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Christine Husmann and Zaneta Kubik

Foreign direct investment in the African food and agriculture sector: trends, determinants and impacts

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Abstract

In this paper, we seek to answer three research questions: (1) What is the pattern of foreign direct investment (FDI) in the African food and agriculture sector in the last 15 years? (2) What are the drivers of FDI in the African food and agriculture sector? (3) What is the evidence on the impacts of private-sector investments in the African food and agriculture sector on the product and labor markets, with particular focus on income effects? Our analysis shows that a total of $48.737 billion was invested in the African food and agriculture sector by foreign private-sector investors between 2003 and 2017, with a noticeable peak in FDI inflows observed after the 2008/09 agricultural commodities shocks suggesting that international investors want to capitalize on high food prices. The initiatives such as the New Alliance for Food Security and Nutrition and Grow Africa, which aim to create a conducive environment for investment, might have also contributed to the growth of FDI volumes reported over the last years.

Our econometric analysis reveals that market potential is one of the main drivers of FDI in food and agriculture sector in Africa. More specifically, population size consistently has a significant impact on sectoral FDI inflows in Africa, irrespective of the model specification. Among the supply-side factors, the size of agricultural land turns out to be an important predictor of FDI inflows. Agglomeration effects are also observed, with a lagged volume of FDI inflows having a very strong impact on the level of current FDI. Finally, infrastructure or institutional quality play an essential role in attracting investment. These findings give support to various strands of literature that we drew upon in the theoretical framework.

Uncovering the impacts that private-sector investment has on the population proved not to be straightforward. Even though the literature is relatively abundant, it is flawed with multiple methodological issues that limit its internal and external validity. Despite these caveats, most of the studies reviewed in our paper seem to suggest positive impacts on farm and labor income. The effects on equality and poverty are not clear, as some investment schemes may be biased towards the better-off households. However, wage-employment opportunities generated by private-sector investment seem to benefit the poorest, especially when they target unskilled labor or women. Finally, there is evidence that private-sector investment might act as a driver of technical innovation. However, many research gaps remain.

Keywords: foreign direct investment; food; agriculture; Africa; income; employment

JEL codes: E22, E24, F21, F23, Q00, Q13, Q18

Acronyms

CCF	Country Cooperation Frameworks
DAP	Delivered At Place
FAO	Food and Agriculture Organization
FCFA	Foreign Currency Fluctuation Account
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
ICT	Information and Communications Technology
IFC	International Finance Corporation
IFDC	International Fertilizer Development Center
ILO	International Labour Organization
LOI	Letter of Intent
MNEs	Multinational Enterprises
NEPAD	New Partnership for Africa's Development
OCP	Office Cherifien des Phosphates
OECD	Organisation for Economic Co-operation and Development
OLI	Ownership-Location-Internalization
SAGCOT	Southern Agricultural Growth Corridor
SAM	Social Accounting Matrix
SAR	Spatial Autoregressive (Model)
SEM	Spatial Error Model
UNCTAD	United Nations Conference on Trade and Development
UNIDO	United Nations Industrial Development Organization

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1 Introduction

The food and agriculture sector[i] in Sub-Saharan Africa is undergoing a profound transformation. One important feature of this transformation is the rapidly growing importance of the private sector, understood here as enterprises, companies or businesses, regardless of size, ownership and structure (FAO, 2013), in agricultural production, processing and retail. Globally, processes of liberalization and globalization have shaped the agro-industry, especially since the mid-1980s (von Braun and Díaz-Bonilla, 2008). Thanks to trade liberalization and improvements in logistics, global food trade has doubled in this time span and spurred investments in food production, processing and retail, both by foreign and domestic private-sector investors (Reardon et al., 2009). These changes include a growing orientation towards export markets, especially the food markets of industrial countries. The growth of private-sector investments also led to a consolidation of processing and retail, which induced the so-called 'supermarket revolution' and the spread of fast-food chains in many poor countries (Reardon et al., 2009). A related organizational and institutional change is the rise of vertical coordination via contracts and market linkage arrangements, as well as private grades and standards (Dolan and Humphrey, 2004; Reardon et al., 2009; Swinnen and Maertens, 2007).

In addition, private sector-funded agricultural research has been growing rapidly, with important implications for poor smallholders (see e.g. Pray et al., 2007; Wangwe et al., 2009). Although it is difficult to find data about private-sector investments in agricultural research, as companies often regard such information as trade secret and factor of competitive advantage, there is mounting evidence that private research and development is a major driver of increasing agricultural productivity in low income countries. In particular, the introduction of private-sector innovation in the domains of plant varieties, machinery, pesticides, fertilizers, and poultry has been an important source of new agricultural technologies and has led to increased productivity (Beintema and Stads, 2008; Naseem et al., 2010; Pray et al., 2011). Additionally, proponents of the private sector stress a profound shift in mindset around the engagement of private companies and their role in addressing societal problems; the private sector now appears in a much more positive light and has, in many instances, shown that social value creation and profit maximization can go hand-in-hand (Baumüller et al., 2013).

Although many of these changes are observed in Africa, much more private-sector investment will be necessary in order to successfully deal with future challenges of providing enough jobs and food for a rapidly growing African population. Foreign direct investment (FDI) has the potential to fill this gap, especially where local private-sector investment is insufficient as a

result of financing constraints. Moreover, the potential contributions of FDI to local economies reach much further than just providing capital; it is also expected to create quality employment, bring new technologies that increase productivity, improve infrastructure, and affect domestic investors through spillover effects (Zhan et al., 2018). Yet, FDI, and especially large-scale investments, continue to raise concerns over market dominance, exclusion of smallholder farmers, and limited linkages with the local economies in case of export-oriented projects (Zhan et al., 2018; Karlsson, 2014). In particular, foreign investments involving land acquisition have been criticized for negatively affecting the rights and livelihoods of local communities, leading to conflicts over resources, or being motivated by speculative rather than productive objectives (FAO, 2011; Deininger, 2011).

To this day, however, FDI into the African food and agriculture sector has remained low compared to other regions, at barely 10.5% of the world FDI in the sector (Fiedler and Iafrate, 2017). To address this gap, several important initiatives have recently been launched. These aim to create a conducive environment for private-sector investments, in particular in the form of FDI, for sustainable and inclusive growth in Africa. Most prominent among these initiatives are the Marshall Plan with Africa and the G20 Compact with Africa:

The Marshall Plan with Africa, which was first presented in 2016 but is a 'living document', outlines future cooperation between Africa and the EU. The Marshall Plan stresses the importance of job creation, entrepreneurship and value creation in Africa to achieve food security and inclusive growth.[ii]

The G20 Compact with Africa, initiated by the German government during its G20 presidency in 2017, was set up to promote private investments in Africa in all sectors. The Compact with Africa aims to develop comprehensive, coordinated and country-specific investment compacts between individual African countries, international organizations and other partners. This demand-driven initiative is open to all African countries.[iii] While these initiatives target all sectors in the economy, two other big initiatives, the New Alliance for Food Security and Nutrition (henceforth New Alliance) and Grow Africa, focus exclusively on promoting private investments in the food and agriculture sector:

The New Alliance for Food Security and Nutrition was launched as a partnership between G8 nations, African countries (at present Benin, Burkina Faso, Côte d'Ivoire, Ethiopia, Ghana, Malawi, Mozambique, Nigeria, Senegal, Tanzania) and the private sector in May 2012. The goals of the initiative are to help lift 50 million people out of poverty in Africa by 2022; achieve sustained, inclusive, agriculture-led growth; reaffirm continued donor commitment to reducing poverty and hunger; and leverage the potential of responsible private investment to

support development goals. So far, more than 200 African and international companies have signed Letters of Intent to invest $10 billion in African agriculture[iv].

Grow Africa is a multi-stakeholder platform founded by the African Union, the New Partnership for Africa's Development (NEPAD) and the World Economic Forum in 2011. Its goals are to increase private-sector investments in agriculture[v] and enable countries to realize the potential of their agricultural sectors. The initiative aims to achieve these goals by brokering collaboration between governments, international and domestic agriculture companies and smallholder farmers in order to lower the risk and cost of investing in agriculture and to improve the speed of return to all stakeholders. The partnership platform comprises over 200 companies and governments of 12 countries (Benin, Burkina Faso, Côte d'Ivoire, Ethiopia, Ghana, Kenya, Malawi, Mozambique, Nigeria, Rwanda, Senegal, and Tanzania), of which ten are also part of the New Alliance.[vi]

Against this background, we aim to substantiate the debate about FDI in food and agriculture sector with evidence on both the size and location of investments and their impacts. More specifically, we aim to answer three different research questions:

1. What is the pattern of FDI in the African food and agriculture sector in the last 15 years?
2. What are the drivers of FDI in the African food and agriculture sector?
3. What is the evidence on the impacts of private-sector investments in the African food and agriculture sector on the product and labor markets, with particular focus on income effects and public goods?

Since answering these research questions requires different methodologies, we analyze each of them in a separate section below, i.e. first research question in section 3, second research question in section 4, and third research question in section 5. Note that while the main focus of this paper is on FDI in the African food and agriculture sector, we adopt a broader approach to answer the third research question which requires analyzing the impacts of private-sector investments. This choice is motivated by the limitations of the FDI dataset used in this research. We attempt to answer the third question based on a literature review; however, since microeconomic evidence of the impact of FDI in the African food and agriculture sector is scarce, we cover literature on the private-sector investments without distinguishing between foreign and local investments.

In this study, we consider private-sector investments in the form of:

1. a private company establishing relationships with local farmers for agricultural production to buy their produce for further processing and sale (e.g. outgrower schemes/contract farming);
2. a private company building or taking over a processing factory to process agricultural products;
3. a private company setting up production and/or sales infrastructure for agricultural inputs and/or machinery for farmers and related services;
4. a private company establishing marketing channels (e.g. with supermarkets) for agricultural products;
5. any combination of the above.

Several caveats pertaining to this definition of private sector need to be pointed out. First, investment projects in crop production that entail large-scale land acquisition are included in our dataset and therefore constitute a part of the statistical and econometric analysis of the first two research questions; however, we do not cover them in the literature review on the impacts of private-sector investments as this has been extensively reviewed in the literature (see e.g. Deininger and Byerlee, 2012; Deininger, 2011; Deininger and Byerlee, 2011; Baumgartner et al., 2015; Cotula and Vermeulen, 2011; von Braun and Meinzen-Dick, 2009). Second, because of our data structure, the statistical and econometric analysis covers greenfield investments only, excluding mergers and acquisitions (see section 2.1 for details). Finally, we exclude from our analysis the investments made by individual farmers. Note, however, that globally, farmers are the largest investors in agriculture[vii], and their investment is estimated to be three times higher than the investment from all other sources, public and private, combined (FAO, 2012).[viii]

We first look at the state of FDI in the African food and agriculture sector since 2003 and analyze how much was invested, the subsectors in which investments were made and where the investments flowed. We also conduct an econometric analysis of the determinants of the FDI location at both the country level and spatial pixel level. Then, we review studies that apply methods of structured evaluation research and empirically assess the impacts of private-sector investments in the food and agriculture sector in Sub-Saharan Africa in order to see what evidence exists on impacts and what implications for policy may be gained. This synopsis can fill an important gap in the literature, first, by determining how much is actually invested and where, and secondly by providing robust insights about the impact of private-sector investments in the food and agriculture sector in Africa.

2 Data and method

2.1 FDI data source and reliability

The principal source of data used to analyze the FDI in the African food and beverages cluster stems from fDi Markets, an intelligence unit of the Financial Times[ix]. The dataset comprises cross-border greenfield investments in all countries and sectors worldwide. Note that contrary to the UNCTAD or OECD datasets on FDI, only greenfield investments are included in the fDi Markets dataset, while joint ventures are included only if they lead to a new physical implantation, and mergers and acquisitions (M&A) are excluded. fDi Markets collects data from more than 10,000 public sources worldwide, including local newspapers, investment agencies and companies' press releases. The databank contains all foreign direct investments that have been publicly announced. The collection of investment projects can therefore be considered fairly complete, as it is unlikely that an investment remains completely unnoticed.

An important caveat is that the investment projects are added to the dataset at the time of announcement, and therefore the details such as the amount of capital invested and the number of jobs created are based on the investment plans. The data does not convey information on whether a given project has been realized, when and to which extent, in comparison to the investment plans. We conducted a reliability test of the dataset by drawing a sample equivalent to 5% of all reported projects and verifying the data via a Google search. We were able to identify all projects, and our test confirmed that 76.5% of the projects in this sample were implemented. Even though not fully accurate, we therefore consider this data to be relatively reliable. For a full description of our reliability test, see the Appendix.

In particular, since the funds need to be budgeted in the companies' usually well-audited financial plans, we consider financial estimation of the investment as reliable and we use it throughout our analysis. On the other hand, the number of jobs created can be expected to deviate considerably from original plans and therefore we don't use these numbers in our analysis; instead, we apply capital-labor ratios found in the literature to estimate the total number of jobs created (see section 3.7). In this dataset, the investments are measured in current USD. As noted by Fiedler and Iafrate (2017), this is a common practice in standard FDI databases. Furthermore, due to the dataset's short timeframe and low USD inflation rate over that period, the use of deflator only has a marginal effect on the FDI values.

2.2 Approach to statistical analysis of FDI patterns and determinants

We analyze the patterns of FDI by means of descriptive statistics and maps produced with ArcGIS software using the fDi Markets dataset. We look at both temporal, regional and sectoral patterns of food and agriculture FDI across Africa, as well as the main investing companies. Additionally, we estimate the employment effects of these investments. As mentioned above, we use capital-labor ratios and job multipliers taken from the literature to estimate the number of directly and indirectly created jobs, as well as the jobs created via growth effects.

In the econometric analysis of the determinants of FDI location, we use additional data from different sources. In the country-level analysis, we control for a set of variables that correspond to various strands of theory. This includes using the logarithm of GDP per capita and population size as proxies for market potential, size of agricultural land as a proxy for locational advantage, share of population with access to electricity and a dummy for access to a port as proxies for infrastructure, and finally corporate tax rate and regulatory quality as proxies for institutional environment. The number of variables included in the spatial pixel-level analysis is constrained by the availability of the georeferenced data. More specifically, we were able to control for population density, stunting index, mean years of education for men and women, health index, accessibility, soil index and agro-ecological zones. Tables A5 and A6 in the Appendix provide details of the data sources. Since the fDi Markets dataset tracks the investment at the date of announcement and not the date at which the capital effectively crossed the border, the dependent variables – the volume of food and agriculture FDI and the number of projects per country – are measures of anticipated investments. Therefore, timewise, the control variables correspond to the time of investment decisions, and not investment realization. This characteristic of our dataset enables us to avoid the potential problem of reverse causality.

2.3 Literature review approach

We exclusively review studies of Sub-Saharan Africa using primary data collected since 2000[x] and focussing on impacts of private-sector investments in food and agriculture. The subsectors of interest include horticulture, grains, palm oil and tropical beverages (tea, coffee, cocoa). Studies related to energy crops are not included in our review. While most empirical studies concentrate on contract farming schemes and their impacts on smallholder farmers, we take a broader approach, looking beyond contract farming or outgrower schemes to consider any kind of private investments in the food and beverages cluster along the whole

value chain. However, as mentioned earlier, large-scale land investments are not covered in this paper as others have extensively reviewed this topic. Through this analysis, we review the impacts that private-sector investments have on different subsets of the population all along the value chain to the largest extent possible. Subsets of the population include smallholders, traders and employees, and we also seek to assess effects on public goods. Moreover, we extract information on gender effects and try to differentiate between poorer and better-off groups wherever possible.

To identify relevant papers, we used search engines such as AgEcon and Google Scholar, restricting the search to articles published from the year 2000 onwards. In addition to empirical studies published in peer-reviewed journals, we also include grey literature, provided that the publications contain information about the data and methods used. Emanating from this literature, we employed the snowball method to find other relevant publications. Guided by our conceptual framework, we reviewed the resulting list of articles based on their scope, the data and methods used, the findings, the countries and sectors investigated, the origin of the investor and the size of the investment. An overview of all studies meeting our criteria can be found in Table A4 in the Appendix. We depart from this method for the analysis of the New Alliance and Grow Africa. Since these initiatives are only few years old, an evaluation of their impacts may not yet be feasible. Therefore, we widen our criteria to include grey literature in order to learn more about the impacts of these large investment projects.

2.4 Conceptual framework for the review of the impacts of private investments

The following conceptual framework (see Figure 1) establishes a frame of reference against which we analyze the literature that covers the potential impacts of private-sector investments.

Note that in an ideal scenario, this framework would include:

- Analyses of the short-, middle- and long-term impacts.
- Counterfactual analyses comparing the investment project case with the hypothetical development that would have occurred without investment in order to fully assess the impacts of investments.
- Multiplier effects for consumers and for employment.

Due to the difficulty in conducting these types of analyses, this type of research on the impacts of investment projects in Africa has not yet been attempted. These elements are therefore omitted from our framework.

