainder of this paper proceeds as follows. In Section 2, we discuss the literature related to large-scale land acquisitions and the land situation in Zambia. In Section 3, we present our main indicators. The empirical framework is discussed jointly with our empirical results in Section 4, and Section 5 concludes.

2 Background

2.1 Large-scale land acquisitions

Deininger (2011) and Deininger et al. (2011) estimate that large-scale land acquisitions covering a total of 45 million hectares to be leased or purchased in developing countries have been planned, negotiated or implemented in developing countries since 2000. Anseeuw et al. (2012) estimates it to be as much as 203 million hectares. As pointed out by Schoneveld (2014), the higher figures overstate the amount of land where control has actually been transferred or where changes have been made on the ground, because these figures, depending on source, either relate to deals planned, under negotiation, or signed, or deals actually implemented. The figures can also be misleading, as a lack of officially maintained data of good quality has led to a reliance on media reports suffering from selection bias (Schoneveld 2014). Yet, also more moderate estimates are on a scale that suggests that these land deals should have the potential to have real effects on the economic structure of target countries. On the other hand, when Cotula et al. (2014) study large-scale land deals in Ethiopia, Ghana, and Tanzania, they find, e.g., that in all three countries the scale of land acquisition is small in comparison to available land suited for agriculture, and also that there has been limited implementation.

Looking at the demand side of this process, three main drivers are mentioned in the literature. First, after the hike in food prices in 2007-8 also rich food-importing countries started to be concerned about food security. Second, in response to global warming, developed countries have made commitments to switch to biofuels, and these cannot be produced without making use of land and water. Third, the global financial crisis of 2008, in combination with expectations of rising food prices as well as improvements made in the business environment of target countries, have made investment in agricultural land more attractive. The expectations on rising food prices is, in turn, caused by rising income levels, an increased demand for land for biofuels, but also climate change, as this may entail increased land degradation and water scarcity. Western European countries account for about 40 percent of the total investments, but also countries in the Middle East (such as Saudi Arabia), Africa, East Asia (such as China and South Korea), and North America have been active (Arezki et al. 2015, GTZ 2009, Cotula et al. 2009).

There are clear patterns in terms of the identity of the investor and target countries of the large-scale land acquisitions of recent years. Most deals involve private investors supported by their home government, but there is also direct government involvement in the form of outright land acquisition by government agencies or state-owned enterprises (Cotula et al. 2009). Significant characteristics of the investor countries include higher population levels and food import dependence (Arezki et al. 2015). Others argue that investor countries tend to have a combination of a relative abundance of financial means and shortage of land suitable for agriculture, due to unfavorable climatic conditions, population growth, or urbanization (GTZ 2009). Schoneveld (2014), who studies farmland investments in sub-Saharan Africa, find that the majority of investors come from Europe or North America, and that investments, rather than being driven by food security concerns, often were speculative and caused by biofuel demand and favorable trade conditions for high-value cash crops. The increased number and size of deals following the 2007-2008 price increases and the 2008 financial crises (Arezki et al. 2015) is consistent with a concern for food security but also indicate that some investments where made for more speculative purposes, or due to a drying-up of alternative investment projects. Food prices have fallen lately (FAO 2015), but it remains to be seen if this fall is temporary or reflects a more long-term development.

These land and water deals are often targeted at developing countries, especially countries in Africa or Southeast Asia. The main benefits for the target countries are expected to be mediated by improved access to technology, an upscaling of the physical infrastructure, and improved opportunities for employment (Cotula et al. 2009). At the same time, the process has led to increased pressure on land with good irrigation possibilities and located close to markets. Arezki et al. (2015) find that the share of investments going to Africa account for about 50 percent of the area involved, and the agro-ecological potential in the target country is an important driver, while the yield gap (the difference between actual and potential yield on areas already cultivated) appears not to be. They also find that more deals are undertaken if there is weak land governance, but that, when other factors are held constant, there is no robust effect of other measures of the quality of formal institutions. This in contrast to the findings in Bujko et al. (2015) who, using a different methodology, find that higher levels of corruption is associated with more land deals.

Much of the literature on the effects of large-scale land acquisitions are either qualitative case-studies or investigate the impact of deals known to have been associated with considerable displacement of segments of the populations that only held customary land rights. In terms of labor market-related outcomes, studies have found projects that were in full operation first several years after the deals were signed, projects that were admittedly labor-intensive initially but later became more mechanized, with a resulting drop in labor demand, that some investors changed crops to less labor intensive ones, which also depressed labor demand, that new jobs were not taken up local residents but by workers from other areas or from abroad, and that if there were jobs for local people, these were often short-term or seasonal and poorly paid, and that some projects were associated with displacement which had detrimental consequences for food security, especially for the marginalized who had little land to begin with, see, e.g. FAO (2012) and Richards (2013).

A case of a clearly negative outcome found in some studies is inter- and intra-community conflict (Cotula et al. 2014, Richards 2013). A more typical finding is that of increased food insecurity. For instance, Shete and Rutten (2015) study the effects of one acquisition of land on households in a relatively densely populated region of Ethiopia. They find a loss of income and increased food-insecurity for households that lost their customary grazing and farmland. Yet, many studies on the overall effects come to conclusions that are not easy to reconcile. Recent studies on Ghana can illustrate the differences. Väth (2013) studies an investment in oil plantation in Ghana, and while employment opportunities improved, displacement compensation especially to households who had little land to begin with was insufficient. Schoneveld et al. (2011) study one acquisition of land made for a planation for biofuel production in Ghana and find increased rural poverty, especially affecting women and migrants, as it was made on customary land and therefore deprived households of their livelihood resources. Also for Ghana, Djokoto (2012) argue for a detrimental effect of foreign investments in agricultural on both energy and protein consumption. As a contrast, in terms of effects on employment, FAO (2012) found that foreign investments in agricultural in Ghana contributed to more than 180,000 jobs between 2001 and 2008.

There is more agreement that the promises and goals of many of the large-scale land acquisitions have not been met (Cotula et al. 2014, Richards 2013). Because so many deals proved unsuccessful or were not fully implemented in the first place, Deininger and Byerlee (2012) argue that there is a need for a mechanism to re-allocate land to entrepreneurs that are more productive.

Insights from the wider literature on the determinants of foreign direct investments (FDI) to developing countries (Collier and Patillo, 1999, and Jenkins and Thomas, 2002) are relevant also in the more specific context of large-scale land acquisitions. Naude and Krugell (2007) find that governance rather than policies matters for FDI. The effects of FDI include improved technology and increased employment (Blomström and Kokko 1998, Borenzstein et al. 1998), but Chowdhury and Mavrotas (2006) point to problems with establishing the direction of causality. A first approximation would suggest that FDI in land might have effects similar to FDI in the natural resource sector. Alfaro (2003) finds negative growth effects from FDI in the primary sector, but positive effects from FDI in manufacturing. Lessons may also be drawn from other strands of the natural resource literature, as agricultural land appears to start having properties similar to those of other natural resources. The findings in this literature are mixed. Sachs and Warner (1995) argue that natural resources can be a curse, but Mehlum et al. (2006) show that the curse exist only in countries with poor institutions, and Brunnschweiler and Bulte (2008) even demonstrates that the curse disappears if the correct indicators are used.

2.2 Land and agriculture in Zambia

Zambia is relatively land abundant, yet less than a quarter of the suitable land is currently cultivated, and, combined with low productivity, actual yields are in the range of 10-15 percent of the total potential yield (Deininger et al. 2011). The lack-luster performance of the agricultural sector in Zambia is related to high production costs. For the case of maize, Deininger et al. (2011: 25) notes that "In Zambia, large farms produce at a cost twice the world market price and only the protection provided by high transport costs allows them to turn a modest profit."