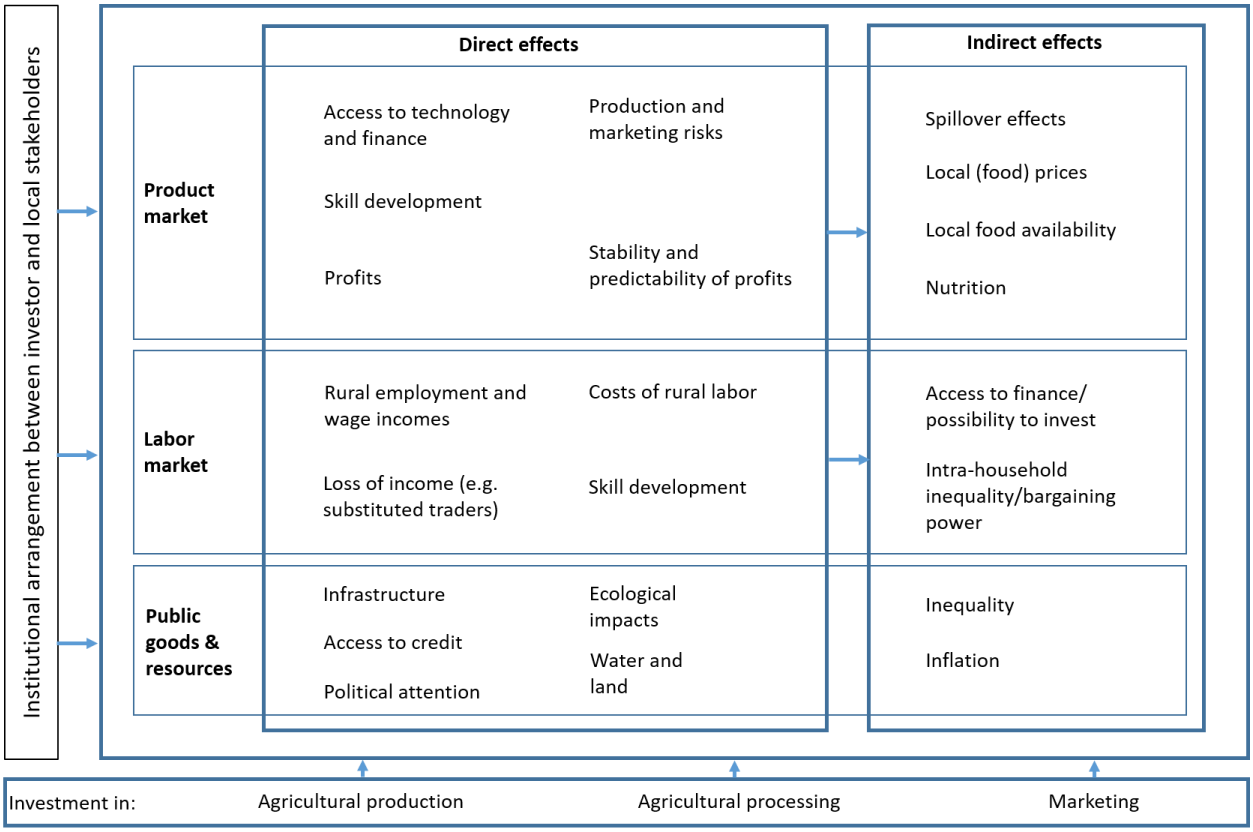

Figure 1: Conceptual framework for the analysis of impacts of private investments

Source: Authors' compilation.

3 FDI in the African food and beverages cluster: how much money is invested and where?

3.1 Temporal patterns in food and agriculture FDI

A total of $48.737 billion was invested in the African food and beverages cluster between 2003 and 2017, according to public announcements of companies' investment plans[xi]. Almost half of these investments, amounting to $21.325 billion, was invested in the pesticides, fertilizer and other agro-chemical subsector. Note that the dataset does not further distinguish between pesticides, fertilizer, and other agro-chemicals. However, we checked the purpose of all 55 projects via Google search and found that 86% of the capital invested in the subsector is related to fertilizer and 14% to pesticides and other agro-chemicals[xii]. We discuss these investments in section 3.8 separately.

Figure 2 - Figure 5 show the change of FDI inflows in the cluster over time in terms of capital investment, number of projects, and number of companies. The figures suggest that FDI inflows into the African food and agriculture sector broadly follow the worldwide trends for the sector (cf. Fiedler and Iafrate, 2017). More specifically, FDI inflows decreased substantially over the 2004-2007 period, when the prices of agricultural commodities were low. This was followed by a rapid increase in 2008 and 2009 and corresponds to the boom in agricultural commodities, indicating that foreign investors sought to capitalize on high food prices and high expected returns.

There was a noticeable surge in FDI inflows to the African food and beverages cluster in 2011. Afterwards, levels of FDI inflows decreased slightly but remained high overall, especially in terms of the number of investment projects and the number of companies involved. The singular peak in 2011 FDI volume is, to a great extent, explained by a single investment project worth almost $2 billion. This was an investment in palm oil production in Cameroon by an Indian company, Siva Group[xiii]. Note that following its announcement, it was impossible to fully trace this investment from official sources[xiv]; it is therefore not clear to which extent the $2 billion project was implemented. The reasons behind a similar rise in the number of projects and number of companies investing from 2011 onwards may be related to structural factors, mainly growth in the demand for food, both locally and internationally, which, in turn, is a consequence of population growth, urbanization, and rising incomes.

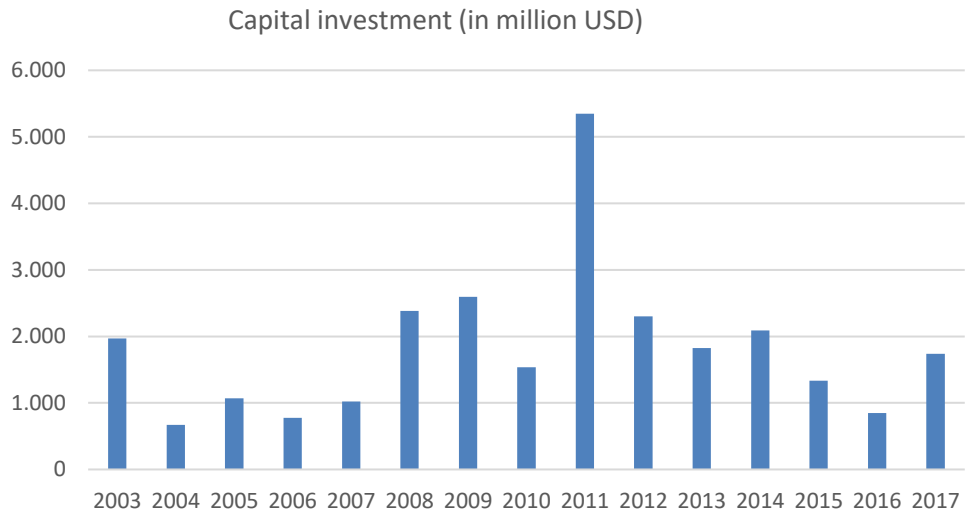

Figure 2: FDI inflows into the African food and beverages cluster 2003-2017 (excluding fertilizer investments): capital investment

Source: Authors' compilation based on fDi data (www.fdimarkets.com; accessed January 16, 2018)

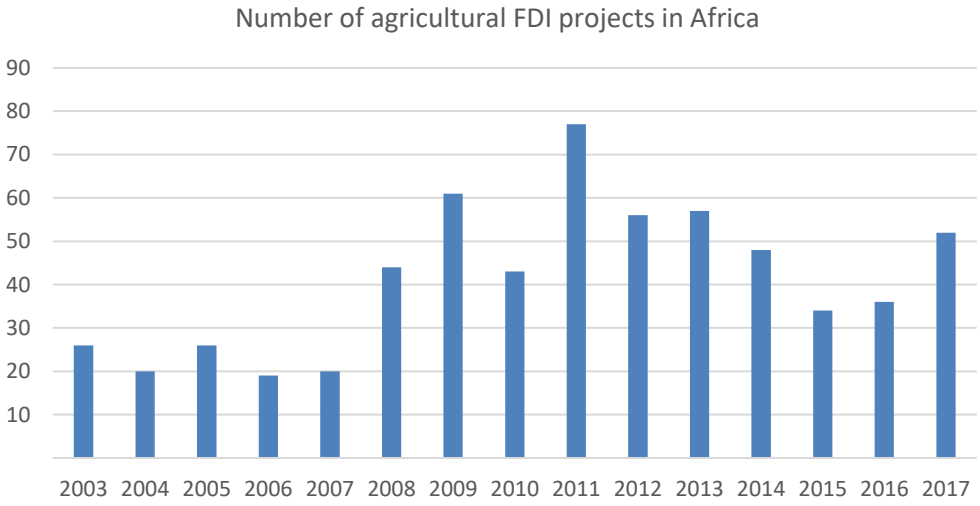

Figure 3: FDI inflows into the African food and beverages cluster 2003-2017 (excluding fertilizer investments): number of projects

Source: Authors' compilation based on fDi data (www.fdimarkets.com; accessed January 16, 2018)

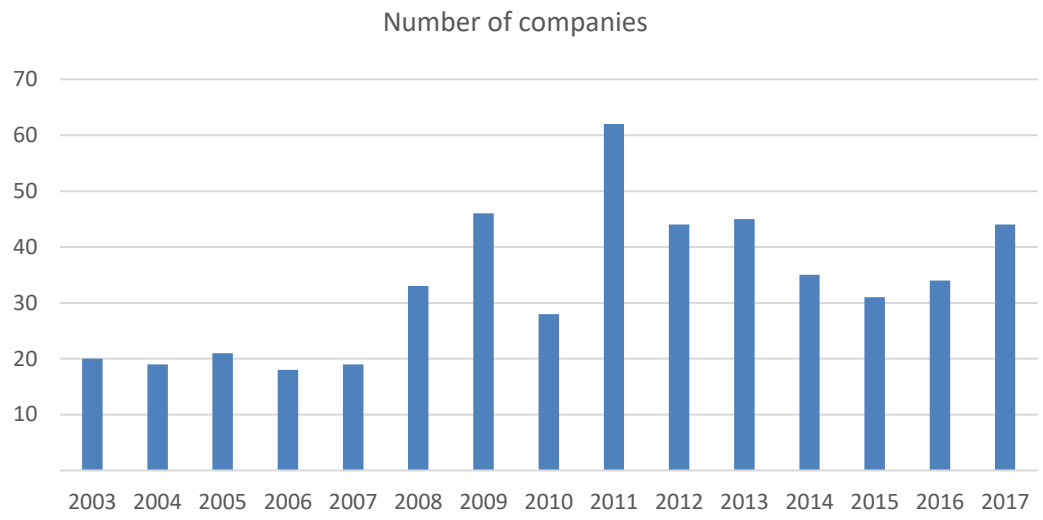

Figure 4: FDI inflows into the African food and beverages cluster 2003-2017 (excluding fertilizer investments): number of companies

Source: Authors' compilation based on fDi data (www.fdimarkets.com; accessed January 16, 2018)

We speculate that the rise in FDI over recent years was triggered by the launch of New Alliance and Grow Africa, both of which were expected to create conducive environment for private-sector investment in agriculture, intensify partnerships between various stakeholders and increase private companies commitments to invest in African agriculture. Properly assessing the success of both initiatives is not straightforward[xv], as their achievements are only reported in their respective progress reports and have not been evaluated by external independent organizations. Moreover, the last annual report of the New Alliance and Grow Africa dates back to 2015. While the data on the implementation of policies and commitments made by the governments involved is fairly detailed, information about the investments made by the companies, measured against their commitments in the (non-binding) Letters of Intent (LOIs), is scarcer.

Progress is only reported for 56% of the 292 LOIs signed by private companies participating in the Grow Africa partnership. According to these LOIs, companies intend to invest close to $10.2 billion, of which about $684 million was reported to be invested in 2014 in 12 partner countries (New Alliance for Food Security and Nutrition and Grow Africa, 2015). The latest official information is available for 2015, when private sector is reported to have invested $500 million, which adds up to $2.3 billion invested over the period 2013-2015.[xvi]

Reviewing the investment progress reported by the ten largest participating companies, measured by their market capitalization value[xvii] offers a mixed picture: from 2016 onwards, none of the companies reported updates concerning their commitments to Grow Africa.

However, with only a few exceptions, updates were provided for the reporting year 2015. Out of the 19 projects reported upon, three were said to operate with minor problems, one commitment was cancelled, one was already completed and all others were on plan or even ahead of schedule.[xviii]

Table 1: Comparison of Grow Africa commitments and the actual investments for the top investors in food and agriculture sector in Africa

Company name	**Grow Africa commitment**			**Actual investment**			
	Destination country	Amount commited (mln USD)	Total amount commited (mln USD)	Project implemented	Amount invested in the project (mln USD)	Other investments (total) (mln USD)	Total amount invested (mln USD)
Diageo	Ethiopia	15	11.5	yes	37.5	281738	319188
	Tanzania	10		no	0		
SABMiller	Ghana	0.615	21.23	no	0	175.5	252
	Mozambique	20		yes	76.8		
	Tanzania	0.615		no	0		
Coca-Cola	Kenya	Not disclosed	Not disclosed	no	0	520.34	520.34
	Malawi	Not disclosed		no	0		
	Nigeria	Not disclosed		no	0		
Heineken	Ethiopia	2.72	22.62	yes	127.78	344.332	472.112
	Nigeria	15		no	0		
	Rwanda	4.9		no	0		
Olam International	Cote d'Ivoire	121.5	121.5	yes	405.3	266.15	671.45
Nestle	Cote d'Ivoire	26	66	yes	4.1	312.81	327.16
	Cote d'Ivoire	40		yes	10.25		
Total			242.85		661.68	1900.87	2562.25

Commitments made in 2012 for the period of 4-5 years in most cases. Actual investment refers to the period 2012-2017.

Source: Authors' compilation based on https://www.growafrica.com/organisations/loi-organisations, accessed November 5, 2018; fDi data (www.fdimarkets.com; accessed January 16, 2018)

Taking into account the limited reporting on companies' progress in recent years, we compare the commitments of six out of the seven top investors in the African food and beverages cluster[xix] who participated in the Grow Africa initiative with the actual investment recorded in our dataset over the 2012-2017 period, after the initiative was launched (see Table 1). The results show that 8 out of the 14 investment projects that were committed to through LOIs

were not yet implemented. For projects that had been implemented, the amount invested significantly exceeded the amount planned in LOIs in all but two cases. More importantly, however, is that these companies realized an important number of investments across Africa that were not included in Grow Africa LOIs. Therefore, in total, the six companies' FDI volume in Africa over the reference period significantly exceeded the amount of investment pledged within the framework of Grow Africa, with $2.5 billion actually invested in comparison to the $243 million pledged[xx]. These figures suggest that, while Grow Africa may not have been effective in executing formal commitments by foreign investors, it may have been successful in creating a conducive environment for investment, with potential spillovers effects on FDI realized outside the initiative framework – this claim would, however, require a more thorough assessment.

3.2 Food and agriculture FDI in different subsectors

The food and beverages cluster contains many different subsectors.[xxi] FDI inflows vary considerably across these subsectors; it is highest in the subsector of pesticides, fertilizers and other agricultural chemicals (43% of total FDI inflows, see section 3.8), followed by crop production (10%) and breweries and distilleries (9%). Sugar and confectionary products accounted for slightly over 8% of agricultural FDI inflows, and the soft drinks subsector attracted 4.6%. All other subsectors received very small shares (see Figure 5). It is noteworthy that contrary to popular perceptions, investment in crop production (and especially investment involving land acquisition) constitute a small share of the total FDI volume in the food and agriculture sector; in total, much more investment goes to the remaining elements of the food value chain.

Almost all investments (96%) fund production[xxii], while 1.7% goes to logistics, distribution and transportation activities, and 1% of the FDI in the food and agriculture sector goes to sales, marketing and support.

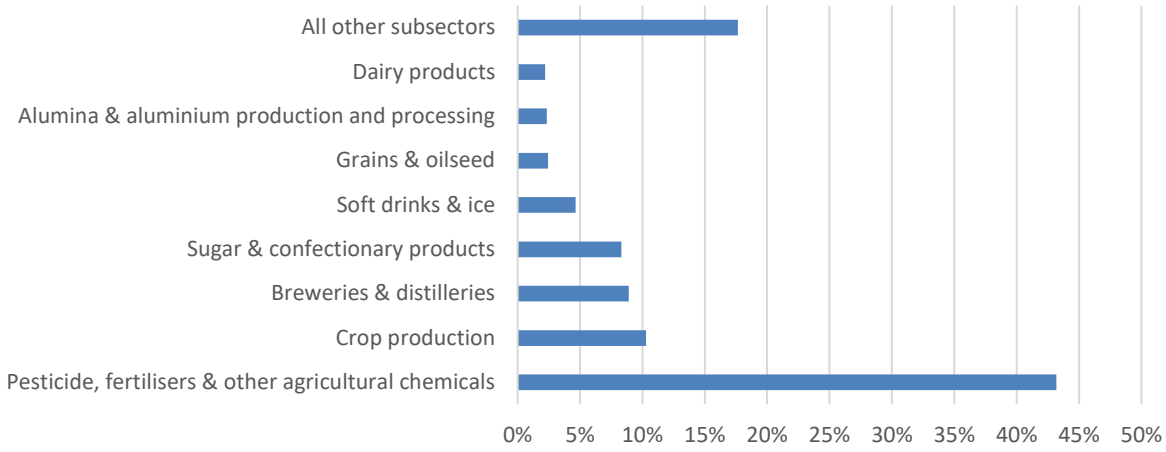

Figure 5: Shares of FDIs in the food and going to different subsectors

Source: Authors' compilation based on fDi data (www.fdimarkets.com; accessed January 16, 2018)

3.3 Regional patterns in food and agriculture FDI

There are considerable regional differences in investment flows. Figure 6 shows that Western Africa received the most investments ($8.109 billion), followed by Eastern Africa ($6.785 billion) and Northern Africa ($5.107 billion). Middle ($4.564 billion) and Southern Africa ($2.912 billion) received the fewest investments. The peak in 2011 in Middle Africa was caused by the aforementioned BioPalm Energy investment project, initiated by the Indian company Siva Group in Cameroon to set up palm oil production. The peak in 2003 in Western Africa can be explained by a $765 million extension of an already existing project by Guinness Ghana (owned by Diageo) in Ghana.

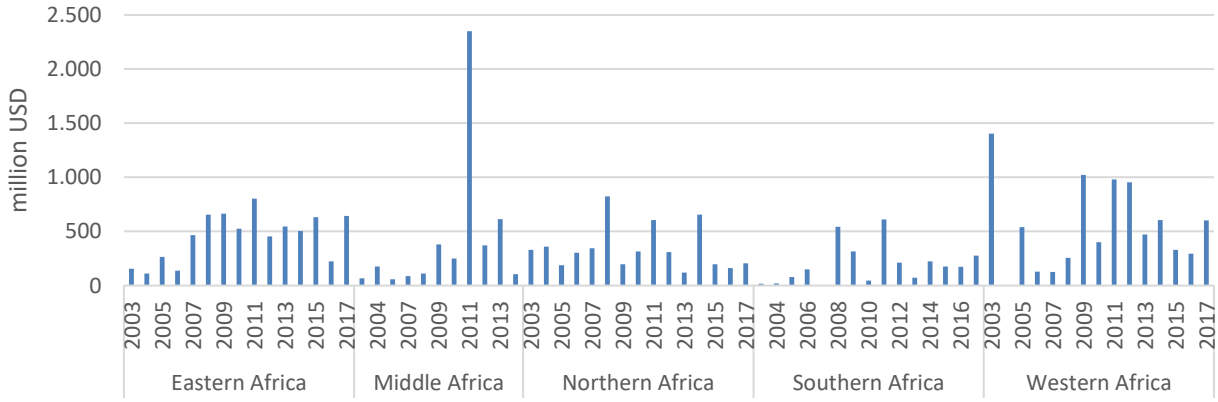

Figure 6: Food and agriculture FDI inflows into the different African regions 2003-2017 (excluding fertilizer investments)

Source: Authors' compilation based on fDi data (www.fdimarkets.com; accessed January 16, 2018)

In Southern Africa, investments are also distributed very unequally: 84% of the investments into the region went to South Africa, 9% to Namibia, almost 7% to Swaziland, while Botswana received very little agricultural FDI (0.04%) and Lesotho did not record a single investment project in the sector in the last 15 years (see also Figure 7).