During the years as a British colony, there was an expansion of large commercial farms operated by white farmers on crown land. The land remaining for the native Africans where called native reserves, trusts, and, later, native trusts. During the years of "African socialism" under President Kaunda (1964-1991), crown land was renamed state land, and the state suppressed the market for land but allowed the chiefs to keep the control of the land in the native reserves and trusts 'given' to them by the colonizers (Brown 2005). With the 1995 Land Act, part of the pro-market reforms undertaken as a condition for debt restructuring, it was again possible to sell and buy land again, also for foreigners. Land tenure in Zambia is now either communal or private titled; it is a dual land system (Sitko 2010). Chiefs or tribal community headmen control the allocation of customary land, and this land can be converted to private land for investors, but cannot be sold. Jayne et al. (2009) discuss how one, in principle, can reallocate land within villages to expand total cultivated land, but because unallocated land is mostly available in remote areas, this implies that someone has to move.

The most productive land is held as private land, which account for less than 10 percent of total land in Zambia, and which can be both sold, bought, and owned by domestic or foreign individuals. It is mostly concentrated around major cities, productive farming areas, along the railway corridor between Livingstone and border of Congo, and in the mining areas of the Copperbelt (Brown 2005). Foreigners can thus buy land, and investors can convert land in customary areas to leasehold if "the investor's proposed use of the land is deemed to be of ‘community’ or national interest” (Brown 2005: 87), but it is still costly for a smallholder to arrange for all documents needed to convert land. Brown (2005) concludes that the 1995 Land Act led to elite capture, land speculation, intra-community conflicts, and displacement and enclosures, sometimes with the chief’s consent. Though customary land cannot be sold, and village or chief cannot be officially compensated when land is converted from customary to private, some chiefs have been compensated with “palaces, vehicles, or cash” Brown (2005:98).

The enforcement of formal rules is currently weak, as noted by Nolte (2014) in a qualitative study on the land governance system in Zambia and its interaction with large-scale agricultural investments. The presence of a new actor, the investor, has altered the balance of power, and local authorities (chiefs) have increased their influence. On the subject of the situation for individual households in this process, Nolte (2014:704) also finds that “The current power balance is such that investors, local authorities and government officials have strong leverage and negotiate land deals, while local land users play an increasingly marginal role.”

Another qualitative study of the issue of large-scale agricultural investments in Zambia is German et al. (2011). They study the processes involved in these large-scale land transfers, and argue that it not a global ‘land grab’ driven by the private sector. Rather, it is a supply-driven process where the government and local (customary) entities play an active role, motivated by a firm belief that economic development benefits by the involvement of and investments by the foreign private sector. They also argue that customary rights seldom are adequately protected in the context of land negotiations despite widespread legal recognition of these rights.

Also Zambians are heavily involved in investments in agriculture and land acquisitions in Zambia. Sitko and Jayne (2012 and 2013) find that the group of emerging farmers with 20-200 hectares, rather than being smallholders expanding, consists of people from urban areas that has earned money and influence from working in the public sector and now, for some reason, can buy land “too cheap.” Emerging farmers operating on title land cultivate on average less than 30 percent of their total available land, which suggests that the employment effect per hectare owned on emergent farms is likely to be limited. Hichaambwa and Jayne (2012) report an increased commercialization of farming, mostly in maize, but households with little land do not seem to take part. Evidently, access to land has an impact on choice of income sources, and possibly on diversification into labor work.

Of potential importance could be the fact that Zambia has a set of designated farm blocks to which they try to direct agricultural investments (Honig 2012). However, the impact of these farm block has been assessed by the Deininger et al. (2011: 65) who notes that there has been ”[n]o progress toward implementing government farm block program; investors appear uninterested in this land.”

3. Data

3.1 Post-Harvest Survey

The questions asked in this paper are whether agricultural investments affect commercial farm wage incomes, and if the magnitude of the effect depends on whether the household is land-poor or not. In this section, we describe our data on household wage incomes and other household-level characteristics. Our data on investments is described in Section 3.2. A set of additional control variables at the district level is discussed in Section 4.

The casual observer may think that the gains for smallholders in general are obvious, but that is not the case. There are good arguments and findings from case studies that point in the opposite direction, which was described in Section 2.1. New firms may drive old firms out of the market, mechanize rather than employ, change to less labor-intensive crops, pay mediocre wages, hire workers from other areas, only hire seasonally, and only hire more educated workers, which are less likely to come from land-poor households.

Our focus on employment-effects for the land-poor households has three reasons. First, these households are the poorest and most vulnerable in Zambia, where access to land and poverty are strongly correlated, and it is important to understand how they are affected. Second, it has been argued that these households are the ones most at risk in the global land rush. Third, the employment effects may be different for households depending on their access to land. As mentioned in the introduction, there is reason to believe that households with a relative shortage of land may benefit more from new job opportunities, since land abundant households do not need off-farm income as much. This is also in line with Hichaambwa and Jayne (2012).

Household-level data is drawn from three rounds of the Supplemental Survey to the Post-Harvest Survey conducted in 2001, 2004, and 2008 (CSO/MAL/IAPRI 2008), henceforth PHS/SS. The Post-Harvest Survey is also known as the Agricultural and Pastoral Production Survey. The supplemental surveys, carried out by the Central Statistical Office in conjunction with the Ministry of Agriculture, Food, and Fisheries and commissioned by the Food Security Research Project (FSRP), cover incomes and livelihoods of small and medium-scale rural holdings. The surveys covered the same sample of roughly

7,000 households as the 1999/2000 Post-Harvest Survey. A sampling frame of smallholder farmers (cultivating less than 20 ha) in the rural areas of Zambia was used, and a household has to have at least some land to be included.

We have two income indicators. All incomes are recalculated into 2009 Kwacha. Summary statistics for the income variables as well as for the other variables used in the empirical analysis of the short-term effects of agricultural investments are presented in Table 1. First, *Commercial farm wage income* is the household real wage income from work on commercial farms. In the three waves of the PHS/SS, three percent of the households report such income. The median value for households that report income is 2,200,000 Kwacha, equivalent to about 1000 USD (PPP, international), or slightly more than a third of the GDP/capita in 2009 in Zambia. Second, *Smallholder farm wage income* is the household real wage income from work on smallholder farms, and eight percent of the households report such income. The median for those that report income from this source is 100,000 Kwacha. Hence, the typical income from work on smallholder farms is on an order of magnitude lower than an income from working on commercial farms.

The main socio-demographic indicator is *Hectares per household member*, which is the number of hectares available for the household divided by household size. Available land refers to land either being cultivated or under fallow. *Household size* is the number of persons in the household the year prior to the survey. This number is adjusted to account for the fact that not all household members are considered part of the household during the entire year. For instance, someone who was a part of a household for only one month is included as 1/12 of a person. The average household size is six persons, but there are instances of households reported to include more than 40 persons. Most households have access to quite little land. The mean and median numbers of hectares available are 2.2 and 1.5. Per household member, the figures are 0.42 and 0.28. *Household head level of education* is the number of years of education of the household head. *Male household head* is a dummy for having a male household head.

3.2 Investments

Our indicator of agricultural investment is a district-level measure of the number of workers that investors (foreign or domestic) state that they will employ when they apply for an investment certificate from the Zambia Development Agency (2014). From the Zambia Development Agency (2014), who issues investment certificates also for non-agricultural sectors, we have information on sector targeted by the investment, year the pledge was made, the size of the pledged investment in terms of intended investment amount and number of employees, and in which district the investment is located.[1] The figures in the data represent both start-up companies and investments in existing companies, but this is in part a reflection of the fact that many commercial farms have a lot of unused farmland on which expansion is possible (FAO 2012).

Our analysis looks at both short-term and long-term effects, as these may be different. It has been argued that the full impact of large-scale land acquisitions may only be visible after a long time (Cotula et al. 2014). On the other hand, some case studies reported in FAO (2012) finds that projects are labor intensive during the initial phase but become increasingly mechanized later on. When we look at long-term effects, *Agricultural investment* represents total number of employees in investments in the agricultural sector between 1994 and 2007. We do not separate foreign investors from domestic, since domestic investors have played a prominent role in land acquisition in agriculture, see, e.g., Cotula et al. (2014), even though the media focus may have been on foreign investors, and many of the projects in our data are undertaken as joint ventures between Zambian firms and foreign firms. Since we focus on employment effects (measured as wage income from commercial farms), we hold that the number of employees is a more appropriate measure of the size of the investment than the dollar value of the investment.

To investigate the short-term effects we use five-year periods prior to each of the three waves of the PHS/SS. For each survey wave, *Agricultural investment* is the total number of employees in investments in the agricultural sector in the five years prior to the survey. Since the two districts Lusaka or Ndola are pure urban districts, the PHS/SS does not include respondents from these two districts. Therefore, all investments pertaining to these districts are excluded from the analysis. *Agricultural investment* in the remaining 70 districts is measured during three somewhat overlapping time periods (1996 to 2000, 1999 to 2003, and 2003 to 2007). Positive levels of *Agricultural investment* are recorded for 45 of the 210 district-period combinations, or slightly more than 20 percent. The average number of employees is 100, see Table 1. Looking at district-periods with positive values only, the average and median number of employees is 404 and 218 respectively. Though there is some persistence regarding which districts that are targeted by investments, there is also meaningful variation, which can be seen from Figures 1.a-c.

<Table 1 about here >

[1] Data on pledged investments from Zambia Development Agency is also used by Kragelund (2009), who does not study agriculture, Jenkin (2012), who only presents descriptive statistics, and Sipangule and Lay (2015), which we discuss in this section.

<Figures 1a-c about here >

We acknowledge that *Agricultural investment* is a noisy signal of the true number of employees resulting from actual investments, as there is good reason to suspect that not all of the pledged investments have been realized. Unfortunately, the level of implementation in these projects is not monitored, but Kragelund (2009) refers to an official from the agency that state that 70 percent of the pledged investments have been carried out. An alternative to using pledges would be to try to identify which investments that actually have started and how many they actually have employed. The problem with that approach is that it is very hard to get comprehensive data on actual investments. What instead happens is that one gets a dataset based on confirmed investments, which is only a subset of actual investments. If this subset is random, or at least if the selection mechanism is uncorrelated with all other relevant aspects, there is no problem. One can then do statistical analysis on confirmed investments, and the conclusions will be valid for all actual investments. However, if there is systematic selection of confirmed investments, the results will be biased. On the other hand, pledged investments might not be representative of actual investments, and econometric results from analysis on pledged investments will then be biased. We argue that the problem with pledged investments not being representative of actual investments is smaller than the problem of confirmed investments not being representative of actual investments. We base this on that it is at least easier to get a picture of, and thereby to handle, the bias from using pledged investments, than to get a picture of the bias from using confirmed investments. For this reason, we refrain from trying to verify implementation as we hold that attempting to do so could introduce systematic errors.[2] Incomplete implementation, if not systematically related to our outcome-measure, suggests that our estimates may suffer from an attenuation bias and underestimate the true effect of actual employment in the agricultural sector. On the other hand, this would mean that our estimates will be conservative. However, investment data from the agency may also underrepresent investment as investments can also be licensed from line ministries (Kragelund 2009) and the stringency of record keeping has varied over time (Jenkin 2009).

A recent working paper by Sipangule and Lay (2015) also draw data from Zambia Development Agency and the Post-Harvest Survey. They study related topics but find no consistent effects on productivity, fertilizer use, or wage-employment opportunities. The present study differs from theirs in a number of important ways. First, in terms of estimation method, we control for various district level characteristics and fixed effects at province, district, standard enumeration area, and household-level, while they use a

[2] Deininger et al. (2011) discuss this problem. As they run into problems when trying to collect data implementation of projects for their case studies, Deininger et al. (2011:64) are forced to acknowledge that “The sample can be considered to represent the projects that were in operation and where investors did not refuse access. If anything, these projects are likely to be the ones that are more successful and that will provide larger benefits to local people.”

difference-in-difference approach at the district level. Second, in regards to the sample, we use three waves of the smallholder survey and they use only the first and the last. Third, when it comes to the indicator of agricultural investment, we use a semi-continuous indicator of employment all pledged investments and they use district-level dummies for foreign investments with confirmed implantation. Fourth, concerning the outcome indicators, we use wage incomes while they use the number of persons employed.

4 Results

4.1 Long-term

Are agricultural investments associated with more or less earnings from commercial farm work, and do the marginalized, in terms of access to own farmland, have more or less to gain from these investments? We are interested in the relationship between agricultural investments and wage incomes from commercial farms, and therefore use two different empirical set-ups, one focusing on the long term and one focusing on the short term. With the short-term framework, explained in more detail below, we can control for more confounding factors that could be problematic in terms of identification. However, a focus on the short-term only means that one could miss important dynamics that take longer time to affect the commercial farm sector.

For this reason, to first see whether there is a relationship between agricultural investments and wage incomes from commercial farm work in the longer run, we estimate variants of the following,

$$y_{hh,2008} = \alpha + \gamma_0 \times Ag\ Inv_{d,1994-2007} + \gamma_1 \times (Hectares/\ HH\ members)_{hh,2008}$$

$$+\gamma_2 \times \left[Ag\ Inv_{d,1994-2007} \times (Hectares/\ HH\ members)_{hh,2008}\right] + \boldsymbol{X\beta_X} + \varepsilon_{hh,2008},$$

where $y_{hh,2008}$ is *Commercial farm wage income*, and $Ag\ Inv_{d,1994-2007}$ represents the total number of employees in pledged agricultural investments in the district of the household over the full period from 1994 to 2007. The latter is included on its own and interacted with our indicator of household size-adjusted access to land, $(Hectares/\ HH\ members)_{hh,2008}$. $\boldsymbol{X}$ is a vector of controls that always contains household characteristics, and in some specifications province fixed effects and a set of district characteristics. All specifications are estimated with weighted OLS, and standard errors are robust and clustered at the district level. As explained above, *Agricultural investment* is a noisy signal of the true number of employees in new projects. There is a risk that the signal-noise-ratio would not be high enough for us to be able to detect an effect on wage incomes. As long as the noise is not systematically related to our variables of interest, our estimates will only be biased towards zero. If so, our estimates could be seen as conservative in the sense that we will underestimate rather than overestimate the possible effects. On the other hand, some areas will have characteristics that both are good for economic development in general and make them are more attractive to investors. Unless we properly can capture this with our set of control variables we will have an omitted variables bias that, in this case, exerts an upward pressure on our estimate.