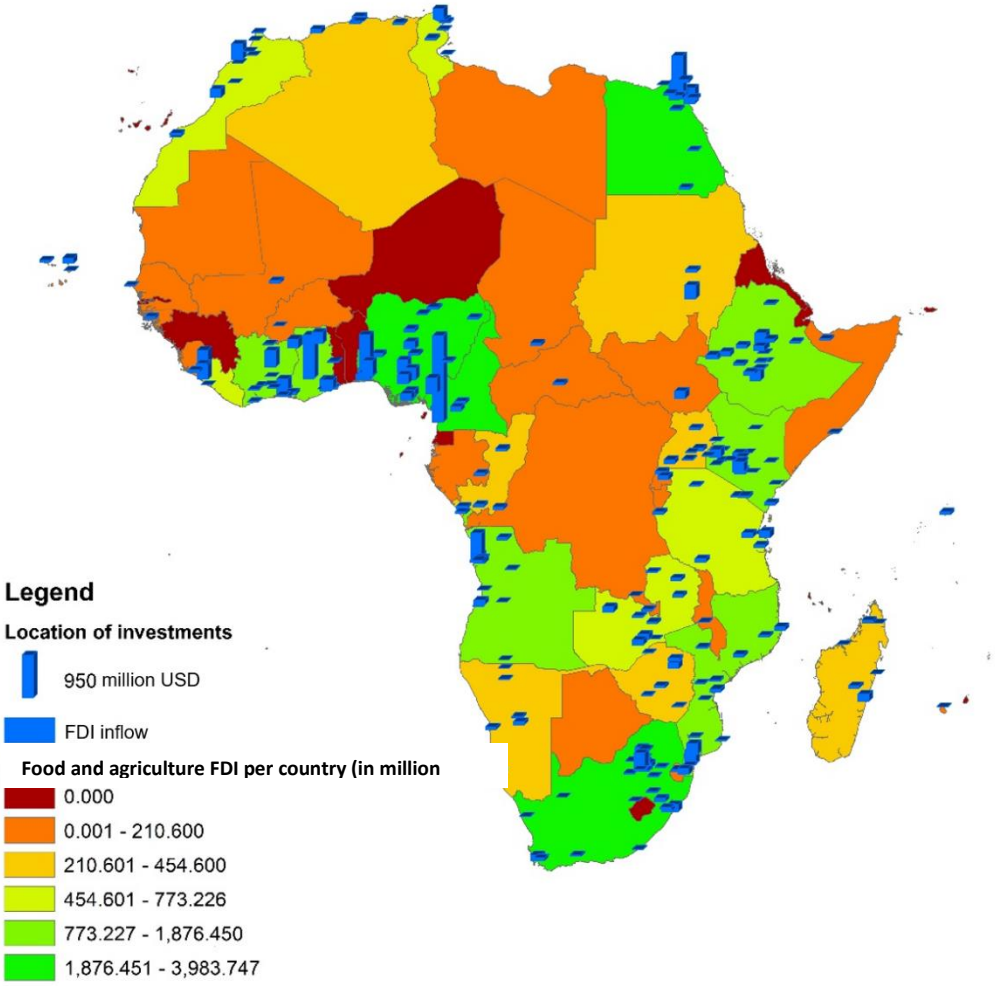

Figure 7: Location of investment projects (excluding fertilizer) and investments per country

Source: Authors' compilation based on fDi data (www.fdimarkets.com; accessed January 16, 2018)

The maps in Figure 7 and Figure 8 offer a more detailed picture of where FDI inflows are targeted. In total, we were able to locate 84% of all projects, representing 88% of the total capital invested[xxiii]. These are visualized in the bars. Each country's food and agriculture FDI summarizes all investments, including those that could not be exactly located. The bars represent the sum of investments made at a given area, i.e. a city or a village, and may thus summarize several different investment projects.

As shown in Figure 7, the highest amount of capital was invested in Nigeria ($3.98 billion), followed by Egypt ($ 2.91 billion), Cameroon ($2.47 billion), South Africa ($2.46 billion), Ghana ($1.88 billion), Angola ($1.48 billion) and Ethiopia ($1.45 billion).

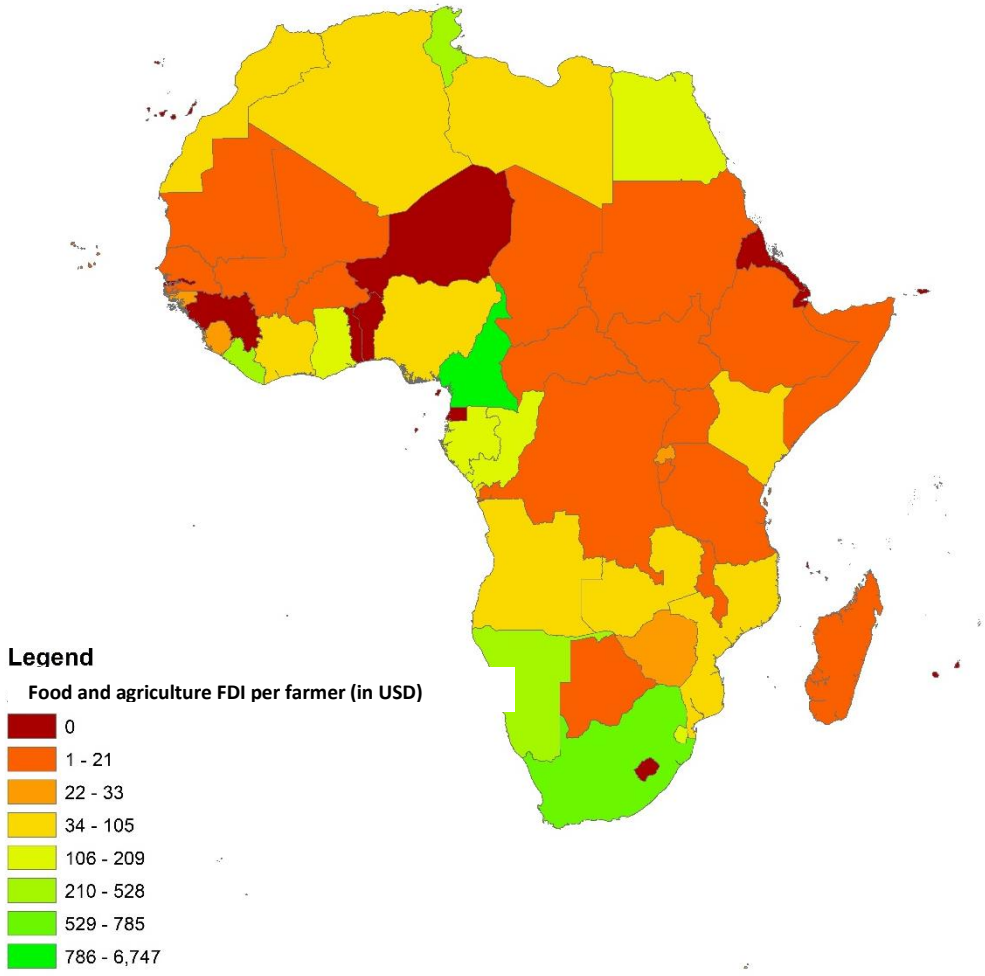

Figure 8: Location of investment projects and investments per farmer (excluding fertilizer)

Source: Authors' compilation based on fDi data (www.fdimarkets.com; accessed January 16, 2018)

Of interest is the food and agriculture investment relative to the number of farmers in a country, as this may better reflect the private sector's response to the size of the agricultural sector within an economy. The data for the number of farmers is estimated by multiplying the share of people employed in agriculture out of all employment with the total population in the country[xxiv], using 2016 World Development Indicators data (The World Bank, 2018). When looking at investments per farmer, the picture changes somewhat (see Figure 8). Cameroon received by far the highest investments per farmer ($6,747) due to the $2 billion oil palm project announced in 2011. Cameroon is followed by South Africa ($785), Namibia ($528),

Tunisia ($370) and Liberia ($318). Central and Eastern Africa, with the exception of Kenya and the countries in the Sahel region, receive very little agricultural FDI per farmer.

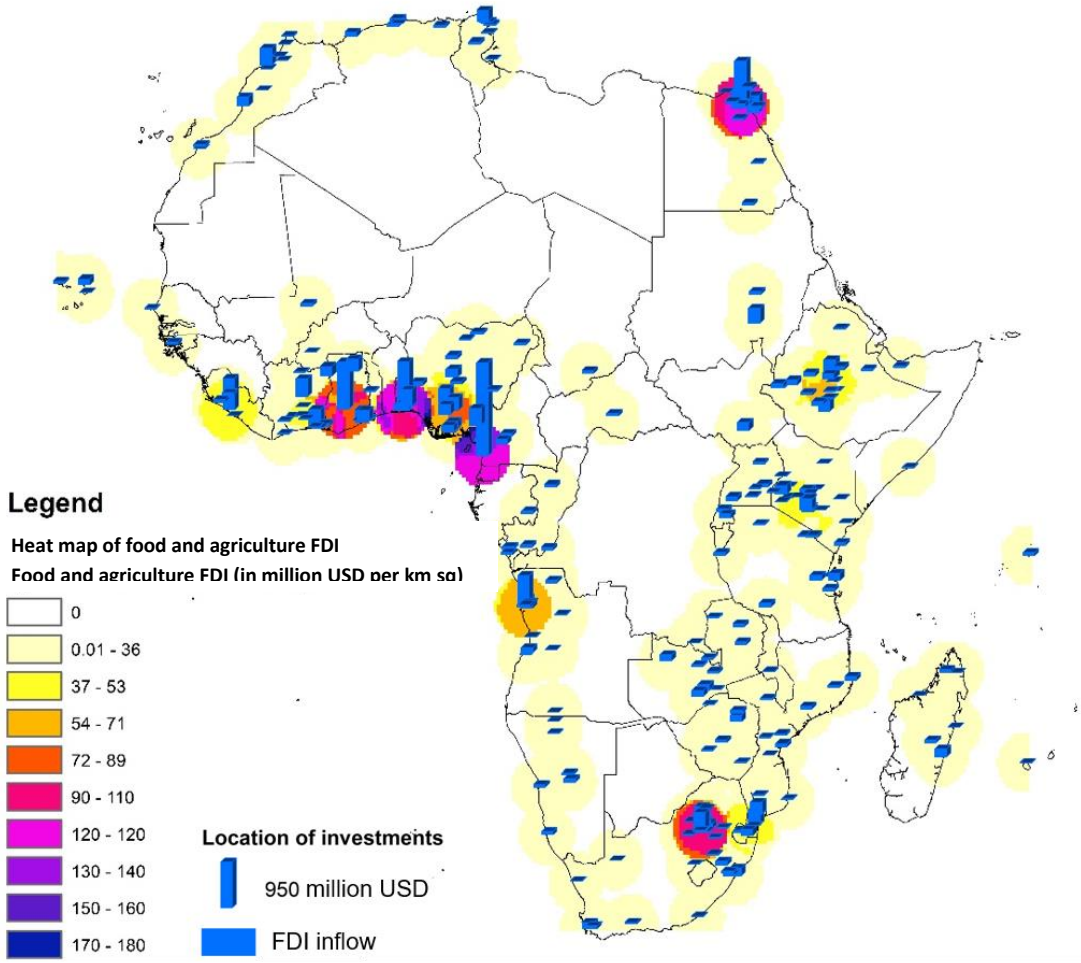

Figure 9: Heat map of food and agriculture investments (excluding fertilizer)

Source: Authors' compilation based on fDi data (www.fdimarkets.com; accessed January 16, 2018)

A heat map of investments (Figure 9) uses point densities of investment locations weighted by the amount of dollars invested. The map illustrates that there are four areas with a high concentration of investments. The first is located in Egypt around Cairo and Damietta. The second is located around Pretoria and Johannesburg in South Africa. The third is located in and around Luanda (Angola). The fourth is a cluster of numerous investment projects along the Western coast, reaching from Kribi in Cameroon over the coastal line of Nigeria, Kumasi and Secondi in Ghana, and ending around Abidjan in Ivory Coast. The whole central part of Africa, from Botswana in the South to the Central African Republic, as well as the Sahel region, stand out as white spots without any substantial agricultural FDI. This distributional pattern

also shows that, other than the cluster in Pretoria and Johannesburg, investments concentrate in or near coastal areas.

3.4 Who invests in African food and agriculture?

A total of 308 different companies[xxv] invested in African food and agriculture sector between the years 2003 and 2017, excluding all investments in the fertilizer, pesticides and other agro-chemical subsector.

Table 2: The 20 companies with highest investments in African food and agriculture sector

Rank	Name of company	Source country	Capital investment (in million USD)	Number of projects
1	Siva Group	India	1907.24	1
2	Diageo	UK	1457.39	13
3	SABMiller	UK	1426.52	29
4	Coca-Cola	United States	1278.01	27
5	Heineken	Netherlands	1265.39	13
6	Olam International	Singapore	1079.45	14
7	Nestle	Switzerland	984.29	33
8	Sime Darby	Malaysia	640	1
9	Savola	Saudi Arabia	515.98	8
10	Anheuser-Busch InBev (ABInBev)	Belgium	493.20	4
11	Lonrho	UK	440	13
12	Associated British Foods (AB Foods)	UK	408.3	7
13	Herakles Capital	United States	383.9	2
14	Nampak	South Africa	334.81	4
15	Cevital	Algeria	316.8	3
16	SOMDIAA Group	France	311.9	6
17	Crown Holdings	United States	308.9	3
18	Bin Omeir Holding	UAE	300	1
19	Coca-Cola Hellenic Bottling (CCHBC)	Greece	300	1
20	Cadbury	UK	292.12	4

Source: Authors' compilation based on fDi data (www.fdimarkets.com; accessed January 16, 2018)

The 20 companies that have invested the most capital in this time period are listed in Table 2. Due to a single investment project of almost $2 billion palm oil in Cameroon, Siva Group tops the list of companies with the highest investment in dollar figure. It is followed by four giant beverage companies, two from the UK, Diageo and SABMiller, Coca-Cola from the USA, and Heineken from the Netherlands. Rank six and seven are occupied by Olam International from Singapore and the Swiss company Nestlé, which both invest in large numbers of food production and logistics projects in Africa. With 33 different investment projects, Nestlé is the company with the most projects in Africa, followed by SABMiller with 29 projects. After Nestlé, which invested almost $1 billion in Africa over the last 15 years, there is a slight drop-off; the next company, Sime Darby from Malaysia, invested two thirds of this value.

Table 2 also shows that investing companies are based in all parts of the world. Many are based in Europe and the US, but some are also based in Africa, the Middle East and Asia. Of all investments (excluding fertilizer, pesticides and other agro-chemicals), 45% of all food and agriculture FDI comes from Europe, 29% from companies in Asia and Oceania, 15% from North American companies, 10% from African companies and 1% from companies headquartered in Latin America. The top three individual countries from which investments flow are India, the United Kingdom, and the United States. Germany's, whose total investment into the African food and beverages cluster barely exceeded $500 million over the last 15 years, lags behind other investors.

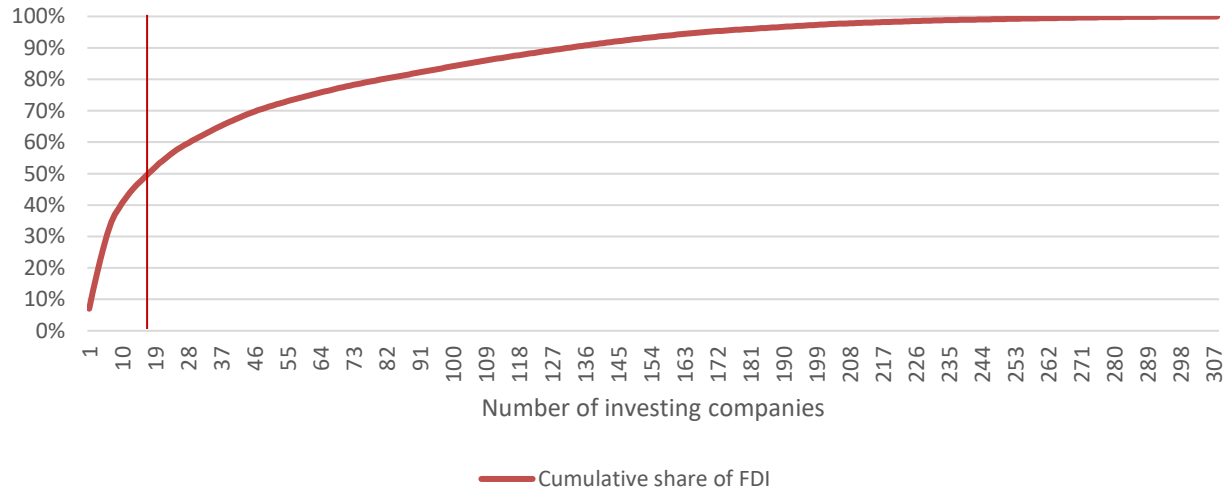

Figure 10: Monopolization in food and agriculture FDI in Africa (excluding fertilizer)

Source: Authors' compilation based on fDi data (www.fdimarkets.com; accessed January 16, 2018)

There does not appear to be a monopoly in food and agriculture FDI in Africa. 17 companies account for 50% of sectoral FDI inflows between 2003 and 2017, and the remaining 50% is accounted for by 291 different companies (Figure 10).

3.5 Food and agriculture FDI and the poor

The proximity of food and agriculture investment to the poor can provide an indication of its potential to contribute to poverty reduction, as expected by the policy-makers (but it might also point to potential misuse of the poor in case of exploitative investments). Based on the conceptual framework presented in section 2.4, we expect FDI to affect poverty and welfare through both direct and indirect effects at the levels of the product market, labor market, as well as public goods and resources. These effects are likely to be the strongest in close proximity to the targeted populations and fade away with geographical distance.