<Table 2 about here >

Is there a long-run effect on wage incomes from commercial farms from new agricultural projects? The results presented in Table 2 suggests that the answer to this question is yes, but the sign of the effect depends on the amount of land at the households' disposal. The estimate for *Agricultural investment* is positive and reasonably significant. The size of coefficients in the first four columns, where no interaction term has been added, suggests that if an additional pledged investment of 100 employees where to take place in the district of the respondent, the average long-run increase in wage income per household from working on commerical farms would be between 5,300 and 6,300 ZMK (2009), equivalent to about 2.3 to 2.8 USD (PPP). This is not a high figure, but it should be remembered that only a few percent of the households report this income source and here we report the average effect for all households, and our estimate may underestimate the true effect due to attenuation bias. We control for household characteristics (hectares per household member, household size, male-headed household, and education of household head) in all columns, and in the second column we add province fixed effects. This allows us to cleanse out systematic differences between the nine provinces of Zambia (Central, Copperbelt, Eastern, Luapula, Lusaka, North-Western, Northern, Southern, and Western). If anything, the positive relationship between investments in agriculture and commercial farm wage incomes is slightly strengthened by this.

In our short-run empirical set-up, we can go further and add fixed effects on the district, standard enumeration area, and household, but that is not possible for the long-run specification. To capture factors at the district level that may be systematically related to both the inflow of agricultural investments and wage incomes from commercial farms, we resort to adding a battery of district-level variables created in ArcGIS. More details on these variables and their sources can be found in Table 6. The large commercial farms that trace their history back to the colonial years were traditionally located close to the railroad network. Also today, access to infrastructure is a key factor determining where investors go. At the same time, differences between the households and firms in different districts in their access to infrastructure are likely to have affected economic development more in general. We add *Railroad*, which is the percentage of a district within 10 km of the railroad, and *Electricity*, which represents the percentage of a district within one km of the electricity transmission network. Both *Railroad* and *Electricity* are for the year 2006. Since agriculture in Zambia is largely rain-fed, the amount of precipitation in an area is likely to feed into decisions on where to locate investments and the productivity of existing smallholder and commercial farms. *Rain* is the average annual rainfall in a district in mm over the period 1961-1990. We add four variables that relate to land use and land cover. *Cropland*, *Forest*, *Grassland*, and *Water body*, represent the percentages of a district area covered by cropland, forests, grassland, or water bodies, respectively. These four represent conditions for the year 2000. As such, they may thus be endogenous in our specification, but at the time of writing, this was the earliest date for which we could find publically available data with this level of detail. We add two indicators of district size. *District area* is the area of a district in km^2. *District population* refers to the total population in the district in 1990. To capture the level of economic development prior to the period during which our agricultural investment pledges where made, we add *Light density*, which is the population-adjusted nighttime light intensity in 1992. The district-level controls are included in the third column, and they have remarkably little effect on the estimate for agricultural investment.

The results indicate that there is a moderately positive long-run effect of agricultural investments on commercial farm wage incomes for smallholder in Zambia on average. However, when we address the question of whether the land-poor have more to lose or more to gain, we see that the size of the effect, and possibly even the sign, depends on the amount of land available per member of the household. The negative interaction term suggests that households with less land have more to gain. This seems reasonable, since the land-poor households are likely to be the ones who have the lowest marginal productivity of labor on their own farm, and therefore relatively more to gain from the opening up of new work opportunities in the district. The marginal effect even goes from positive to negative for households with more than 1.94 hectares per household members, but they are only two percent or our sample, and we impose the linearity of the effect through our choice of specification.[3] The estimated relationship between agricultural investments and wage incomes from commercial farms are also not capturing that agricultural investments go to areas what have a more favorable investment climate in general since adding pledged investments in other sectors, as we do in the final column of Table 2, has no impact. There is even some indication that investments in other sectors have a negative relation with wage incomes from commercial

[3] The exact figures, and similar figures presented later in this paper, should be interpreted with some caution, as they are calculated from point estimates that have confidence intervals around them. These figures should therefore rather be seen as an indication that most households gain from agricultural investments.

farms. This may reflect general labor market dynamics in areas where investments have been made in other sectors.

4.2 Short-term

Our second empirical framework focuses on the short-term relationship between agricultural investments and farm wage incomes. This allows us to include fixed effects at the district, standard enumeration area, or even the household-level. Here we estimate variants of the following,

$$y_{hh,t} = \alpha + \gamma_0 \times Ag\ Inv_{d,t} + \gamma_1 \times (Hectares/\ HH\ members)_{hh,t}$$

$$+\gamma_2 \times \left[Ag\ Inv_{d,t} \times (Hectares/\ HH\ members)_{hh,t}\right] + \boldsymbol{X\beta_X} + \varepsilon_{hh,t},$$

where $y_{hh,t}$ now is either *Commercial farm wage income* or *Smallholder farm wage income*. Total number of employees in pledged agricultural investments in the district of the household in the five year prior to the PHS/SS-survey, $Ag\ Inv_{d,t}$, is included on it's own and interacted with our indicator of household size-adjusted access to land, $(Hectares/\ HH\ members)_{hh,t}$. The content of the vector of controls, $\boldsymbol{X}$, varies depending on specification. $\boldsymbol{X}$ always includes household characteristics and year fixed effects, and in some specifications district characteristics, district fixed effects, standard enumeration area fixed effects, and household fixed effects. Standard errors are robust and clustered at the district level. All specifications are estimated with OLS, and households are weighted by their initial population weights. If agricultural investments in any given five-year period is positively correlated with prior investments, and if these prior investments positively affect our outcome variable, the estimated coefficient for agricultural investments will have an upward bias.

<Table 3 about here >

In the first two columns of Table 3, the only control variables are household characteristics. Agricultural investments are positively related to commercial farm wage incomes. The magnitude is larger than what we saw in Table 2, where the focus was on the long run. This may reflect a positive bias, as discussed in the previous section, or it may capture that the effect does indeed diminish over time. This would be consistent with the findings reported in FAO (2012) that some projects where initially labor intensive but became more mechanized over time. The negative interaction term with hectares per household member together with the positive main effect of agricultural investment, suggests that effect of adding a project in a district raises wage income from commercial farms for smallholder farm households with less than 1.03

hectares per household member. The marginal effect is thus positive for the absolute majority, as more than 90 percent of the households in our sample have less than 1.03 hectares per household member. In results not shown, we have re-estimated all specifications in Table 3 with Tobit, and the qualitative results are very similar.

While we here focus on wage incomes from commercial farms, case studies of investments made in Zambia suggest that there are other positive effects on the local economy. In the case of Kascol in Zambia, the net income effect on outgrowers was four times higher than the wage income for the unionized employees (FAO 2012). This is not to suggest that outgrowers are necessarily better off or more pleased with these investments. Richards (2013:21) describes how some farmers in the out-grower scheme of the Marli Investments in Zambia "revealed various complaints, including Marli's total control of market decisions, and the imposition of various restrictions, including that other household members were not allowed to grow jatropha for sale to other buyers and an obligation to pay for some non-essential services." To investigate whether such outcomes are general or specific for the investments considered in these case studies is beyond the scope of the present paper, but would be worthy of study in future research.

The average size of the district-level agricultural investment in this three-period sample is about 100 employees. One investment of this size would on average raise the wage income from commercial farms for a household with 0.28 hectares of land (the sample median) by 19,200 Kwacha, equivalent to 8.5 USD (international, PPP), which amounts to about 25 percent of the average wage income from commercial farms. As argued above, this may seem like a low figure, but it should be seen in the light that this is the average increase for the whole sample and that only a few percent of the households report any wage income from working on commercial farms.

A natural concern is that the results could be affected by an omitted variables bias, which could, for instance, be the case if some district characteristics determined both the incidence and scope of new projects and the activity among already existing commercial farmers. We deal with this potential problem in columns three to six. Another concern is that the results could be affected by another omitted variables bias, which could, for instance, be the case if some village characteristics determined both the incidence and scope of new projects close to the village and the amount of land available per household member. We deal with this potential problem mainly in columns seven to 10.

In the third and fourth columns, we include our vector of district-level control variables, with little consequence for our estimates. In the fifth and sixth columns, we include district fixed effects, meaning that all time-invariant district characteristics are cleansed out, and wage income from commercial farms is regressed on only the within-district variation in pledged agricultural investments. We still find that households with relatively little land benefit from the investments, but unless we add the interaction term, there is no significant relationship between investments and incomes.

There were about 16,400 standard enumeration areas (SEAs) in Zambia in 2008, which means that in 2008, where the total Zambian population was about 12.5 million, they on average covered a population of about 760 persons. The sample we use spans 394 different SEAs, each with an average of 29 households. These localities may be different in terms of the local labor markets met by agricultural workers, but also in terms of other aspects relevant to optimizing behavior of these rural farming households. They can differ in terms of access to infrastructure, access to and scope of markets for farm products, activity in other sectors of the economy, and the extent to which the local chiefs or village leaders encourage or discourage agricultural investments, etc. In our context, it is important to understand that they also can differ in terms of the quality and productivity of land. Suppose these localities only differed in land productivity. Areas with higher land productivity would attract more investments, in the past and the present, but would also allow farmers to survive on less land per household member. The estimates in the fifth and sixth columns would suffer from an omitted variables bias, caused by the omission of land quality or average land per household member in the locality and the interaction between land per household member in the locality and agricultural investments. Since land per household member will be positively correlated with land per household member among other households in the locality, the estimate for *Hectares per household member* and the interaction between this variable and *Agricultural investment* would be negatively biased. In the seventh and eighth columns, we therefore add standard enumeration area fixed effects.

We still find that households with less land benefit from agricultural investments also when all time-invariant characteristics for immediate surrounding are held constant. The positive changes in the estimates for *Hectares per household member* and the interaction between this variable and *Agricultural investment* suggest that these were indeed downward biased in the estimations with district fixed effects. The threshold number of hectares per household member is here a lower 0.33, but since most households have so little land available, the marginal effect of agricultural investments is still positive for 60 percent of our sample.

By using a standard household fixed effects approach, as we do in the last two columns of Table 3, we no longer capture the effect depending on hectares available, but changes in hectares available. More specifically, only the within-household variation in land per household members is used in the interaction term. The interpretation of the household fixed effects-specifications are problematic exactly because they rely on just changes in the amount of available land per household member rather than the amount of land that is available at each given time. Positive changes in land, which according to our estimates depress the impact of investments on commercial farm wage incomes could e.g., come from households acquiring more land. The choice to do so could be related to improved local conditions, and optimizing households may choose to spend more time on their own land rather than sell their labor. For this reason, we are more confident in the results with the standard enumeration area fixed effects, as these rely also on the variation between households in terms of land per household member. With this caveat, the results from the household-fixed effects results are in line with what we find in our other specifications.

Zoomers (2010) and Schoneveld (2014) discuss how the pressure on land for commercial use not only relates to investments in the production of food, non-food agricultural commodities, or biofuels. The development of protected areas and reserves, tourism also matter, as does infrastructure and urbanization, and demand from more traditional sectors such as mining. Are we in Tables 2 and 3 capturing that rural households become more land-poor as a direct consequence of the expansion of commercial farms, or land acquisitions related to investments in the non-agricultural sector, and therefore are pushed into wage employment, or are we capturing that the expansion of commercial farms pulls workers into for them more profitable activities? We test this in two ways, in Tables 4 and 5. If what we were capturing here was a push into commercial farm work from the displacement of smallholders, then investments in the non-agricultural sector could have similar impact on commercial farm wage income as investments in the agricultural sector. We find no indication that this is the case. All specifications in Table 4 are identical to those reported in Table 3, with the exception that *Non-agricultural investment* has been added. These results also reassure us that *Agricultural investment* was not capturing a generally favorable business climate or economic development in certain districts.

Moreover, if agricultural investments captured an environment favorable for all forms of agriculture and thus were positively correlated with the hiring activity of smallholders, we would expect *Agricultural investment*, on its own or interacted with *Hectares per household member*, to be significantly related also to wage income from working on smallholder farms. In Table 5, we use the same specifications as in Table 3 with the important difference that the dependent variable is *Smallholder farm wage income*. There appears to be no effect on wage income from working on smallholder farms. The coefficient for *Agricultural investment* is close to zero and far from significant. This also suggests that what we are capturing is a pull into commercial farm work rather than a push from own farm production.

To sum up, Tables 4 and 5 support the insights we got from Table 2 and 3. We are therefore reasonably confident that our results capture an effect on the labor market for workers on commercial farms, and that the size and even sign of this effect depend on how much land per person a household has available.

<Table 4 about here >

<Table 5 about here >

5 Concluding remarks

The global land rush has caught the attention of many observers, but where some see an opportunity, others fear that the already vulnerable may face yet another challenge. This paper systematically assesses the long- and short-term effects of agricultural investments in Zambia between 1994 and 2007 on wage incomes from commercial farm work for rural smallholder households. Special attention is given to the impact on households with relatively little land (per household member). Our results, which are quite robust, indicate that agricultural investments have a moderately positive effect, but that the effect is lower the more available land the households have. It appears that the land-poor have most to gain from agricultural investments, at least in terms of employment opportunities.

References

ADBG. 2015. Africa Infrastructure Country Diagnostics. African Development Bank Group.

Alfaro, L. 2003. Foreign Direct Investment and growth: Does the sector matter. *Working Paper*, Harvard Business School.

Anseeuw, W., Wily, L. A., Cotula, L., and Taylor, M.. 2012. Land Rights and the Rush for Land: Findings of the Global Commercial Pressures on Land Research Project. ILC, Rome

Arezki, R., Deininger, K., and Selod, H. 2015. What Drives the Global "Land Rush"? *World Bank Economic Review*, 29(2): 207-233.

Blomström, M., Kokko, A. 1998. Multinational Corporations and Spillovers. *Journal of Economic Surveys*, 12(3): 247–77.

Borensztein, E., De Gregorio, J., and Lee, J.-W. 1998. How Does Foreign Direct Investment Affect Economic Growth? *Journal of International Economics*, 45: 115-135.

Brown, T. 2005. Contestation, confusion and corruption: market based land reform in Zambia. In Evers, S., Spierenburg, M., and Wels, H. (eds) *Competing Jurisdictions: Settling land claims in Africa*, pp. 79-107. Leiden: Brill Academic Publishers.

Brunnschweiler, C., and Bulte, E. 2008. Linking Natural Resources to Slow Growth and More Conflict. *Science*, 320(5876):616-7

Bujko, M., Fischer, C., Krieger, T., and Meierrieks, D. 2015. How Institutions Shape Land Deals: The Role of Corruption. *CESifo Working Paper No. 5178.*

Chowdhury, A., and Mavrotas, G. 2006. FDI and Growth, What causes What? *World Economy*, 29:9-19.

CIESIN (2015) Center for International Earth Science Information Network - CIESIN - Columbia University, United Nations Food and Agriculture Programme - FAO, and Centro Internacional de Agricultura Tropical - CIAT. 2005. Gridded Population of the World, Version 3 (GPWv3): Population Count Grid. Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC).

Collier, P., and Patillo, C. 1999. Reducing the Risks of Investment in Africa. London: Macmillan.

Cotula, L., Vermeulen, S., Leonard, L., and Keeley, J. 2009. Land Grab or Development Opportunity? Agricultural Investment and International Land Deals in Africa. London/Rome: IIED/FAO/IFAD.