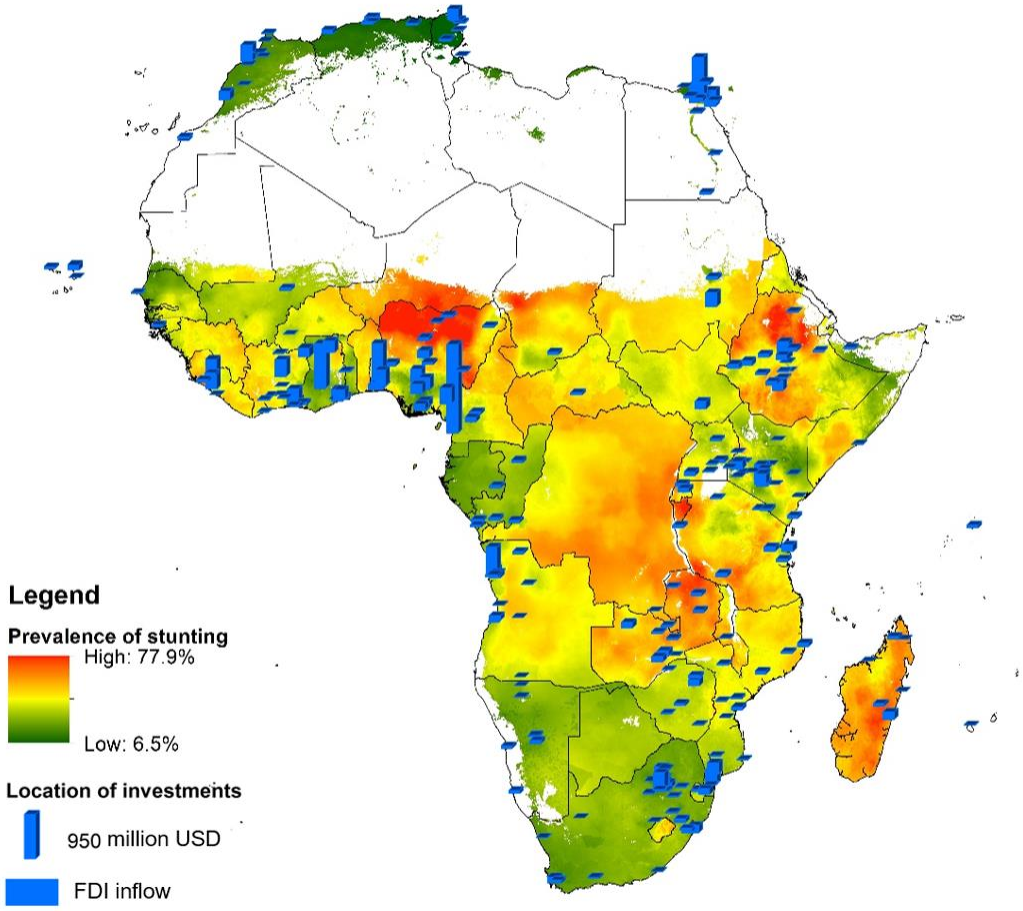

Figure 11: The location of food and agriculture FDI and their proximity to the poor

Source: Source: Authors' compilation based on fDi data (www.fdimarkets.com; accessed January 16, 2018) & Osgood-Zimmerman et al. (2018)

To check whether investments are located close or far away from poor people, we overlay the location of investments with the prevalence of child stunting, estimated for 2015 using data developed by Osgood-Zimmerman et al. (2018), which we use as a proxy for poverty[xxvi]. This visualization reveals no clear correlation between the prevalence of stunting and food and agriculture FDI inflow. While some investments occur in areas where the prevalence of stunting is low, e.g. in South Africa or northern Africa, many investment projects are located in areas where the prevalence of stunting is moderate or even high, like in certain regions of Ethiopia, Madagascar, Zambia, Malawi and Tanzania as well as northern Nigeria (see Figure 11).

The figure 12 below confirms this lack of correlation. In this figure, the prevalence of stunting was classified into nine groups. For each of these groups, the share of investments located in areas with a prevalence of stunting in the defined range was calculated using ESRI ArcMap software.[xxvii] A relatively large share (60%) of food and agriculture FDI in terms of dollars invested is located in areas with stunting levels of 29% or higher. This result suggests that a good share of sectoral FDI ends up in areas where many people are poor. However, our econometric analysis below (section 4.3) did not reveal any statistically significant relationship between (logarithm of) GDP per capita or poverty rate and the FDI volume.

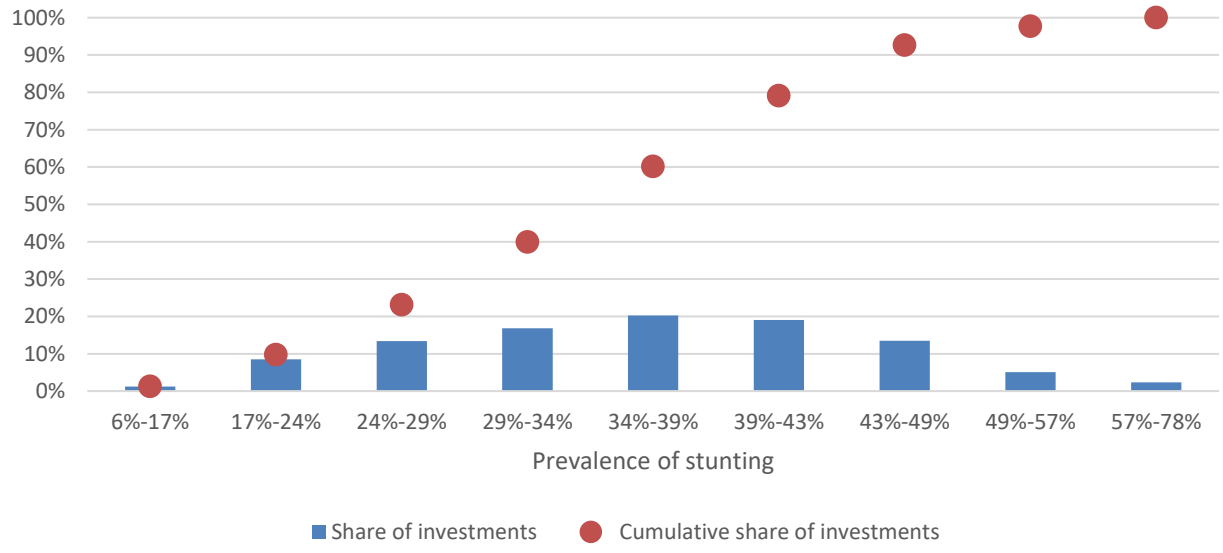

Figure 12: The share of food and agriculture FDI (excluding fertilizer) in areas with different values of stunting prevalence

Source: Authors' compilation based on fDi data (www.fdimarkets.com; accessed January 16, 2018)

3.6 Markets served and investment motives

Whenever available, the fDi dataset provides information on the targeted markets and the companies' investment motives. For the 279 companies for which this information is available, the main target markets are regional markets and domestic markets, mentioned 143 and 126 times, respectively. The global market or sub-regional markets play a minor role (mentioned 6 and 4 times, respectively; multiple answers were possible). The share of companies serving regional markets is slightly higher for investments in fertilizer projects compared to all other subsectors (65% vs. 49% of all answers, respectively). This finding suggests that in the food and agriculture sector, investing companies are reacting to the potential of a rapidly emerging consumer class in Africa.

This impression appears to be corroborated by the motives provided by companies for their investments. These were disclosed for 101 out of the 680 projects. The most cited motive is the growth potential of the domestic market (58 mentions), followed by a favorable business climate or regulations (31 mentions) and the proximity to markets or customers (23 mentions). Natural resources (14 mentions) and infrastructure and logistics (9 mentions) appear to be important for a few investment projects, while lower costs (6 mentions), financial incentives or tax reasons (2 mentions), government support (2 mentions) and the presence of suppliers or joint venture partners (2 mentions) appear relatively unimportant. The availability of a skilled workforce did not have a single mention, indicating that the level of human capital in Africa is not a deciding factor for FDI inflows. Note that while the information on markets and motives disclosed by the companies might not be fully reliable, it is broadly confirmed by the findings of the econometric analysis below.

3.7 Jobs created through FDI

One major benefit of FDI are jobs created through the investments. As the World Development Report 2013 puts it, "[j]obs are the cornerstone of economic and social development. Indeed, development happens through jobs." (The World Bank, 2012, p. 2). As we discuss in section 5.4, empirical evidence on private-sector investments in food and agriculture shows that labor market effects are very important for poverty reduction, especially among the very poor and specifically if jobs for unskilled workers and for women are created.

Without going into detail, it is important to keep in mind that labor market effects go beyond the number of direct jobs created. The quality of the jobs, among other qualitative measures, also needs to be considered, e.g. whether the jobs created are "good" jobs with above average

productivity, jobs with potential for productivity growth and jobs resulting in knowledge externalities. Also worth considering is whether jobs are stable, secure and well-paid and whether firms offer trainings for their employees. The few empirical studies comparing multinational enterprises (MNEs) with African domestic firms find that jobs created through FDI tend to be "good" jobs (Javorcik, 2014) and that foreign-owned firms tend to offer more stable and secure jobs than domestic firms. Using data from the UNIDO Africa Investor Survey 2010, Blanas et al. (2017) also find that, ceteris paribus, MNEs have more permanent full-time workers, a lower probability of offering temporary work and employ fewer temporary workers than domestic firms.

Apart from this scant evidence, the empirical literature on the contribution of FDI to employment and employment growth in Africa is very limited (Coniglio et al., 2015). We refrain from analyzing the quality of the jobs created and their other qualitative features, such as knowledge- and productivity-spillovers, as we do not have the necessary data. Instead, we estimate the employment effects in terms of the number of jobs created through food and agriculture FDI in Africa in the last 15 years. This contributes to fill a gap in the literature, since several studies already compare the quantity and quality of jobs created by MNEs versus domestic firms (e.g. Blanas et al., 2017; Coniglio et al., 2015; Javorcik, 2014) but very few provide data on the absolute numbers of jobs created by investments.

Estimating the number of jobs created by an investment is difficult. The data on the number of projected jobs provided by investors in their investment plans may not be reliable[xxviii]; on the other hand, we consider the data on the capital invested as relatively accurate. We use the latter, and combine it with capital-labor ratios to calculate the number of jobs created per million USD invested. Note, however, that calculating capital-labor ratios using data on a national level (e.g. with WDI data) is misleading, as the gross fixed capital formation of MNEs is not distinguishable from that of domestic firms. This was demonstrated by a study by Coniglio et al. (2015) that analyzed data from the 2010 UNIDO Africa Investor Survey, covering 19 Sub-Saharan African countries, and found that the mean capital-labor ratio of MNEs is over ten times larger than the capital-labor ratio of domestic firms ($690,000 compared to $61,500, respectively).

Therefore, in order to estimate the number of jobs created by FDI in the food and agriculture sector in Africa in the last 15 years, we apply the capital-labor ratio for MNEs found by Coniglio et al. (2015) to the total investment volume from our dataset, and we arrive at 39,108 jobs directly created through FDI in in this sector in Africa in the last 15 years by all investments excluding fertilizer[xxix]. Bear in mind that this number is, of course, an estimate and not the actual number.

Estimating the number of directly created jobs on its own does not capture the total employment effects of FDIs. To properly estimate economy-wide job creation effects, it is important to consider the total job effects, which include not only direct jobs, but also indirect jobs, i.e. jobs created throughout the supply chain, e.g. in suppliers and distributors, and induced jobs, i.e. jobs resulting from increased spending by direct and indirect employees. On the other hand, there may be job losses in competing companies (IFC, 2013). Kapstein et al. (2012a, 2012b) attempt to capture these complex employment effects caused by IFC lending in Ghana and Tunisia. They differentiate direct, indirect and induced impacts[xxx] that arise from injecting capital into the economy.

The authors apply input-output modeling based on the 2010 Social Accounting Matrix (SAM) of Ghana and the 2007 SAM for Tunisia to quantify the wider socio-economic impact of IFC investments on various sectors, using a Leontief production function. As this production function assumes constant returns to input, impacts such as a potential transformational effect of the additional finance cannot be quantified. Using job multipliers, they provide absolute figure estimates of the number of jobs created directly and indirectly by a $1 million dollar investment. A percentage of this multiplier captures the induced effect (Kapstein et al., 2012a).

For Ghana, Kapstein et al. (2012a) provide the multiplier data for agriculture and industry, among other sectors, whereas for Tunisia, the authors differentiate, among others, food processing, agriculture and manufacturing[xxxi] (see Table 3 for the specific numbers) (Kapstein et al., 2012b).

Table 3: Economy-wide employment associated with $1 million investment in Ghana and Tunisia

Country	Economic Sector	Direct / Indirect	+ Induced
Ghana	Agriculture	1,398	+12%
	Industry	181	+22%
Tunisia	Food Processing	584	+0%
	Agriculture	654	+12%
	Manufacturing	213	+22%

Source: Kapstein et al. (2012a, 2012b)

The data in Table 3 can be read as follows for Ghana: 1,398 jobs are created directly and indirectly economy-wide for $1 million invested in non-financial institutions in the agricultural sector, and 12% of this multiplier captures the induced effects. In other words, the total jobs multiplier is 1,398 + (12% *1,398) = 1,566.

We use these figures as a rough estimate of the total employment effect of FDI in Africa, applying the figures for the agriculture sector to the crop production; animal production; and agriculture, construction and mining subsectors and the industry figures to all other subsectors differentiated in the fDi dataset (excluding fertilizer investments). Taking into account relative similarities in the economic structure, the employment effects of FDI into Northern Africa and South Africa are calculated using data for Tunisia. For all other countries we use the data for Ghana.

With these figures and sector differentiation, we calculate that the employment effect (direct, indirect and induced) was 9 million jobs in the agricultural sector, 1.2 million in the food processing sector and almost 4.5 million jobs in the manufacturing and industry sector, totaling 14.7 million jobs created in Africa between 2003 and 2017. Excluding induced effects, this amounts to about 8 million jobs in agriculture, 3.7 million jobs in industry and manufacturing and 1.2 million jobs in food processing for a total of almost 13 million jobs.

Of course, these numbers have to be interpreted with great care, as the multipliers have been developed only for the economies of Ghana and Tunisia, based on the countries' 2007 and 2010, respectively, SAMs. While using multipliers that are based on SAMs of 2007 and 2010 is not optimal, the timeframe for which they are relevant is in the middle of our FDI data's timeframe. We therefore assume that changes in productivity or production functions before and after 2010 cancel each other out to a certain extent. Economy-wide capital-labor ratios calculated with data from the World Development Indicators show a stagnating or increasing trend, with values for the year 2010 lying somewhere between the values for 2003 and 2017 for most countries.

As a robustness check, we applied the figures provided for Ghana to FDI in all African countries, which resulted in 14 million direct, indirect and induced jobs. Doing the same with the figures provided for Tunisia, we get a number of 12.3 million direct, indirect and induced jobs. While the latter represents a deviation of 16% from our earlier calculation, applying the data for Ghana to all African countries only results in a 4% deviation. Thus, although job multipliers are available for only two African economies, it seems that the estimation of employment effects using this data is quite robust.

The difference between the 39,108 jobs directly created through FDI in Africa calculated using capital-labor ratios provided by Coniglio et al. (2015) and the 13 million directly and indirectly created jobs calculated using the data of Kapstein et al. (2012a, 2012b) seems to be very large and implies a multiplier effect of approximately 334 new indirect jobs created for every job directly created through FDIs. While data on job multipliers for Africa is difficult to find[xxxii], Bekhet (2010) uses input-output tables for various years for the economy of Malaysia and

arrives at multipliers that are much higher (1000 indirect jobs per direct jobs or even higher). Thus, while results from the different calculation methods differ widely, the significance of the gap may indeed be explained by the importance of employment multiplier effects.

The creation of almost 1 million jobs per year by FDIs in the food and beverages cluster alone is a substantial contribution to the urgent demand for jobs in Africa. However, this figure is dwarfed by the size of the labor force and the expected increase in demand for employment due to population growth. Africa's labor force amounted to almost 476 million people in 2017 (The World Bank, 2018), and the population of Sub-Saharan Africa alone is expected to increase by 198 million people between 2017 and 2030 (ILO, 2018). This will require an additional 18 million new jobs per year to absorb the young people entering the labor force (International Monetary Fund, 2015). Evidently, many more investments are needed to offer adequate employment for all.

3.8 Fertilizer investments in Africa

In the previous sections, we excluded FDI into the pesticides, fertilizer, and other chemicals subsector from the analysis. However, since the amount invested in this subsector constitutes almost half of the total volume of the food and agriculture FDI in Africa, in the following section, we describe these investments and their patterns more in detail.

3.8.1 Supply- and demand-side constraints in access to and use of fertilizer in Africa

There are important supply-side constraints in the fertilizer market that present unique challenges in Africa. While there exist significant constraints that mainly affect the demand side, these are extensively discussed elsewhere (see e.g. Ariga et al., 2008, 2006; Benin et al., 2013; Jayne et al., 2003; Kelly, 2006). In this section, we focus on supply-side constraints and analyze the recent rise in fertilizer investments in Africa against the background of historically low fertilizer production in the region.

3.8.2 History of fertilizer production in Africa

Fertilizer production in Africa has historically been very low (see Figure 13). Of the total 230 million tons of fertilizer produced worldwide in 2002[xxxiii], only 3.9% was produced in Africa (FAO, 2018), the great majority of it (97%) in North Africa (Gregory and Bumb, 2006).[xxxiv] One reason for such low production levels is the scarcity of the raw materials needed for fertilizer production in Sub-Sahara Africa, especially natural gas, phosphate rock, sulfur, and potassium salts. Yet, there are deposits of some of the necessary natural resources in Nigeria, Angola, Equatorial Guinea, Ethiopia, Mozambique, Namibia, Democratic Republic of Congo,

Madagascar and Tanzania, which offers opportunities for fertilizer production. Substantial commercial phosphate rock deposits exist in Togo and Senegal (Gregory and Bumb, 2006).