Cotula, L., Oya, C., Codjoe, E. A., Eid, A., Kakraba-Ampeh, M., Keeley, J., Kidewa, A. L., Makwarimba, M., Seide, W. M, Ole Nasha, W. O., Asare, R. O., and Rizzo, M. 2014. Testing Claims about Large Land Deals in Africa: Findings from a Multi-Country Study. *Journal of Development Studies*, 50(7):903-925.

CSO/MAL/IAPRI. 2008. Supplemental Surveys, 2001, 2004, and 2008, to Post-Harvest Surveys. Lusaka, Zambia: Central statistics Office, Ministry of Agriculture and Livestock, and Indaba Agricultural Policy Research institute.

Deininger, K. 2011. Challenges Posed by the New Wave of Farmland Investment. *Journal of Peasant Studies*, 38(2): 217-47.

Deininger, K., and Byerlee, D. 2012. The Rise of Large Farms in Land Abundant Countries: Do They Have a Future? *World Development*, 40(4):701-714.

Deininger, K., Byerlee, D., Lindsay, J., Norton, A., Selod, H., and Stickler, M. 2011. Rising Global Interest in Farmland. Can It Yield Sustainable and Equitable Benefits? Washington: World Bank.

DIVA-GIS. 2015. Available online at www.diva-gis.org.

Djokoto, J. G. 2012. Effects of Foreign Direct Investment Inflows into Agriculture on Food Security in Ghana. Journal of Economics and Sustainable Development, 3(2):81-92.

FAO. 2010. Global map of monthly precipitation - 10 arc minutes. Available online at www.fao.org/geonetwork.

FAO. 2012. Trends and Impacts of Foreign Investment in Developing Country Agriculture. Evidence from case studies. Rome: Food and Agriculture Organization of the United Nations.

FAO. 2015. Food Outlook: Biannual Report on Global Food Markets, May 2015. Rome: Food and Agriculture Organization of the United Nations.

GADM. 2015. Global Administrative Areas. Available online at www.gadm.org.

German, L., Schoneveld, G., and Mwangi, E. 2011. Contemporary processes of large-scale land acquisition by investors: case studies from sub-Saharan Africa. *Occasional Paper 68*. CIFOR, Bogor, Indonesia.

GRZ. 2009. Economic Report. Lusaka: GRZ, Ministry of Finance and National Planning.

GTZ. 2009. Foreign Direct Investment (FDI) in Land in developing countries. Deutsche Gesellschaft für Technische Zusammenarbeit, Eschborn.

Hichaambwa, M., and Jayne, T. S. 2012. Smallholder commercialization trends as affected by land constraints in Zambia: What are the policy implications? *IAPRI Working Paper*.

Honig, L. 2012. State land transfers and local authorities in Zambia. *Mimeo*: Cornell University.

Jayne, T. S., Zulu, B., Kajoba, G., and Weber, M. T. 2009. Access to land and poverty reduction in rural Zambia: Connecting the policy issues. Food Security Research Project, Policy synthesis, No. 34.

Jenkin, S. 2012. Foreign investment in agriculture. A medium-term perspective in Zambia. *Mimeo*, Lund University.

Jenkins, C., and Thomas, L. 2002. Foreign Direct Investment in Southern Africa: determinants, characteristics and implications for economic growth and poverty alleviation. CSAE and CREFSA.

Kragelund, P. 2009. Part of the disease or part of the cure? Chinese investments in the Zambian mining and construction sectors. *European Journal of Development Research*, 21: 644-661.

Mehlum H., Moene, K., and Torvik, R. 2006. Institutions and the resource curse. *Economic Journal*, 116: 1–20.

Naude, W. A., and Krugell, W. F. 2007. Investigating Geography and Institutions as Determinants of FDI in Africa. *Applied Economics*, 39:1223-1233.

NOAA. 2015. National Centers For Environmental Information. National Oceanic and Atmosphere Administration. Available online at http://ngdc.noaa.gov/eog/dmsp/downloadV4composites.html.

Nolte, K. 2014. Large-scale agricultural investments under poor land governance in Zambia. *Land Use Policy*, 38, 698-706.

Oakland Institute. 2011. Understanding Land Investment Deals in Africa – Country Report: Zambia.

RCMRD. 2015. Regional Centre of Mapping of Resources for Development. Available online at servirportal.rcmrd.org.

Richards, M. 2013. Social and Environmental Impacts of Agricultural Large-Scale Land Acquisitions in Africa – With a Focus on West and Central Africa. Washington, D.C.: Rights and Resources Initiative.

Sachs, J.D. and Warner, A.M. 1995. Natural resource abundance and economic growth. *NBER Working Paper* No. 5398.

Schoneveld, G. C. 2014. The geographic and sectoral patterns of large-scale farmland investments in sub-Saharan Africa. Food Policy, 48:34-50.

Schoneveld, G. C., German, L. A., and Nutakor, E. 2011. Land-based Investments for Rural Development? A Grounded Analysis of the Local Impacts of Biofuel Feedstock Plantations in Ghana. Ecology and Society, 16(4).

Shete, M., and Rutten, M. 2015. Impacts of large-scale farming on local communities' food security and income levels – Empirical evidence from Oromia Region, Ethiopia. *Land Use Policy*, 47:282-292.

Sipangule, K., and Lay, J. 2015. The Impact of Foreign Large-Scale Land Acquisitions on Smallholder Productivity: Evidence from Zambia. AGRODEP Working Paper 0011.

Sitko, N. J. 2010. Fractured governance and local frictions: The exclusionary nature of a clandestine land market in southern Zambia. *Africa*, 80(1):36-55.

Sitko, N. J., and Jayne, T. S. 2012. The rising class of emergent farmers: An effective model for achieving agricultural growth and poverty reduction in Africa? *IAPRI working paper 69*.

Sitko, N. J. and Jayne, T. S. 2013. *Structural transformation or elite land capture?: The growth of "emergent" farmers in Zambia*. Food Policy, 48:194-202.

UNCTAD. 2011. World Investment Report 2011. UNCTAD, UN.

UNCTAD. 2012. Statistical databases online. Available online at http://stats.unctad.org/.

Väth, S. J. 2013. Gaining neighbors or big losers. What happened when large-scale, land-based investment in the Ghanaian oil palm sector met the local population on the ground? LDPI Working Paper 24.

World Bank, 2009. Awakening Africa's Sleeping Giant. Prospects for Commercial Agriculture in the Guinea Savannah Zone and Beyond. Washington: World Bank.

Zambia Development Agency. 2014. Investment pledges from 1994-2013. Dataset. Lusaka, Zambia

Zoomers, A. 2010. Globalisation and the foreignisation of space: seven processes driving the current global land grab. Journal of Peasant Studies, 37(2):429-447.