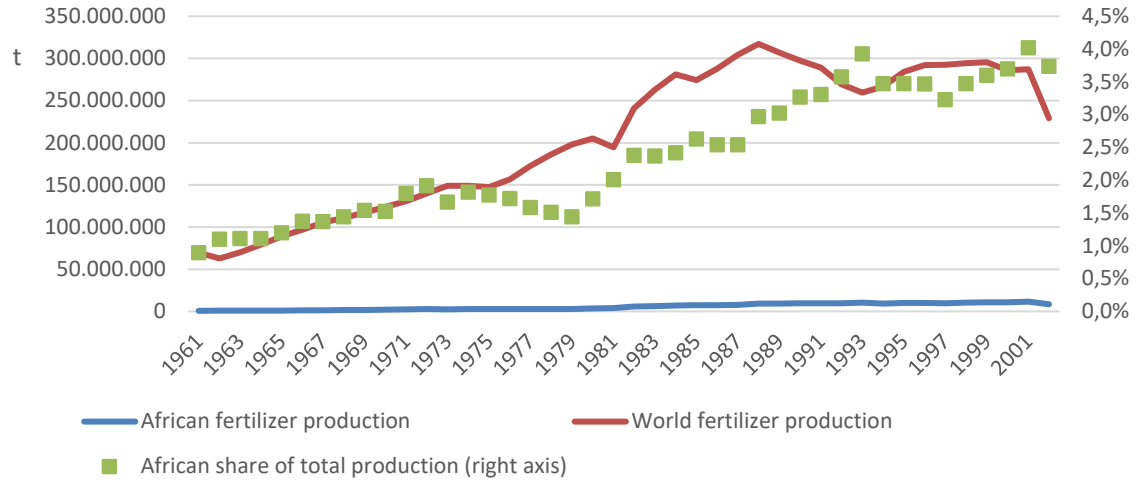

Figure 13: Fertilizer production in Africa compared to world production

Source: FAO (2018)

3.8.3 Structural barriers

For a long time, the private sector was absent from the agricultural input markets in Africa. This fact encouraged donors from the 1960s onwards to create state-owned enterprises that gained monopolistic power over marketing and investments in the agricultural sector. Yet, by the early 1980s, it became obvious that many of these public enterprises were not efficient and consumed a large share of public financial resources (Gregory and Bumb, 2006). As many African governments were also very limited in their willingness and/or ability to spend on agricultural input procurement, the supply of agricultural production inputs, especially in small African countries, depended heavily on assistance from donors. As a result, fluctuations in donor spending had significant effects on the availability of fertilizer in many African countries.

These difficulties led to the first privatization efforts, such that by the mid-1990s, many state-owned enterprises had lost their monopolistic position. Although the private sector was allowed to engage in agricultural input and output marketing by this point, macroeconomic instability, the lack of marketing skills, limited access to finance, inadequate regulatory systems and the lack of market transparency discouraged the private sector from operating in the agricultural input business and prevented the development of well-functioning input markets in Africa, especially in Sub-Saharan Africa (Gregory and Bumb, 2006). Most African countries also lack the investments to build capacity in the private sector and support

infrastructure that would be necessary to create an open and competitive market that offers a choice of fertilizers at reasonable prices to farmers (Gregory and Bumb, 2006).

Structural barriers, aggravated by the scarcity of the natural resources needed, have led to very low fertilizer production in Africa (despite a slight increase in production since the late 80s; see Figure 13). As a result, fertilizer production in Africa is far too low to satisfy the demand on the continent. Thus, virtually all African countries depend on fertilizer imports. Moreover, the underdeveloped agricultural input markets cause severe inefficiencies in fertilizer procurement and distribution in most African countries.

3.8.4 Disadvantages of the dependency on fertilizer imports

Since there are ample supplies of fertilizer on the international market, the main disadvantage for countries relying on imported fertilizer is not the availability of fertilizer but the variability of international prices and price instability caused by factors such as the devaluation of local currencies or fluctuating oil prices (Conway, 2012; Gregory and Bumb, 2006). At the time of the food price spike, for instance, the price of diammonium phosphate (DAP) rose nearly six-fold in early 2008 (Conway, 2012).

Due to the limited use of fertilizer by African farmers, Sub-Saharan Africa accounts for less than 1% of the global fertilizer market. At the country level, the size of the market is even smaller. Additionally, these countries use several similar products for which product differentiation is not biophysically justified. Because of economies of scale in both production and procurement, countries using small quantities of these products pay higher prices for both product and shipping when they import fertilizer (Gregory and Bumb, 2006).

3.8.5 Investment trends

Against this background, investments made in the fertilizer, pesticides and other agro-chemical subsector since 2003 can be seen as a very positive development (see Figure 14). A total of $21.325 billion was invested in the fertilizer, pesticides and other agro-chemical subsector between 2003 and 2017, which is almost half of the total food and agriculture FDI in this time span. As the fDi dataset does not further differentiate investments in this subsector, we checked the purpose of all 55 projects in the subsector using Google search. We found that 86% of the capital invested in the subsector is related to fertilizer and only 14% concern pesticides and other agro-chemicals. Most of these investments are for manufacturing (approximately $21.2 billion out of the total $21.32 billion invested in the subsector since 2003), and only a small share ($124 million) is directed at logistics, distribution, transportation as well as sales and marketing activities.

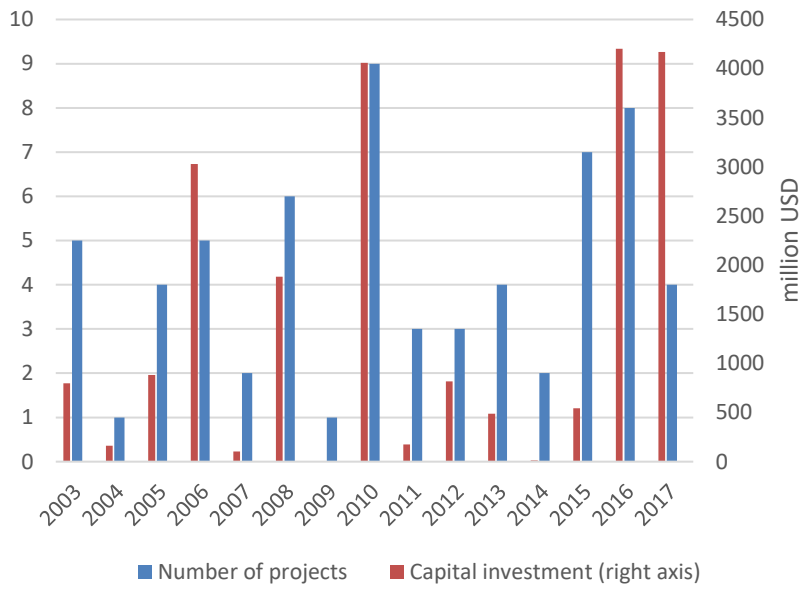

Figure 14: FDI in the fertilizer, pesticides and other agro-chemicals subsector in Africa

Source: Authors' compilation based on fDi data (www.fdimarkets.com; accessed January 16, 2018)

Several large-scale fertilizer investment projects have been announced since 2003. Figure 14 shows high investment values in the fertilizer subsector in 2006, 2008, 2010, 2016 and 2017. In 2006, the Egyptian firm Orascom Construction Industries announced its plans for a $2.1 billion ammonia/urea fertilizer project in Algeria, and the Canadian company Agrium planned to invest $850 million in a nitrogen plant in Egypt. The Spanish company Fertiberia drove up FDI inflows in 2008 with their plans to set up a $1 billion ammonia plant in Algeria. The peak in 2010 was caused by three large investments in fertilizer production projects: Olam International announced it would set up a $1.3 billion ammonia-urea fertilizer complex in Gabon, the Indian company Nagarjuna Fertilizers and Chemicals published investment plans for a $1.06 billion petrochemicals and fertilizer project in Nigeria and India's biggest state-run urea maker, Rashtriya Chemicals & Fertilizers, signed a memorandum of understanding with the government of Ghana to install a $1.5 billion fertilizer plant in the country. In 2016, the Moroccan company Office Cherifien des Phosphates (OCP) signed a deal with the Ethiopian government to set up a $3.7 billion fertilizer plant in Ethiopia, making up more than half of the planned food and agriculture FDI inflows into the continent in that year. Finally, in 2017, two large fertilizer companies, Yara International and Haldor Topsoe AS, announced investments of $2 billion each in Mozambique and Angola, respectively. These recent positive developments suggest that the policy reforms in many African countries have started to bear fruits.

4 Factors influencing the location of food and agriculture FDI – a quantitative analysis

As noted in section 3.3, the regional distribution of FDI in the food and beverages sector across Africa is very uneven. The following section aims to explain these regional patterns by analyzing the causal factors that determine the location and scale of FDI in food and beverages sector across African countries. Even though the literature on the determinants of FDI to developing countries is abundant, most of the available studies include only a limited number of African countries in their analysis. Additionally, research focusing specifically on FDI inflows to Africa is even scarcer (Asiedu, 2002).

4.1 Theoretical background

In our econometric analysis of the determinants of FDI in the African food and beverages cluster, we build on several strands of literature, including Dunning's eclectic paradigm (Dunning, 1979), the new theory of trade with contributions from Markusen (1984) and Helpman (1984), institutional theory (Mudambi and Navarra, 2002; Grosse and Trevino, 2005; Bénassy-Quéré et al., 2007), as well as some insights from the new economic geography (Krugman, 1991). Note that while these theories typically focus on the structural determinants of FDI location, which is relevant to our cross-sectional analysis, they do not account for the impact of political processes, such as the New Alliance and Grow Africa, which, as suggested in section 3.1, may have influenced the changes in FDI inflows over time.

Dunning's eclectic or OLI (Ownership-Location-Internalization) paradigm (Dunning, 1979) accommodates a variety of earlier economic theories of the determinants of FDI and the foreign activities of MNEs. It posits that a firm will engage in productive activities in a foreign country in the presence of competitive advantages, location advantages and internalization advantages. In our context, location-specific advantages are of particular interest; they appear when locating in a foreign country provides a firm access to the country's natural and created endowments, as well as special tax regimes, lower production and transportation costs, or important market size, access to protected markets, and lower risk (Dunning and Lundan, 2008).

Within the framework of the new trade theory, FDIs are typically classified as horizontal and vertical. Horizontal FDI (Markusen, 1984) is explained by MNEs seeking access to local markets and avoiding costs related to transportation or protectionist policies; it can be therefore considered a substitute for exports. In this context, the main determinants of FDI are market

size and potential, as well as transportation and commercial costs (Kinoshita and Campos, 2003). Vertical FDI (Helpman, 1984), on the other hand, results from differences in factor prices between countries with different endowments. Further developments of the theory include export platforms (Ekholm et al., 2007), where firms invest in production in a given country to sell in third countries, especially when trade barriers between the host and third countries are low; or complex vertical FDI (Baltagi et al., 2007) where a foreign subsidiary is involved in exporting to third countries for processing before selling in a final destination. These last contributions emphasize the importance of accounting for possible spatial interactions in the choice of FDI location.

In institutional theory, the role of institutions and the institutional environment is a primary factor determining where MNEs locate (Bénassy-Quéré et al., 2007). For example, in the institutional FDI fitness theory (Wilhelms, 1998), the attractiveness of a given location for FDI inflows is, to a great extent, a function of amenable institutional characteristics, i.e. policies, laws and their implementation, rather than the country's fundamental characteristics, such as population size. In particular, the importance of government, markets, education and socio-cultural factors is emphasized.

Finally, the theory of new economic geography (Krugman, 1991) focuses on the agglomeration forces in production, which are explained by the existence of several key elements, namely increasing returns to scale, monopolistic competition, transportation costs, and technological externalities between companies. These lead to an uneven distribution of productive activities across space, which is divided into core and periphery areas. In this context, the perceived demand should have a positive effect on investment flows towards a given destination, while production costs and the intensity of local competition should have a negative effect.

4.2 Estimation strategy

Our estimation strategy seeks to establish the determinants of FDI location and scale in the food and beverages cluster across African countries. In line with the different strands of literature described above, we distinguish several sets of variables that serve as potential correlates of FDI location, namely market potential, location advantages, infrastructure, institutional environment, and agglomeration effects, as in eq. (1):

$$FDI_i = \beta_0 + \beta_1 Mar_i + \beta_2 Loc_i + \beta_3 Infr_i + \beta_4 Inst_i + \beta_5 Agglo_i + \varepsilon_i \quad (1)$$

where FDI_i is the logarithm of the total value[xxxv] of FDI in the food and beverages cluster received by country i in a reference period; Mar_i is the market potential of country i, proxied here by the logarithm of the GDP per capita and population size; Loc_i are location advantages

of country i, proxied by supply-side factors, such as natural resources, in this case agricultural land; $Infr_i$ is country i's infrastructure, measured by access to electricity and ports; $Inst_i$ is the institutional framework in country i (regulatory quality and corporate taxes); finally, $Agglo_i$ corresponds to potential agglomeration effects, represented here by the lagged value of the dependent variable.

We expect that higher market potential (higher GDP per capita and larger population), better location advantages (larger areas of available agricultural land), better infrastructure and better institutions (lower corporate taxes and better regulatory quality) will attract more investments. Also, in line with the new economic geography (Krugman, 1991), more FDI is likely to be directed towards countries with higher levels of past investments. The cross-sectional analysis is done for three five-year periods, 2003-2007, 2008-2012, and 2013-2017. Ideally, we would apply a panel, rather than cross-sectional, regression. However, the data for specific variables were not available for the 15 years in all the countries. Taking into account that most of our variables are of structural nature, and even in case of amenable factors such as infrastructure or institutions, significant changes are likely to happen over years rather than on a year-to-year basis, we preferred to opt for a cross-sectional analysis that allowed us to include relatively high, in comparison with the literature, number of countries.

Additionally, as a second step, we apply spatial econometric models to account for potential spatial dependencies between the destination country and the neighboring countries. More specifically, we test for the existence of a spatial lag using a spatial autoregression model (SAR) where the spatial dependence occurs with respect to the dependent variable as in eq. (2), and the existence of a spatial error using a spatial error model (SEM) accounts for spatial autocorrelation between neighboring countries' errors as in eq. (3).

$$FDI_i = \beta_0 + \beta_1 Mar_i + \beta_2 Loc_i + \beta_3 Infr_i + \beta_4 Inst_i + \beta_5 Agglo_i + \rho.W.FDI_i + \varepsilon_i \quad (2)$$

$$FDI_i = \beta_0 + \beta_1 Mar_i + \beta_2 Loc_i + \beta_3 Infr_i + \beta_4 Inst_i + \beta_5 Agglo_i + \lambda.W.\varepsilon_i + u_i \quad (3)$$

$\rho.W.FDI_i$ is the spatial autoregressive term, with W a n x n matrix of contiguous neighboring countries. ρ is a spatial autoregressive parameter which shows how FDI in neighboring countries affect FDI in a destination country. If significant, its omission would bias the estimated coefficients (Anselin, 1988). λ is a spatial autoregressive parameter which measures how FDI in the destination country is affected by the shocks in FDI in neighboring countries (Coughlin & Segev, 2000). If significant, its omission would not necessarily bias the estimated coefficients but would imply that the standard errors are wrong (Anselin, 1988).

Finally, we also account for the impact of particular independent variables in neighboring countries. More specifically, we include the logarithm of GDP per capita and the population

size of neighboring countries to test for the impact of neighboring markets potential on FDI location as in eq. (4):

$$FDI_i = \beta_0 + \beta_1 Mar_i + \beta_2 Loc_i + \beta_3 Infr_i + \beta_4 Inst_i + \beta_5 Agglo_i + \beta_6 Neighboring\ Mar_i\ \varepsilon_i \quad (4)$$

These three models enable us to distinguish between various FDI motives: horizontal FDI, vertical FDI, and regional trade platforms (Blonigen et al., 2007).

4.3 Main results

Before proceeding to the results of our econometric analysis, we present descriptive statistics in Table 4. Note that we had to drop five countries[xxxvi] because of the missing data. The analysis therefore comprises 48 countries for the period 2003-2007 and 49 countries, including South Sudan, for the remaining two periods, 2008-2012 and 2013-2017. Overall, on average, the African countries received $343 million of food and agriculture FDI[xxxvii] and four investment projects per country over a 5-year period; however, these numbers fluctuate between the three periods analyzed here, in line with the temporal pattern described in section 3.1. Of particular interest is the evolution of the explanatory variables over years. As expected, a noticeable rise in population and incomes can be observed. On the other hand, the availability of agricultural land seems to be contracting over years, suggesting that an increased competition over this productive resource might be an important factor for MNEs investment location. Positive developments are observed in terms of access to electricity, our proxy of infrastructure, which was consistently increasing between 2003 and 2017. Finally, regulatory quality, our proxy of institutions, was very low, and did not change over the 15-year period, despite the importance attached to creating enabling environment for investment in Africa by the initiatives, i.e. New Alliance and Grow Africa, described in previous sections.

Table 4: Descriptive statistics

	Total*		2003-2007		2008-2010		2013-2017	
	Mean	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**
FDI: volume (million USD)	343.43	737.18	210.36	525.48	429.73	709.09	391.19	922.74
FDI: number of projects	4.61	7.80	2.58	4.54	6.16	9.37	5.12	8.36
GDP per capita (USD)	2202.63	2951.59	1994.86	2760.61	2261.69	3179.22	2347.10	2946.09
Population (million)	20.62	28.82	18.35	25.58	20.59	28.76	23.13	32.32
Agricultural land (km sq)	211236.80	243757.10	215362.20	272041.80	211309.60	238246.40	207122.80	224120.10
Access to electricity (percent of population)	40.12	29.05	36.74	28.66	40.33	29.12	44.03	29.23
Ports (dummy)	0.71	0.45	0.73	0.45	0.71	0.46	0.71	0.46
Corporate tax (percent)	29.21	4.31	29.95	3.93	28.97	4.34	28.72	4.61
Regulatory quality (index [-2.5,2.5])	-0.65	0.56	-0.65	0.57	-0.64	0.58	-0.66	0.55
Number of observations	146		48**		49		49	

*Average for the three 5-year periods.
**Excluding South Sudan

Table 5 presents the main estimates of the determinants of FDI in the food and beverages sector in African countries. Note that such cross-sectional country-level analysis is inherently exposed to several methodological flaws: first, multi-collinearity of the independent variables, and second, omitted variable bias. In order to address these issues, especially the omitted variable bias, we additionally apply first-differenced estimator in Table A3 in the Appendix. However, although this is a useful way to control for unobserved effects, it has its own limitations. Most importantly, differencing can substantially reduce the variation in the explanatory variables (Wooldridge, 2009), which turns out to be particularly pronounced in case of our analysis, where most of the independent variables change very little over time. This leads to large standard errors, and this effect is additionally inflated by the small number of observations. Keeping the limitations of both models in mind, we report below the results of the first one. The results are presented for both the logarithm of the FDI volume (columns (1)-(3)) and the number of projects (columns (4)-(6)) per country as the dependent variable. We expect that total FDI may better capture big projects, while the number of projects will give more weight to smaller projects whose importance to the economic development may be equally high.