Figures

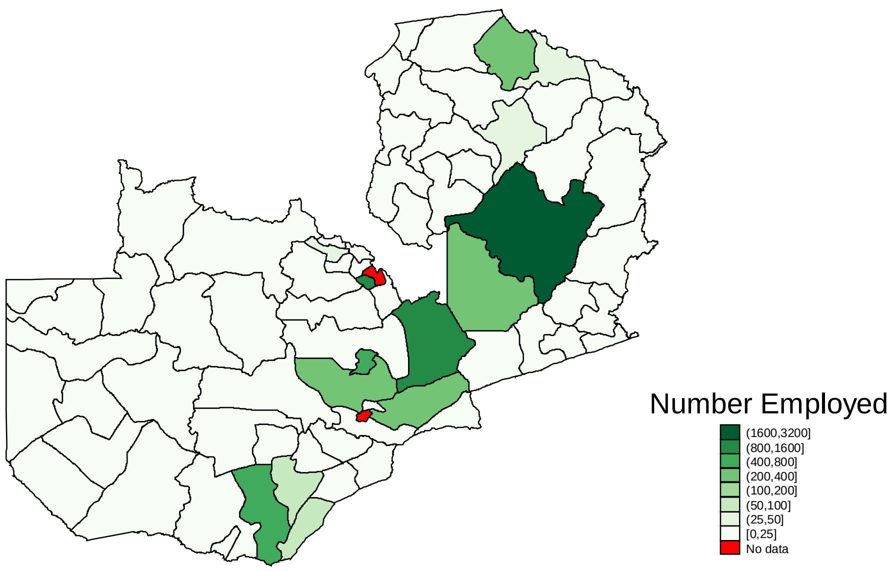

Figure 1.a. Pledged investments in agriculture 1996-2000.

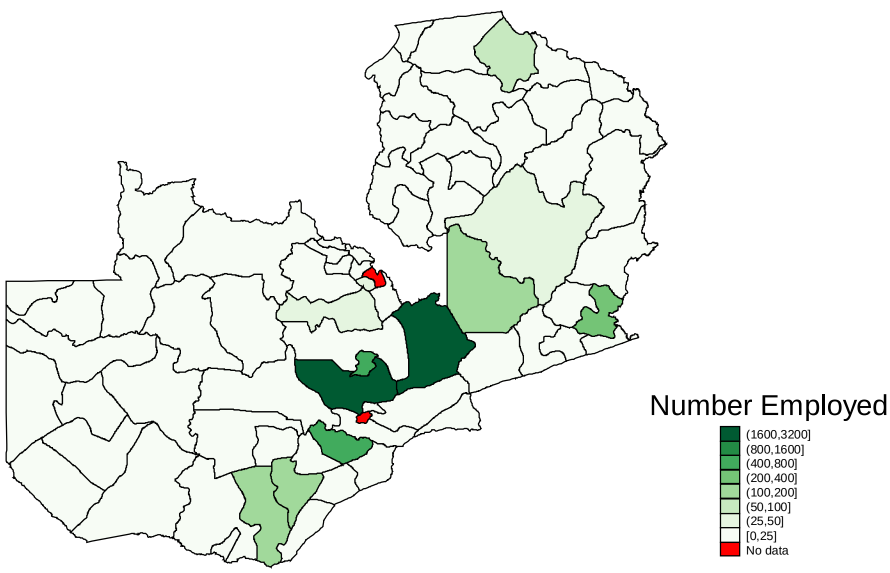

Figure 1.b. Pledged investments in agriculture 1999-2003.

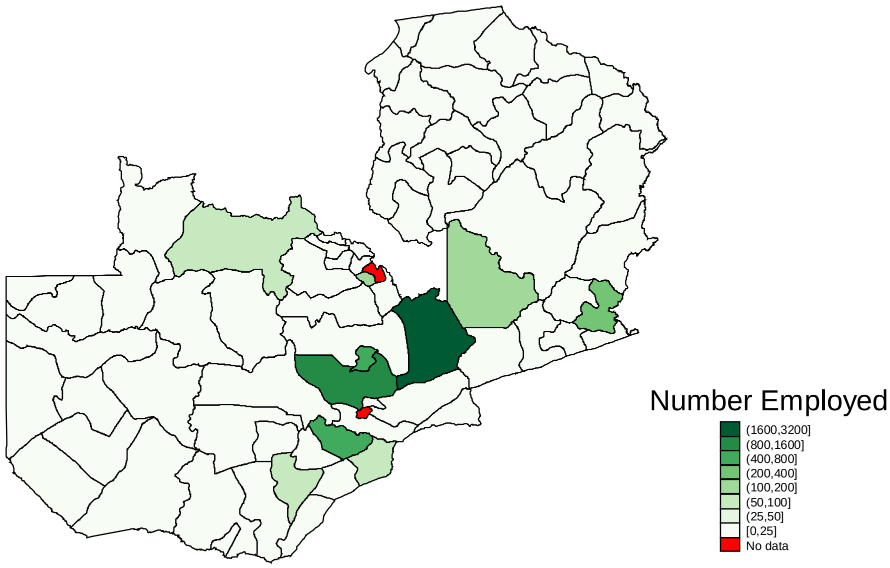

Figure 1.c. Pledged investments in agriculture 2003-2007.

Table 1. Summary statistics

	N	Mean	Median	Std.dev.	Min	Max
Commercial farm wage income (1000's)	11608	75.69	0	567.67	0	12104.91
Smallholder farm wage income (1000's)	11607	26.41	0	226.25	0	6657.70
Agricultural investments	15505	100.89	0	350.74	0	2893
Non-agricultural investments	15505	108.29	0	443.50	0	8694
Hectars per household member	15148	0.42	0.28	0.51	0	13.21
Household size	15505	6.11	6	3.18	0.08	41
Hectars available	15148	2.19	1.5	2.26	0	20
Household head level of education	15501	5.22	6	3.83	0	19
Male household head	15505	0.77	1	0.42	0	1
Railroad	15505	5.75	0	12.62	0	74.04
Electricity	15505	2.65	1.68	3.40	0	27.32
Rainfall	15505	1033.64	1016.92	200.40	678.50	1413.33
Cropland	15505	9.73	6.94	7.99	0.52	30.26
Forest	15505	0.50	0.43	0.41	0.02	1.96
Grassland	15505	0.07	0.03	0.08	0.00	0.38
Water body	15505	2.43	0.45	6.51	0.01	43.76
Log District area	15505	9.16	9.23	0.72	6.52	10.59
Log Population in 1990	15505	11.53	11.58	0.46	9.92	12.73
Log Light density in 1992	15505	-6.88	-6.56	1.89	-9.21	-3.00

Notes:

The figures represent the three-period sample used in Tables 3-5.

Table 2. Agricultural investments 1994-2007 and commercial farm wage incomes

	(1)	(2)	(3)	(4)	(5)
	Dependent variable: Commercial farm wage income				
Agricultural inv. (1994-2007)	0.053**	0.058***	0.063***	0.081***	0.078***
	(0.023)	(0.021)	(0.014)	(0.021)	(0.020)
Hectares per HH member	-15.696	-15.326	-11.336	8.669	10.093
	(14.702)	(17.760)	(17.620)	(17.037)	(17.018)
Agricultural inv. * Hectares per HH member				-0.042*	-0.044*
				(0.022)	(0.022)
Non-agricultural inv.					-0.011*
					(0.006)
Household-level controls	Yes	Yes	Yes	Yes	Yes
Province fixed effects	N	Yes	Yes	Yes	Yes
District-level controls	N	N	Yes	Yes	Yes
Observations	4,362	4,362	4,362	4,362	4,362

Notes:

Estimated with (weighted) OLS. Standard errors, clustered by district, in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent level, respectively. The dependent variable is in 1000's of ZMK and drawn from the 2008 wave of the PHS/SS. The Household-level controls are Household size, Male household head, and Household head level of education. The District-level controls are Railroad, Electricity, Rain, Cropland, Forest, Grassland, Water body, District area, District population, and Log Light density.

Table 3. Agricultural investments the last five years and commercial farm wage incomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
					Dependent variable: Commercial farm wage income					
Agricultural inv.	0.165***	0.263***	0.146**	0.237**	-0.044	0.050*	-0.013	0.051***	0.019	0.102***
	(0.059)	(0.091)	(0.060)	(0.093)	(0.031)	(0.028)	(0.011)	(0.017)	(0.015)	(0.040)
Hectares per HH member	-51.396***	-30.409**	-60.332***	-40.565**	-53.141**	-33.661**	-21.549**	-8.683	-10.322	3.407
	(17.988)	(12.792)	(22.039)	(17.122)	(21.947)	(16.590)	(9.690)	(7.240)	(9.644)	(9.033)
Agricultural inv.		-0.255***		-0.237**		-0.229**		-0.154**		-0.195**
* Hectares per HH member		(0.092)		(0.099)		(0.098)		(0.065)		(0.081)
Household-level controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District-level controls	N	N	Yes	Yes	N	N	N	N	N	N
District fixed effects	N	N	N	N	Yes	Yes	N	N	N	N
SEA fixed effects	N	N	N	N	N	N	Yes	Yes	N	N
HH fixed effects	N	N	N	N	N	N	N	N	Yes	Yes
Observations	11,255	11,255	11,255	11,255	11,255	11,255	11,255	11,255	9,957	9,957

Notes:

Estimated with (weighted) OLS.Standard errors, clustered by district, in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent level, respectively. The dependent variable is in 1000's of ZMK and drawn from the 2001, 2004, and 2008 waves of the PHS/SS. The Household-level controls are Household size, Male household head, and Household head level of education. The District-level controls are Railroad, Electricity, Rain, Cropland, Forest, Grassland, Water body, Log District area, Log District population, and Log Light density.

Table 4. Agricultural investments the last five years and commercial farm wage incomes, controlling for non-agricultural investments

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
					Dependent variable: Commercial farm wage income					
Agricultural inv.	0.163***	0.260***	0.146**	0.236***	-0.045	0.049*	-0.013	0.051***	0.019	0.102***
	(0.059)	(0.091)	(0.059)	(0.092)	(0.031)	(0.027)	(0.011)	(0.017)	(0.015)	(0.039)
Hectares per HH member	-51.679***	-24.645*	-59.939***	-36.497**	-53.002**	-31.778*	-21.508**	-10.711	-10.256	3.765
	(17.988)	(13.460)	(22.214)	(18.549)	(21.898)	(17.176)	(9.696)	(7.267)	(9.649)	(8.045)
Agricultural inv.		-0.252***		-0.235**		-0.228**		-0.155**		-0.195**
* Hectares per HH member		(0.092)		(0.099)		(0.099)		(0.066)		(0.081)
Non-agricultural inv.	0.053	0.085	0.025	0.046	0.013	0.023	0.005	-0.006	0.006	0.008
	(0.068)	(0.109)	(0.053)	(0.083)	(0.018)	(0.024)	(0.011)	(0.013)	(0.015)	(0.021)
Non-agricultural inv.		-0.075		-0.046		-0.022		0.026		-0.004
* Hectares per HH member		(0.109)		(0.098)		(0.076)		(0.019)		(0.036)
Household-level controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District-level controls	N	N	Yes	Yes	N	N	N	N	N	N
District fixed effects	N	N	N	N	Yes	Yes	N	N	N	N
SEA fixed effects	N	N	N	N	N	N	Yes	Yes	N	N
HH fixed effects	N	N	N	N	N	N	N	N	Yes	Yes
Observations	11,255	11,255	11,255	11,255	11,255	11,255	11,255	11,255	9,957	9,957

Notes:

Estimated with (weighted) OLS.Standard errors, clustered by district, in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent level, respectively. The dependent variable is in 1000's of ZMK and drawn from the 2001, 2004, and 2008 waves of the PHS/SS. The Household-level controls are Household size, Male household head, and Household head level of education. The District-level controls are Railroad, Electricity, Rain, Cropland, Forest, Grassland, Water body, Log District area, Log District population, and Log Light density.

Table 5. Agricultural investments the last five years and smallholder farm wage incomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
					Dependent variable: Smallholder farm wage income					
Agricultural inv.	0.003	0.005	-0.001	-0.004	0.007	0.010	0.005	0.008	0.002	-0.004
	(0.007)	(0.010)	(0.007)	(0.007)	(0.007)	(0.009)	(0.008)	(0.010)	(0.010)	(0.013)
Hectares per HH member	-5.297	-4.699	-6.308*	-5.559*	-5.909*	-5.262	-7.203**	-6.585**	-5.834	-6.769
	(3.244)	(3.294)	(3.446)	(3.344)	(3.369)	(3.505)	(2.922)	(3.152)	(5.050)	(5.406)
Agricultural inv.		-0.007		-0.006		-0.008		-0.007		0.013
* Hectares per HH member		(0.010)		(0.010)		(0.009)		(0.007)		(0.013)
Household-level controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District-level controls	N	N	Yes	Yes	N	N	N	N	N	N
District fixed effects	N	N	N	N	Yes	Yes	N	N	N	N
SEA fixed effects	N	N	N	N	N	N	Yes	Yes	N	N
HH fixed effects	N	N	N	N	N	N	N	N	Yes	Yes
Observations	11,254	11,254	11,254	11,254	11,254	11,254	11,254	11,254	9,956	9,956

Notes:

Estimated with (weighted) OLS.Standard errors, clustered by district, in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent level, respectively. The dependent variable is in 1000's of ZMK and drawn from the 2001, 2004, and 2008 waves of the PHS/SS. The Household-level controls are Household size, Male household head, and Household head level of education. The District-level controls are Railroad, Electricity, Rain, Cropland, Forest, Grassland, Water body, Log District area, Log District population, and Log Light density.

Table 6. Variables

Panel A: Household-level

Variable	Source	Short Description
Commercial farm wage income	PHS/SS	Household real wage income from working on commercial farm(s). In 1000's of ZMK (2009).
Smallholder farm wage income	PHS/SS	Household real wage income from working on small-holder farm(s). In 1000's of ZMK.
Hectares per household member	PHS/SS	Hectares available divided by the number of members in the household.
Household size	PHS/SS	Number of members in the household.
Hectares available	PHS/SS	Cultivated and fallow land.
Household head level of education	PHS/SS	Educational attainment in years of household head.
Male household head	PHS/SS	The household head is male.

Panel B: District-level

Variable	Source	Short Description
Agricultural investments	ZDA	Total employees in pledged investments in the agricultural sector during (i) 1994-2007 or (ii) the 5-year period prior to the PHS/SS wave.
Non-agricultural investments	ZDA	Total employees in pledged investments in sectors other than agriculture during (i) 1994-2007 or (ii) the 5-year period prior to the PHS/SS wave.
Railroad	DIVA-GIS (2015)	Percentage of a district within 10 km of railroad (2006).
Electricity	ADBG (2015)	Percentage of a district within one km of medium to high voltage transmission line (2006).
Rainfall	FAO (2000)	Average annual rainfall in a district 1960-1990 in mm.
Cropland	RCMRD (2015)	Proportion of cropland in a district (2000).
Forest	RCMRD (2015)	Proportion of forest in a district (2000).
Grassland	RCMRD (2015)	Proportion of grassland in a district (2000).
Water body	RCMRD (2015)	Proportion of water body in a district (2000).
Log District area	GADM (2015)	Area of a district in km2.
Log Population	CIESIN (2015)	Total population in a district in 1990.
Log Light density	NOAA (2015) and CIESIN (2015)	Log Light density is the natural log the intensity of nighttime light in 1992 divided by the 1990 population level plus of 0.0001.

Panel C: Additional information

Data	Source	Short Description
District boundaries	GADM (2015)	Administrative boundaries data were extracted from the GADM database.