The results are mixed with respect to specific theories and give support to several strands of literature. In line with Dunning's eclectic theorem (1979) and the new trade theory on horizontal FDI (Markusen 1984), the FDI inflows can be explained by the local market potential among other explanations, represented here by the population size and the logarithm of GDP per capita. In particular, population size consistently has a significant positive impact on FDI volume and the number of FDI projects through the years. On the other hand, the logarithm of GDP per capita, a proxy of purchasing power, has a negative coefficient in most cases. This suggests that FDI flows into relatively poor but populous areas, which supports the findings in section 3.5. However, these coefficients are not statistically significant, and we cannot therefore draw consistent conclusions[xxxviii]. Alternatively, we also controlled for the poverty ratio in order to capture the relationship between FDI and poverty and see if investments flow towards high poverty-rate locations where they are the most needed, but we found no significant results.[xxxix]

On the supply side, countries' natural endowments are shown to be an important factor; the size of agricultural land, which may be particularly relevant for investment projects in agribusiness, some of which are directly involved in crop production, while others have linkages with crop production within a supply chain, has a significant impact on attracting FDI inflows, and the magnitude of the coefficient is especially high when the dependent variable is the number of FDI projects. Note that agricultural land variable turns out consistently significant also in the fist-differenced model in Table A3. To measure whether quality of

infrastructure has an effect, we control for access to electricity and include a dummy variable for access to a port. These coefficients are insignificant in most cases, with the sole exception of the access to electricity in the first column. Finally, and importantly from a policy perspective, regulatory quality positively affects FDI inflow in terms of the number of projects; an improvement of regulatory quality score by one standard deviation increases the number of investment projects by four, which is exactly the mean number of projects per country in a 5-year period.

Table 5: Determinants of FDI in food and beverages sector in Africa (excluding fertilizer)

	Logarithm of FDI volume			Number of FDI projects		
	2003-2007	2008-2012	2013-2017	2003-2007	2008-2012	2013-2017
	(1)	(2)	(3)	(4)	(5)	(6)
Logarithm of GDP per capita	-0.387	0.0147	-0.173	0.310	-0.716	-0.739
	(0.484)	(0.564)	(0.607)	(0.683)	(1.440)	(1.415)
Population	0.0467***	0.0301**	0.0353**	0.104***	0.104***	0.116***
	(0.0134)	(0.0145)	(0.0135)	(0.0189)	(0.0370)	(0.0316)
Agricultural land	0.0267**	0.0385**	0.0245	0.0129	0.144***	0.104**
	(0.0131)	(0.0180)	(0.0206)	(0.0185)	(0.0459)	(0.0481)
Access to electricity	0.0369*	0.00681	0.00316	0.0209	0.0880	0.0478
	(0.0185)	(0.0221)	(0.0234)	(0.0261)	(0.0566)	(0.0545)
Ports, dummy	-0.790	0.0248	0.381	0.376	0.0762	1.511
	(0.713)	(0.861)	(0.894)	(1.006)	(2.200)	(2.083)
Corporate tax	-0.0254	0.0108	-0.0588	-0.0149	0.298	-0.00085
	(0.0803)	(0.0791)	(0.0825)	(0.113)	(0.202)	(0.192)
Regulatory quality	0.196	-0.132	0.589	1.046	3.365**	3.921**
	(0.583)	(0.635)	(0.708)	(0.823)	(1.623)	(1.649)
Constant	3.539	1.593	4.402	-2.004	-4.442	4.516
	(3.428)	(3.951)	(4.225)	(4.837)	(10.10)	(9.844)
Observations	48	49	49	48	49	49
R-squared	0.534	0.354	0.326	0.623	0.600	0.570

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Population in million. Agricultural land in ten thousands km sq.

We also control for potential agglomeration forces in foreign investment by including the lagged values of independent variable in Table 6. Due to the lack of available FDI data for the period prior to the year 2003, we cannot analyze the 2003-2007 period. Nevertheless, the results for 2008-2012 and 2013-2017 clearly point to important agglomeration effects, both in terms of FDI volume and number of FDI projects. The magnitude of this effect is slightly higher, but still moderate overall in the 2008-2012 period; a 1% increase in the last period's FDI volume increases the contemporaneous investment inflow by around 0.7%; or

alternatively, when the total number of previous investment projects increase by one, this leads to one more project in the current period. On the other hand, inclusion of the lagged dependent variable might cause other coefficients to be downward-biased; indeed, the explanatory power of the variables that were significant in the table above has now decreased substantially.

Table 6: Agglomeration effects

	Logarithm of FDI volume		**Number of FDI projects**	
	2008-2012	2013-2017	2008-2012	2013-2017
	(1)	(2)	(3)	(4)
Logarithm of GDP per capita	0.131	-0.229	-0.817	0.0559
	(0.462)	(0.527)	(1.195)	(0.906)
Population	0.00174	0.0209*	-0.00552	0.0565**
	(0.0134)	(0.0124)	(0.0394)	(0.0215)
Agricultural land	0.0135	0.00204	0.106***	-0.0520
	(0.0157)	(0.0189)	(0.0391)	(0.0365)
Access to electricity	-0.0168	-0.00484	0.0366	-0.0305
	(0.0188)	(0.0204)	(0.0484)	(0.0361)
Ports, dummy	0.573	0.342	-0.160	1.118
	(0.715)	(0.776)	(1.826)	(1.326)
Corporate tax	0.0827	-0.0520	0.297*	0.00177
	(0.0666)	(0.0716)	(0.168)	(0.122)
Regulatory quality	-0.00937	0.802	1.939	1.596
	(0.520)	(0.617)	(1.384)	(1.090)
Logarithm of the FDI volume in previous period	0.669***	0.526***		
	(0.145)	(0.139)		
Number of FDI projects on previous period			1.188***	0.710***
			(0.269)	(0.0906)
Constant	-1.145	3.808	-2.338	1.151
	(3.288)	(3.671)	(8.389)	(6.276)
Observations	49	49	49	49
R-squared	0.578	0.504	0.731	0.830

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Population in million. Agricultural land in ten thousands km sq.

As a further step, we employ spatial econometrics methods to account for potential spatial dependencies between the destination country and the neighboring countries in Table 7.[xl] More specifically, we control for spatial dependencies in the dependent variable, corresponding to the SAR model, in columns (1), (4), and (7); spatial dependencies in error term, corresponding to the SEM model, in columns (2), (5), ad (8); and finally, we include proxies for market potential in neighboring countries (average GDP per capita and population

size). We present the figures for the logarithm of FDI volume only, as the findings for the number of projects were inconclusive.

Table 7: Spatial models

	Logarithm of FDI volume								
	2003-2007			2008-2012			2013-2017		
	SAR	SEM		SAR	SEM		SAR	SEM	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Logarithm of GDP per capita	2.406	2,621	2,39	-2.246	-2,232	-2.948	4.778**	6.212***	3.985*
	(1.7173)	1,8212	(1.7957)	(2.0189)	-2,0685	(2.0424)	(2.042)	(1.973)	(2.091)
Population	0.0318**	0.0296**	0.034***	0.0247*	0,0187	0.026*	0.021	0.0185	0.0224*
	(0.0131)	(0.01356)	(0.0130)	(0.0139)	-0,0142	(0.0138)	(0.0133)	(0.0121)	(0.0133)
Agricultural land	0.0287**	0.0331**	0.027*	0.0177	0.0307*	0.005	0.034*	0.0369**	0.0226
	(0.0134)	(0.0134)	(0.0140)	(0.0176)	-0,0177	(0.0189)	(0.0199)	(0.0175)	(0.022)
Access to electricity	0.048***	0.047**	0.05***	0.037*	0.0495**	0.0352*	0.014	0.0015	0.0187
	(0.0179)	(0.0195)	(0.0180)	(0.0209)	(0.0228)	(0.0213)	(0.0237)	(0.0210)	(0.02397)
Number of ports	0.108*	0.092	0.11*	0.0639	0,0349	0.0918	0.1595**	0.191***	0.1695**
	(0.0637)	(0.0676)	(0.063)	(0.0742)	-0,077	(0.0741)	(0.0788)	(0.072)	(0.079)
Corporate tax	-0.125	-0.120	-0.128	-0.0172	-0,0627	-0.014	-0.0339	-0.0502	-0.0572
	(0.0845)	(0.088)	(0.0866)	(0.0791)	-0,0917	(0.0827)	(0.0865)	(0.080)	(0.0887)
Regulatory quality	0.308	0.319	0.440	-0.0192	0,2429	-0.101	1.196*	1.229**	1.219*
	(0.526)	(0.575)	(0.5107)	(0.6034)	(0.659)	(0.592)	(0.676)	(0.540)	(0.6758)
Rho	0.3779*			0.488***			-0.118		
	(0.206)			(0.1779)			(0.2197)		
Lambda		0.293			0.696***			-0.810**	
		(0.3172)			-0,2425			(0.3615)	
Logarithm of GDP per capita, neighbouring countries			-0.0697			0.352**			0.1299
			(0.1314)			(0.1739)			(0.184)
Population, neighbouring countries			0.077**			0.0454			0.0055
			(0.0343)			(0.0354)			(0.0327)
Constant	7.94**	8.70**	7.052**	2.717	7,482	0.0265	11.30***	10.12***	10.455**
	(3.520)	(3.902)	(3.5161)	(3.974)	-4,763	(4.03)	(4.345)	(3.669)	(4.409)
Observations	43	43	43	44	44	44	44	44	44
Pseudo R-squared	0,6624	0.6363	0.6783	0.4692	0,3195	0.5015	0.4542	0.4480	0.4726

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The results vary by period pointing to different business models in FDI across years. In 2003-2007 and 2008-2012, ρ, the spatial autoregressive term for dependency in the dependent variable, is significant and positive. Also, the impact of market potential in neighboring countries, i.e. population size in the first period, and the GDP per capita in the second period, has a significant and positive impact on FDI inflow in the destination countries. These findings suggest that foreign investment in food and agriculture sector in that period took form of complex vertical FDI with agglomeration. On the other hand, the results in columns (7)-(9) show a different picture for 2013-2017: only λ, the spatial autoregressive term for dependency in error term is significant and negative, implying that the shocks in FDI inflow in neighboring countries are negatively correlated with the shocks to FDI in destination country, which gives a hint of competition for foreign investment between neighboring countries, rather than spatial agglomeration as seen in previous two periods. It is also worth noting that spatial econometrics models are known to reduce the bias in the estimated standard error in the presence of spatial dependency (Anselin, 1998). Therefore, apart from the consistently significant population density coefficients, infrastructure (measured by access to electricity) is found to be significant in the two first periods. This result has straightforward policy implications in terms of the need for reliable infrastructure if policymakers wish to attract FDI.

Since we were able to identify the location of 84% of the investment projects, we also conduct the analysis of the determinants of food and agriculture FDI at the spatial pixel level (see Table 8). We could not control for the same independent variables as in the previous analyses because of the limited availability of georeferenced data. However, we were able to use a set of controls that correspond to our theoretical background. This includes using stunting rates, which are strongly correlated with the level of poverty or, on the contrary, negatively correlated with level of wealth, as well as population density, which combined, are proxies of market potential; mean education for men and women and the health index represent local labor characteristics; accessibility is a direct measure of infrastructural quality; and soil index and agro-ecological zones refer to locational advantages, especially for agricultural production. Additionally, we also control for the number of conflict fatalities, both current as well as lagged, as we expect current conflict to discourage investment, while post-conflict situations may offer new investment opportunities. Note that since all control variables but one (number of fatalities) are available for a single point in time only, we do not conduct the spatial pixel level analysis for 5-year periods as was done in the country-level analysis; instead, we estimate the determinants of food and agriculture FDI for the whole 2003-2017 period at once.

Table 8: Spatial pixel level analysis

	Logarithm of total FDI volume	Logarithm of FDI volume excluding fertilizers	Logarithm of fertilizer FDI volume
	(1)	(2)	(3)
Population density	0.0469***	0.0461***	0.00253***
	(0.000393)	(0.000385)	(0.000138)
Stunting	-0.00961***	-0.00855***	-0.00142**
	(0.00158)	(0.00155)	(0.000555)
Education, men	-0.000341**	-0.000293**	5.82e-05
	(0.000148)	(0.000145)	(5.18e-05)
Education, women	0.000635***	0.000594***	-2.32e-05
	(0.000141)	(0.000138)	(4.94e-05)
Health index	0.000132	0.000194	0.000119
	(0.000323)	(0.000317)	(0.000113)
Accessibility	0.000114***	0.000122***	-0.000004
	(0.00003)	0.000029	(0.000017)
Soil index	0.000037	0.0000543	-0.0000698**
	(0.000097)	(0.0000949)	(0.0000339)
Conflict fatalities	0.000971	0.00123	-0.000682
	(0.00132)	(0.00130)	(0.000463)
Conflict fatalities, lagged	0.0245***	0.0236***	0.00324***
	(0.00229)	(0.00225)	(0.000802)
Controlling for agroecological zones	YES	YES	YES
Constant	-0.0230***	-0.0229***	-0.00174**
	(0.00200)	(0.00196)	(0.000702)
Observations	474,973	474,973	474,973
R-squared	0.033	0.033	0.001

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Population density in thousands of people. Accessibility in hours to a major city. Conflict fatalities in thousands of people.

The results are presented for the logarithm of total food and agriculture FDI in column (1), the logarithm of FDI excluding fertilizer sector in column (2), and finally, the logarithm of FDI in the fertilizer sector separately in column (3). The figures in columns (1) and (2) generally confirm our previous findings, especially with respect to the role that market potential plays in attracting foreign investment. An increase in population density by one thousand people leads to an increase in FDI inflows by almost 5%, and a 1% decrease in the stunting rate leads to a 1% increase

in FDI. These variables are also statistically significant in column (3), but their magnitudes are much smaller. Education levels for both men and women are also statistically significant; however, the magnitude of the coefficient is close to zero. Note also that women's education has a positive coefficient, while men education's is negative. Accessibility is another statistically significant control variable in columns (1) and (2); even though, the magnitude of the coefficient is very small, its sign suggests that the lower the accessibility, i.e. the longer the time needed to access a major town, the higher the FDI inflow. While this result would be counterintuitive for other sectors, it makes sense in the food and agriculture, where a lot of projects are related to farming and where agro-processing businesses are often located in rural areas. The soil index is statistically significant in the case of fertilizer FDI. The sign of the coefficient suggests that lower soil constraints (meaning land that is more suitable for agriculture) is correlated with higher FDI in the fertilizer sector. Finally, the figures in columns (1) to (3) provide evidence that foreign investors tend to take up new opportunities in post-conflict locations.

5 Impacts of private-sector investments in the African agriculture and food sector

Determining the impacts of private-sector investments on the wellbeing of individuals and societies requires a different approach than the statistical analyses employed in the previous sections. Due to limitations in the available data and the difficulty of quantifying well-being, we use a literature review to gain insight into this question. Even so, insufficient studies exist on the impacts of FDIs on well-being, therefore we now broaden our definition of investments from FDIs specifically to private-sector investment in general. In this section, we review the available empirical evidence related to the impacts of private-sector investments on various economic outcomes, as was presented in the conceptual framework in section 2.4.

5.1 Direct, indirect and induced effects of food and agriculture investments in rural Africa

In our review, we look at the different impacts that private-sector investments can have, including impacts on the wellbeing of the local population and on public goods (see also Figure 1 in section 2.4). Our definition of wellbeing draws on poor people's own description of poverty. Analyzing the views, experiences and aspirations of more than 20,000 poor men and women from 60 countries, Narayan et al. (2000) find that six dimensions feature prominently in these descriptions of poverty:

1. **Hunger,** i.e. the lack of food.
2. **A psychological dimension** as expressed by powerlessness, voicelessness, dependency, shame, and humiliation.
3. Access to **basic infrastructure**, especially roads (particularly in rural areas), transportation, and clean water.
4. **Education** as a means of escape from poverty, but only if education meets demand on the labor market and the local economic structure allows for returns on education.
5. **Health,** including foregone incomes due to the inability to work.

6. Physical, human, social, and environmental **assets** as a way to cope with vulnerability. In many cases, this vulnerability has a gender dimension.

All six dimensions are included in the conceptual framework.

Generally, private-sector investments can impact local people via labor and product markets and the creation or destruction of public goods. The impacts of investments can be further differentiated as direct and indirect. Direct effects include:

- Productivity increases through improved technologies that are introduced by investment; and
- New risk-sharing mechanisms for production and marketing risks and resulting higher profits from production and/or reliability and timing of profits (e.g. through supply agreements with specified prices or new production possibilities during the lean season).

Investment projects can have indirect effects on the product market. These spillovers from the investment project affect the other activities that locals engage in, e.g. knowledge about production technologies or improved management skills can also be applied to other crops. Other indirect effects include changes in the availability of food if significant shares of land are dedicated to the production of non-food crops and in local food prices. Both effects depend on the openness of the market and scarcity effects.

On the labor market, direct impacts can materialize through new employment opportunities, especially for women, leading to new sources of wage income. On the other hand, shifts in the costs of rural labor can occur if rural labor is made scarcer through the new job opportunities and opportunity costs of labor change as a result.

Indirect effects through changes in the labor market include new possibilities to invest in agricultural production technologies thanks to off-farm income. This phenomenon is often found in studies analyzing factors determining the adoption of innovations (e.g. Feder et al., 1985; see also Govereh and Jayne, 2003; von Braun and Kennedy, 1994) or changes in intra-household inequality and bargaining power when women find new employment. The agri-food processing and packaging industry, for instance, is a labor market that is characterized by a very high share of low-skilled female workers. Such changes are likely to influence the welfare distribution within households as women's bargaining power increases. Improvements in women's bargaining power often change the allocation of resources allocation in favor of women's priorities, which are often to the benefit of children's nutrition, health and education (Ashraf, 2009; Getahun, 2016).

Similar effects may materialize through investments in mechanization. If activities like threshing are conducted mechanically, this reduces the arduousness of the task and may free up male labor for other tasks and allow women and children to take over. The use of threshers can translate into higher incomes, allowing male workers to seek other income-generating activities, especially where off-farm employment opportunities exist (Pingali, 2007).

Direct impacts on public goods arise when investors build or modernize local infrastructure and other amenities or facilitate public investment by providing access to credit or by attracting credit-providing institutions. Private-sector investments can also have impacts on the environment, including improved or decreased water availability, e.g. through the establishment of waste water treatment facilities; due to the excessive use and pollution of water; or by attracting political attention to a certain sector. Indirect effects include changes in societal levels of inequality; inequality is reduced if projects benefit groups that were historically left behind by local development efforts, and increases if some groups find new income opportunities while others do not. A related indirect effect is inflation of local prices if (some) incomes rise significantly, which can negatively affect those who do not benefit to the same extent. Psychological benefits, such as improved self-confidence and pride may be other positive indirect effects of investment projects for those who benefit. Investments in mechanization reduce drudgery and thus have the potential to shift tasks between household members and to make agriculture more attractive, especially to young people (Benin, 2015; Daum and Birner, 2017; Houssou and Chapoto, 2015; Pingali, 2007).

The nature of the direct and indirect channels through which wellbeing is affected is determined by the institutional arrangement of the investment. Institutional arrangements include the specific contracts with farmers (prices, quality criteria, input provision and other specifications), working contracts with employees and accompanying measures set up by the investor, such as health or schooling facilities. It also encompasses the process through which the project is implemented, including the sharing of information and consultation with farmers, land acquisitions or regulation of water usage. Finally, the wider institutional setting includes the social obligations of companies and market competition, which is decisive for establishing market power (Poulton et al., 2004).

All these factors and their interactions can positively or negatively affect local people's wellbeing. Of key importance is determining which parts of a population benefit and which lose in relative and absolute terms.

5.2 Institutional arrangements

There is little analysis of institutional arrangements between governments and investors in the existing literature. Only one study of an oil palm project in Uganda has assessed the provisions that investors must abide by. The authors find that tax breaks for investors result in foregone government earnings. Additionally, they lead to reduced production costs for the investor and reduce the competiveness and profitability of domestic oilseed producers and processors who are required to pay tax (Benin and Walusimbi, 2004).

Another general finding from the comparison of twelve case studies of agricultural export producers in Africa is that competition among processors is generally beneficial for farmers, as competition between buyers enables farmers to obtain a higher farm-gate price and therefore a higher level of income (Depetris Chauvin and Porto, 2010).

There is little description of the contractual arrangements made between investors and contract farmers or employees in the publications we review. Many studies only mention that investors pay product prices that are higher than market prices to avoid side selling (e.g. Minten et al., 2009). Furthermore, several investors provide inputs on credit and specify prices in the contracts with the farmers, but the studies do not compare these provisions with the market prices in the area. The supplier arrangements for farmers selling to supermarkets are also not described in detail. Rao et al. (2012) report that in the traditional market, farmers sell to traders that collect vegetables at the farm gate without any prior agreement, while supermarkets have agreements with vegetable farmers regarding product price, physical quality, hygiene and consistency in supply. Price agreements are made before delivery. Payments are usually made only once a week or every two weeks. Prices paid by supermarkets are normally higher and more stable than the prices on traditional vegetable markets, creating a strong incentive for farmers to sell to supermarkets (Rao and Qaim, 2011; Rao et al., 2012). Yet, in this study, all agreements between supermarkets and farmers are verbal and written contracts are uncommon (Rao et al., 2012).

5.3 Product market

5.3.1 Direct effects

5.3.1.1 Income effects on product markets

Most of the studies reviewed find positive income effects on the product and/or total household income of producers participating in an investment project as contract farmers. Bellemare (2012) analyzes a range of contract farming schemes in Madagascar in which farmers cultivate different crops. Using survey data for participating and non-participating farmers, the author finds that a 1% increase in the likelihood of participating in contract farming entails, on average, a 0.6% increase in a household's total income and a 0.5% increase in a household's income per adult equivalent. He also finds a 0.5% increase in a household's income net of contract farming revenues, which suggests that contract farming has spillover effects onto other income sources.

Results of a study using data from 100 smallholder avocado farmers in Kenya indicate that contract farming can have a positive and significant effect on smallholder income from avocado production. Income from contract farming is about 40% higher than that of farmers who do not participate in the contract farming scheme. However, results also show that contract farming does not have any significant effect on the total household income due to substitution effects (Mwambi et al., 2013).

Analyzing a household survey of 396 smallholder rice farming households in Benin, Maertens and Vande Velde (2017) also find positive income effects for farmers participating in a local contract farming scheme. Controlling for selection bias, the authors find that contract farmers' rice production income is twice as high and that their total household income is 17% higher than that of non-contracting farmers. The reason for these income gains are: area expansion for rice production and higher net revenues from rice production per hectare due to the use of improved inputs provided on credit by the contractor; an increased share of rice that is commercialized per household and better farm-gate prices compared to the sample average. Better prices are attributed to the better quality of the rice produced, especially regarding purity, which is due to better sorting at the farm level and increased value-adding at the enterprise level (Maertens and Vande Velde, 2017).

Elepu und Nalukenge (2009) compare the income effects of different contract farming schemes for sunflower, sorghum and rice production in Uganda. Using interviews with contracting and non-contracting farmers, they find that contract farmers' average gross profits from sunflower

and sorghum production that are 2.7 times and almost 6 times higher respectively. The authors speculate that the profit differentials may be due to higher prices, higher productivity and the improved technology used by contract farmers. In contrast, non-contracting farmers make higher profits off their rice sales than contracted farmers (23%). This is probably because contracting farmers sold lower-value wet rice and received lower prices for dry rice compared to non-contracted farmers.

Similarly, Maertens, Minten, and Swinnen (2012) find that export-oriented contract farming in Madagascar leads to higher and more stable incomes for farmers and thereby improves household food security. While these authors do not have a baseline or a control group with which to corroborate the statements made by the contract farmers they interviewed, they try to support their findings with recall data on the length of the hunger period. They find that participation in contract farming reduced the hungry season from almost four to less than two months. Analyzing the bean export supply chains in Senegal, the same authors find that rural households benefit from participating in contract farming, earning incomes that are 110% higher than the average income in the region where the data was collected (Maertens et al., 2012).

Positive effects of contract farming are also found by Wambui Muriithi (2014) in her study on the impacts of vegetable commercialization on household income in Kenya. This study finds that households participating in the export market earn incomes that are 39% higher than non-participating households (Wambui Muriithi, 2014). A study using the survey data of 158 farmers participating in a mango outgrower scheme in Ghana shows that farmers report that their participation in the outgrower scheme increases their average annual income from mango production by approximately 34%, but they do not provide any evidence on total household income (Abdul-Razak et al., 2015).

Jones und Gibbon (2011) analyze an investment project for organic cocoa production by an exporting company (Esco) in rural Uganda. Their results suggest that a 10% increase in the volume of sales to Esco as a share of total sales generates a 6% increase in net cocoa revenue of the participating farmers. The authors explain these cocoa income gains by better prices and improved technology, accounting for 23% to 77%, respectively, of the welfare effect (Jones and Gibbon, 2011). Bolwig, Gibbon, and Jones (2009) find a significant increase in household income (12%) through participation in a contract farming scheme for organic coffee production in Uganda, compared with a control group.

The only evidence of farmers experiencing negative income effects from contract farming is reported by Ragasa et al. (2018) who analyze different maize outgrower schemes in the Upper

West region in Ghana. Using structured surveys of households and communities, in-depth interviews with firms and aggregators and a survey of plot-level data of 1261 maize-producing households dating from 2016, the authors find that plots under contract farming schemes are more likely to be treated with improved inputs and to have a higher productivity than other plots. On average, those under the scheme have significantly lower profits than farmers with plots that are not cultivated under the outgrower scheme. This is because the higher yields achieved under the contract farming scheme are not enough to offset the higher input costs, resulting in negative profits. More detailed data shows that 44% of the households participating in an outgrower scheme have positive profits, but the percentage of households that does not participate in a contract farming scheme and sees high profits is larger than the share of households that do participate in a scheme (Ragasa et al., 2018). The authors explain this finding by the fact that the profitability of contract farming schemes that include the provision of improved input packages on credit basis depends on the prices of these inputs. The latter are influenced by external factors, such as the presence or absence of input subsidy programs or exchange rate fluctuations. Thus, the profitability of participating in a contract farming scheme may not be stable over time. In the case of their study, the region considered was part of a fertilizer subsidy program that was phased out in the year of data collection (2014/15), which led to much higher fertilizer prices than before. While the authors do not have detailed data on profitability of different production schemes before 2014, their data still point to higher profitability of scheme participation in earlier years (Ragasa et al., 2018).

Supermarkets are generally found to generate positive income effects for the supplying farmers. Rao and Qaim (2011) report a net per capita income gain of 48% for farmers in rural areas around Nairobi who sell their vegetables to supermarkets.[xli] Further disaggregating the subsample of farmers who supply to supermarket, they find that farmers who own less than one acre of land see income gains of 67%, possibly because the opportunity to sell to supermarkets at more stable prices creates new incentives for these smallholder farmers to commercialize. Following up with the same sample of farmers four years after the initial data collection round, Andersson et al. (2015) show that supplying to supermarkets continues to be associated with incomes that are almost 60% higher than those of farmers selling on the traditional vegetable market. However, almost half of the farmers who had sold to supermarkets in the first survey round had dropped out of this marketing chain, which resulted in a return to the lower incomes farmers had prior to selling to supermarkets (Andersson et al., 2015).

4.3.1.2 Access to technology and finance

Some studies indicate that investment projects enable farmers to access improved technologies, which is expected to increase their productivity and thus lead to higher profits and improved welfare. In their study comparing sorghum, sunflower and rice contract farming schemes in Uganda, Elepu und Nalukenge (2009) find that contract farming schemes lead to improved access to seeds and higher technology adoption rates, particularly for sunflower and sorghum. They also show that the disparity in gross profits between contracting and non-contracting sunflower farmers can be explained in part by their cultivation of different varieties. Similarly, a study on the effects of an organic mango outgrower scheme in Ghana reveals that participating farmers experience significant positive changes in the transfer of technology and are more likely to adopt new farming techniques (Abdul-Razak et al., 2015).

In the case of the vegetable export sector in Madagascar, the investor, Lecofruit, loans different agricultural inputs to contractors and uses the first harvest delivered to the company as a reimbursement for these inputs. Contracting farmers have to follow the company's strict instructions and are closely monitored to ensure correct production and management; 34% of the surveyed farmers even report that representatives of the firm will put the pesticides on the crops themselves to ensure that it is done correctly (Minten et al., 2009). While this institutional arrangement suggests that inputs are used efficiently, there is no evidence provided on the situation of non-participating farmers and thus no way to measure the gains achieved through the provided inputs.

In the case of sorghum production for breweries in Sierra Leone, Ghana, Uganda and Zambia, companies encourage farmers to buy fresh seeds for every crop cycle, which breaks the traditional rule of reusing part of their crop for the next cycle to reduce costs (van Wijk and Kwakkenbos, 2012). However, the study does not provide any information about difficulties in accessing such inputs or whether they are made accessible by the company. In the case of a mango outgrower scheme in Ghana, 86% of the interviewed farmers name inadequate inputs as a major challenge (Abdul-Razak et al., 2015).

Some investment projects also improve farmers' access to finance. In the case of sorghum production for beer breweries, for instance, farmers had increased access to credit, which was provided either by the investor or by banks that were encouraged by the investor to give credit to participating farmers (van Wijk and Kwakkenbos, 2012). Several other studies mention that investors loan out inputs but do not provide further detail (Elepu and Nalukenge, 2009a; Freguin-

Gresh et al., 2012; Maertens et al., 2012; Minten et al., 2009; Mwambi et al., 2013; Väth and Kirk, 2011).

While supermarkets do not directly provide access to finance or technology, the higher and relatively stable prices they offer enable farmers to invest in inputs or technologies themselves and thus increase their productivity. Rao et al. (2012) analyze how the productivity of farmers selling to supermarkets differed from that of farmers selling in traditional markets in Kenya. They found that those selling to supermarkets had improved meta-technology ratio[xlii] of about 45% and scale efficiency increases of 30%. This was primarily due to reduced marketing risks and higher output prices. Farmers' technical efficiency also improved but remained relatively low for both farmers selling to supermarket and those selling on traditional markets.

4.3.1.3 Production and marketing risks

One important factor for farmers' wellbeing can be the reliability of output markets and the distribution of risks involved in agricultural production, which depends on the risk sharing mechanisms between producers and buyers. Yet, very few studies analyze or mention this factor. Elepu und Nalukenge (2009) study the role of contract farming in the commercialization of smallholder agriculture in Uganda using data from sorghum, rice and sunflower schemes. The study states that contract farming schemes generally provide assured and reliable markets, although market unreliability due to overproduction and unstable market prices were also observed during their data collection. Nonetheless, non-contracting farmers were generally more affected by unreliable markets and high marketing costs, although both contracted and non-contracted farmers complained about high production and marketing costs (Elepu and Nalukenge, 2009a). However, the authors stress that the differences between crops and contracting schemes makes it difficult to reach general conclusions.

Supermarkets can potentially create relatively profitable, lower risk, fast growing, and year-round markets for producers. All studies analyzing the impacts of supermarkets on local farmers show that farmers selling to supermarkets rather than to traditional markets enjoy higher and more stable output prices and reduced marketing risks (Andersson et al., 2015; Neven et al., 2009; Neven and Reardon, 2004; Rao and Qaim, 2011; Rao et al., 2012). However, these results should not be overemphasized, as these studies all rely on the same dataset of vegetable farmers in a 100km band around Nairobi.

4.3.1.4 Output prices

Prices constitute a major issue for smallholder farmers, as do the reliability and predictability of prices for agricultural produce. Evidence suggests that prices offered by investors who engage smallholder farmers in contract farming schemes are generally above local market prices and are therefore more profitable for the contracting farmers. The reason for companies to offer higher prices is often to avoid side-selling.

In Madagascar, 61% of the surveyed farmers indicated that the contract prices in an investment scheme for beans destined for export are higher than local market prices (Minten et al., 2009). Companies that produce sorghum for breweries in Ethiopia are also reported to generally negotiate a guaranteed annual price that is slightly above the local market price in order to avoid side-selling (Getaneh and Bekabil, 2008; van Wijk and Kwakkenbos, 2012). However, study results from Uganda and Zambia show that some brewing companies only pay the local market price (van Wijk and Kwakkenbos, 2012).

In their partial equilibrium analysis of an oil palm project in Uganda, Benin and Walusimbi (2004) estimate that the expected production of palm oil from the project would increase the quantity of edible oils on the domestic market by nearly 50%, causing prices of vegetable oils to plummet by 28% to 71% within two years, depending on the assumed price elasticities of demand and supply for vegetable oils. This development would lead to a considerable reduction of the profitability of vegetable oil production for existing local oilseed processors. However, results need to be interpreted with care, as the authors assume linear supply and demand curves, zero cross-price elasticities and assume a closed economy for their ex-ante analysis of the impacts of the investment project in question.

Some studies indicate that organic certification that is part of certain investment projects can be responsible for higher output prices, as it offers sellers premium prices that are above the market prices for conventional products. Higher and more stable market prices are found to offset the risks of costly (in terms of time, labor and equipment) value-adding through processing as required in the scheme (Bolwig et al., 2009).

Taking a broader approach and considering consumer benefits, which include a large share of poor small farmers who tend to be net buyers of food, the effect of decreasing prices is often wellbeing-enhancing for this population group. Yet, the studies in our review panel do not cover this critical linkage.

4.3.1.5 Skill development

Skill development, e.g. extension services provided by investors, can be an important benefit for farmers that may also lead to considerable spillover effects. Yet, evidence of this is scarce, and the few studies where skill development is considered find mixed results. In the case of a sorghum contract scheme in Uganda, most of the interviewed contracted farmers lacked extension services and credit access, while a majority of the interviewed contracted rice farmers received such services (Elepu and Nalukenge, 2009a).

Masakure und Henson (2005) cite that the possibility of benefitting from the extension services provided in a horticultural contract farming scheme in Zimbabwe is an important reason for farmers to participate in the scheme. However, the authors only analyze reasons that motivate farmers to engage in contract farming but do not provide any evidence on whether such services were actually provided, and if so, whether they had any measurable impact. In the case of investment projects for the sourcing of sorghum for breweries, it is reported that companies invest in training farmers in farm and financial management, quality issues and farmer organization (van Wijk and Kwakkenbos, 2012). Teaching farmers organic practices for coffee production is found to be rewarded by a 7% increase in yield per tree on average (Bolwig et al., 2009).

5.3.2 Indirect effects

4.3.2.1 Spillover effects

The spillover effects of investment projects can increase wellbeing of local population by providing them with transferrable skills and technology. The development of production and management skills that farmers can obtain by participating in investment projects can have considerable spillover effects onto the production of other crops. Farmers can also use the higher income gained as a result of the higher prices offered by investors or increased productivity to invest in improved technologies for their other fields. Furthermore, spillover effects can spread from direct beneficiaries to other farmers in the region, e.g. through sharing of improved farming practices.

Maertens, Minten, and Swinnen (2012) find that a contract farming scheme for vegetable production in Madacascar had indirect effects on rice production in the region. The spillover was due to the spread of technological and managerial practices. A regression analysis revealed that extension services provided to vegetable contract farmers led to an increase in the productivity

of rice production by 64%, along with household income and food security. Results of a study of the bean export sector in Senegal show that farmers invest capital from contract farming in their own farm business, which leads to higher outputs and farm incomes (Maertens et al., 2012).

Ragasa et al. (2018) do not provide hard evidence on spillover effects but assume that spillover effects are the reason that the total gains in household income due to contract farming are much larger than income gains from rice production alone. The authors posit that the size of the total income gains is due to technical and managerial spillover effects on the farm or the relief of cash constraints due to higher income from rice production, which enables them to make investments in other farm activities. Other studies indicate no spillover effects from contract farming, because farmers lack the labor, skills, knowledge and time to reinvest their capital (Mwambi et al., 2013).

Spillover effects to the wider community are observed in the organic cocoa outgrower scheme in Uganda. The scheme has led to positive changes for all farmers; average cocoa prices have risen by 40%, and all households have increased their use of technologies by over 20% (Jones and Gibbon, 2011).

4.3.2.2 Nutrition

Changing household production patterns and increased income due to participation in various forms of investment projects can change households' nutritional outcomes both in terms of calories consumed and micronutrient intake. Analyzing data from 1200 households in six regions in Madagascar, Bellemare and Novak (2017) find that participating in contract farming reduces the duration of a household's hungry season by about eight days on average. Interestingly, these effects are more pronounced for households with more children, especially for families with more girls.

Chege et al. (2015) analyze how selling to supermarkets rather than through traditional markets impacts the nutrition of farming households. The authors find that nutrition is influenced via three channels: cash income, changes in choice of commodities produced and gender roles. Additionally, an increase in cash income and in vegetable production increases household consumption, which, in turn, increases the intake of calories, vitamin A, iron and zinc. On the other hand, when vegetable production becomes more profitable, male household members often take over this source of revenue, which negatively affects calorie intake and micronutrient consumption of household members. While the overall effect is still positive, the analysis shows that impacts are manifold and complicated.

5.4 Labor market

Generally, evidence from the studies that were analyzed shows that the labor market plays a significant role, especially for very poor rural households with relatively few assets. This is in line with earlier research showing that increased employment and income-earning opportunities for the poor are key to poverty reduction, since labor is often the only asset owned by the poorest (von Braun, 1995; von Braun et al., 2009). However, the poverty-reducing impact of new employment opportunities depends on various factors, including geographic location, education requirements and gender effects.

5.4.1 Direct effects

Investment projects can create new opportunities for different population subgroups and can therefore have heterogeneous impacts across a population. By analyzing the number of people involved in export horticulture through product and labor markets for fruits and vegetables in Ghana and Kenya, beans and tomatoes in Senegal, bananas and pineapples in Côte d'Ivoire and vegetables in Zambia, Maertens et al. (2012) find that more households are affected through labor markets than through product markets (as defined in the conceptual framework in section 2.4). Furthermore, several studies show that it is especially the very poor and women who benefit from new employment opportunities created by investments in the agriculture and food sector (English et al., 2004; see e.g. Getahun, 2016; Maertens et al., 2012; Maertens and Swinnen, 2006).

A supply chain analysis of French bean production and export in Senegal shows that both French bean contract farming and wage employment on agro-industrial estates increase the incomes of rural people. Although the income effect for contract farming is higher, estate workers also earn significantly higher incomes than non-participating households; contract farmers and estate workers have incomes that are 3 million and 1.4 million FCFA[xliii] higher, respectively, than incomes of non-participating households (Maertens and Swinnen, 2006). Others report income gains of more than 50% for households that are employed in the tomato export industry in Senegal and 60% for households employed in the bean export industry, leading to reduced poverty rates (Maertens et al., 2012).

Ahlerup and Tengstam (2015) find that investments made between 1994 and 2007 in the Zambian agricultural sector have positive short- and long-term effects on commercial farm wage incomes for rural smallholder households. Interestingly, these authors find that the commercial farm wage income effect is especially large for land-poor rural households. This is presumably because such

households have the lowest marginal productivity of labor on their farms and thus benefit the most from new job opportunities created by agricultural investments in their neighbourhood.

Herrmann (2017) analyzes the wage income effects of a large-scale rice and sugarcane investment in the Southern Agricultural Growth Corridor (SAGCOT) of Tanzania. He finds that monthly wages and incomes are two to three times higher than for local jobs, because annual employment duration is almost twice as high in the agro-industry created by the rice investment than in the local sectors. This is in spite of the fact that jobs in the rice industry are mostly short-term contracts and that average daily wages do not differ significantly between the newly created rice agro-industry and the local sectors. The study finds per capita income gains of 50% in the rice industry and 84% to 99% for workers in the sugar industry. Furthermore, income poverty is 24% to 28% lower for workers in the rice industry and 40% lower for workers in the sugar industry compared to those not benefitting from the investment.

The switch from traditional markets to supermarkets also has labor market effects. Neven et al. (2009) find that farmers who supply to supermarkets rely heavily on hired workers who constitute 80% of their labor force, such that even smallholder farmers who do not supply to supermarkets profit through increased prices on the labor market (see also Rao and Qaim, 2011 for similar findings). Wages for hired workers in the supermarket supply chain are 25% higher than in the traditional supply chain, justified by a much higher productivity of labor. Furthermore, the rural poor who work for farmers in the supermarket supply chain have a higher incidence of full-time jobs than their counterparts in the traditional supply chain, due to the year-round production and vegetable bundling requirements of supermarkets (Neven et al., 2009; Rao and Qaim, 2011).

5.4.2 Indirect effects

There is evidence that the increased income from foreign investment-related employment opportunities for women can decrease intra-household inequality. The increased female labor participation in the rural labor market leads to a reduction of gender discrimination and to female empowerment in their households (Getahun, 2016; Maertens et al., 2012). Results from a study in the flower farm sector of Ethiopia suggest that the increased earnings of women positively impacts the intra-household bargaining power of women (Getahun, 2016).

A second indirect effect of increased income comes in the form of spillover effects, which enables households to invest in other (agricultural) activities. An analysis of data from Senegal shows that households with wages from the agro-industry cultivate their land more intensively and use 75% more agricultural inputs than households without such wage incomes (Maertens et al., 2012).

5.5 Public goods

The creation of public goods (and also public bads) can be an important result of investment projects. For instance, investment can result in public goods if water rights and compensation mechanisms are transparent and fair and waste water is treated and reused adequately, or if health and education facilities built by the investor are also accessible for people who are not contracted or employed by the company. Unfortunately, very few studies address this question and evidence about the creation or destruction of public goods is scarce.

5.5.1 Direct effects

There is evidence in the literature of projects having direct effects on infrastructure provision and quality, as well as on government priorities and the environment. These can all be broadly classified as tangible or intangible public goods. Some investment projects involve the building of infrastructure and other amenities, which can directly contribute to the wellbeing of the entire community where the project is located. A study on a mango outgrower scheme in Ghana reported that 53% of the interviewed farmers felt that educational facilities in their community had improved and that improved access to farm tools and sanitary and health facilities also benefited non-contracting farmers (Abdul-Razak et al., 2015).

Investments, especially when they are high-profile, can have an effect on regional and even national governance. Their presence has the potential to attract political attention to areas or sectors that were previously neglected. The only study reporting on this phenomenon is an analysis of the BIDCO Oil Refineries Limited oil palm investment in Uganda. The study found that one of the few positive aspects of the project was the increased political attention to the area where the oil palm plantation was set up (Benin and Walusimbi, 2004).

The environment is a public good that can be either positively or negatively affected through private-sector investment. The set-up of plantations and the increased use of agro-chemicals or overuse of water induced by agricultural investments can lead to severe negative ecological impacts. In the case of sorghum contract farming in Uganda, interviewed farmers reported seeing signs of soil exhaustion on their fields. They attributed this to the use of high-yielding varieties distributed in the contract farming scheme. Data in this study also suggests that contracted farmers who used the high-yielding variety were more affected by pests and diseases than farmers using other varieties (Elepu and Nalukenge, 2009a).

In a study on the effects of an organic mango outgrower scheme in Northern Ghana, surveyed farmers reported changing the way they use their available farmland and seeing positive results.

In this case, the organic farming methods that were introduced by the investor helped improve biological activity and soil conditions. The results of this study also show that onsite trainings on best farming practices, fire prevention, water protection and land management have positive effects on the use of resources and the protection of the environment (Abdul-Razak et al., 2015).

Indications of potential negative ecological impacts comes from the study on Ethiopian flower farms. Flower production can cause water, air and soil pollution through the intensive use of chemicals and poor water disposal management. The flower sector is also characterized by its intensive use of water, which is likely to have negative impacts on local farmers who depend on ground water resources (Getahun, 2016).

5.5.2 Indirect effect

The main indirect effect on public goods identified in the literature relates to social capital. Results of some studies suggest that participation in outgrower schemes lead to positive effects on social capital and community welfare. In the case of a mango outgrower scheme in Ghana, 64.6% of the interviewed farmers indicated that participation in the scheme encourages cooperation among farmers. Other reported positive outcomes of participation included building networks, interconnectivity, friendship, trust and exchange among farmers (Abdul-Razak et al., 2015). Getahun (2016) also finds that the average social network score of women employed in cut flower farms is significantly higher than that of women in the control group. This suggests that working in the flower farm sector has a positive impact through network formation, since both groups had comparable scores before some women started to work on the flower farm.

5.6 Outcomes for local population subgroups

The following is a summary of the overall impacts of investment projects on the subjective wellbeing of the local population. We also differentiate the findings about impacts presented in the previous chapter for different groups within the local population.

5.6.1 Private-sector investment and its effect on subjective wellbeing

A simple way to assess well-being is by individual's subjective assessment. This information is captured by some studies which directly measure the effects of private-sector investments on the subjective wellbeing of the local population. Herrmann (2017) reports that 74% of the workers hired through an investment project for rice production felt that their wellbeing improved, and

only 12% felt that their wellbeing worsened through the investment. However, most of the rice workers (75%) would not recommend this job to their children.

5.6.2 Welfare outcomes by population subgroup

The welfare impacts of private-sector investment projects tend to vary between population subgroups in observable patterns. For instance, several studies show that very poor households benefit from high-value production through estate-farming and other employment opportunities rather than through contract farming, which mostly benefits better-off households (Ahlerup and Tengstam, 2015; Maertens et al., 2012; Maertens and Swinnen, 2006; McCulloch and Ota, 2002). Similarly, Herrmann (2017) finds that land-rich outgrowers in the SAGCOT corridor of Tanzania benefitted more from a sugar cane plantation investment than the land-poor. Ragasa et al. (2018) report similar results for maize outgrowers in Ghana, where the plots of the poorest farmers have the lowest yields and lowest profits. Workers in the agro-industry in the value chain created by a sugar investment project have slightly lower estimated income effects than outgrower farmers, but these are still very large (Herrmann, 2017). These effects might deepen existing inequalities.

There are certain barriers for smallholder farmers preventing them from participating in contract farming schemes. Maertens, Minten, and Swinnen (2012) find that the level of education is relatively high among farmers who participate in contract farming schemes. Furthermore, asset ownership and locational advantages, e.g. of agricultural equipment, including irrigation, and assets such as land or livestock, access to market information, or distance to market, are factors that determine which farmers are more likely to participate in contract farming schemes. This suggests that farmers who are disadvantaged may be excluded from such schemes. There are fewer constraints regarding participation in the labor market, which benefits poorer households and women (Ahlerup and Tengstam, 2015; Getahun, 2016; Maertens et al., 2012; McCulloch and Ota, 2002).

Similar results are found in the literature about the impacts of supermarkets; farms that supply to supermarkets are on average five times larger in overall size than those who market their produce via traditional channels. Furthermore, for the great majority of smallholder producers, the supermarket channel is generally difficult to enter due to the existence of a capital requirement threshold which includes physical (especially irrigation, transport, and ICT), financial, human and organizational capital and covers both production and marketing (Neven et al., 2009). Nevertheless, Rao and Qaim (2011) show that smaller and poorer farms that manage to supply to supermarkets disproportionately benefit from their participation in this supply chain. Furthermore, farms that supply to supermarkets rely heavily on hired labor and thus create new

employment opportunities that especially benefit the poor (Neven et al., 2009; Rao and Qaim, 2011).

The impacts of agricultural investments are often different for men and women. The wage employment opportunities created by agricultural investment projects can have important gender implications. This is because the majority of employees are female (especially in the horticulture sector), and off-farm employment opportunities are generally limited for women in rural areas. In the case of the horticulture sector in Senegal, 90% of employees in the bean sector and 60% in the tomato sector are female. Data from the Senegal case study shows that the gender wage gap in the export industry is 3 to 6 times lower than in other sectors (Maertens et al., 2012).

Getahun (2016) analyzes the welfare impacts and the gender implications of the new employment opportunities created by investments in flower farms in Ethiopia. The study finds that the majority of the jobs created are low-skilled and were overwhelmingly filled by women. These jobs have positive impacts on the earnings of women. This reduced household income from other sources, such as remittances or agricultural produce. But overall, the study finds that the net income effect of employment in flower farms is large and positive; obtaining the job increased the wage income of the employed women by more than 266%, causing a 25% to 33% increase in household consumption. Per adult equivalent, household food consumption increased by about 45% compared to the control group. He also finds that getting a job helped to reduce the severity of food insecurity and hunger (Getahun, 2016).

On the other hand, investments may change gender roles to the disadvantage of women and children. For instance, when a household supplies vegetables to supermarkets, this reportedly increases the likelihood that men will take control of the revenue from vegetable production that was previously managed by women. This represents a change in likelihood of over 20 percentage points, which leads to a decrease of the share of household expenditures on nutrition and dietary quality (Chege et al., 2015). Other studies indicate that female farmers are largely excluded from supplying to high-value export chains and contract-farming schemes (Dolan, 2001; Maertens et al., 2012). This exclusion may be a consequence of the fact that female farmers generally have less access to land, water, agricultural credit and production, as well as marketing information (Wambui Muriithi, 2014), which have been shown to be important entry barriers to contract farming.

Apart from income effects, Getahun (2016) finds that female flower farm workers indicate economic independence, self-confidence, satisfaction, self-worth and the ability to make their own decisions as positive outcomes of working on the farms. However, getting a job on a flower

farm reduces women's demand for leisure and that of their oldest daughter and husband. Moreover, employed women often complain about hard physical work, exposure to dangerous chemicals and the risk of incurring costly health services, as well as pressures and time constraints making it more difficult to cope with domestic responsibilities. Yet, both women and their husbands state that the job has considerable positive impacts on their wellbeing (Getahun, 2016).

Several studies show that children also benefit from new employment opportunities and incomes earned by their parents through contract farming. Farmers who participated in an organic outgrower scheme in Ghana were shown to invest their higher income into their children's education (Abdul-Razak et al., 2015). Maertens, Minten, und Swinnen (2012) also find that female employment in the export industry increases primary school enrolment by 9%.

5.7 Methodological issues

Despite the relative abundance of the literature assessing the various impacts of private-sector investments in the food and agriculture sector in Africa, it is extremely difficult to draw straightforward conclusions. The literature review presented above clearly emphasize the complexity and highly contextual nature of the findings. As shown above, the current literature is narrowly focused and provides insights into contract farming or supermarkets, but the evidence on investments in other steps of the food value chain, such as food processing, is scarce, or even non-existent. Additionally, several methodological weaknesses that the current research is flawed with need to be pointed out.

Bellemare and Bloem (2018) show that methodological challenges that the research in this area[xliv] is faced with typically lead to low internal and external validity of the findings. More specifically, the problem of self-selection makes causal identification difficult. Even though more recent studies employ econometric techniques such as selection-correction methods or instrumental variables to overcome this issue, Bellemare and Bloem (2018) show that in many cases, the identifying assumptions are questionable. Second, the effects of investment schemes are heterogeneous and context-dependent, and therefore it is difficult to extrapolate such results. Indeed, most of the studies reviewed here focus on a specific commodity, and even in case of a study that analyzed three various crops in the same context, the results were not consistent between the crops (Elepu and Nalukenge, 2009).

Additionally, Ton et al. (2018) point to publication and survivorship bias. The latter seems to be of particular importance, as investment projects that have previously failed are simply less likely,

or not likely at all, to be included in the empirical analyses. There are examples of many failed investment projects (see e.g. Tait, 2015; Vorley et al., 2015; Rosa Luxemburg Stiftung and African Centre for Biodiversity, 2018), however, they are rarely analyzed in the academic literature. A related problem is the short time-frame applied in most studies which does not allow researchers to assess the impacts of investment over the long run, while the available evidence suggests that some projects, even if seemingly successful at the initial stages, struggle to get to scale (Vorley et al., 2015). In this context, it is important to treat the findings described in the sections above with caution.

6 Conclusion and implications for policy and research

In this study, we conducted different statistical analyses of the patterns and drivers of FDI across Africa and supplemented these findings with research on the reported effects of private-sector investment on the population's wellbeing.

Our analysis shows that a total of $48.737 billion was invested in the African food and agriculture sector by foreign private-sector investors between 2003 and 2017. While this number is important, it is still not enough to deal with Africa's future challenges, especially the task of providing food and jobs for rapidly growing population. However, positive developments are observed. While the FDI started from a low base at the beginning of the period analyzed here, it reached much higher levels in recent years. A noticeable peak in FDI inflows is observed after the 2008/09 agricultural commodities shocks, suggesting that international investors aim to capitalize on high food prices.

Additionally, the initiatives such as the New Alliance for Food Security and Nutrition and Grow Africa, aimed at attracting more private-sector investment to the African food and agriculture, might have also contributed to the growth of FDI volumes reported over the last years. Even though they may not have been effective in executing formal commitments by foreign investors, both initiatives seem to have been successful in creating conducive environment for investment, with potential spillovers effects on FDI realized outside their frameworks.

The analysis of sectoral patterns shows that the production of fertilizers, pesticides and other agro-chemicals, crop production and breweries received the highest FDI volumes. It is noteworthy that contrary to popular perceptions, investment in crop production and related land acquisition constitutes a relatively small share of total FDI. Also, we do not find evidence that FDI leads to market concentration. We estimate that in total, these investment flows contributed to creation of about 14.7 million jobs in the continent, including direct, indirect and induced effects. Regional distribution of FDI seem to be very uneven across the continent, but also within countries. Nigeria, Ethiopia, Egypt, Algeria, Ghana and Mozambique are the main beneficiaries. Most companies aim to serve the domestic or regional market, which shows that tapping into the growing African agricultural and consumer market is increasingly attractive.

Our econometric analysis reveals that indeed, market potential, proxied here by the logarithm of GDP per capita and population size, is one of the main drivers of FDI in food and agriculture sector in Africa. More specifically, population size consistently has a significant impact on sectoral FDI

inflows, irrespective of the model specification. Among the supply-side factors, the size of agricultural land turns out to be an important predictor of FDI inflows. Agglomeration effects are also observed, with a lagged volume of FDI inflows having a very strong impact on the level of current FDI. Finally, we show that amenable factors, i.e. factors over which policy-makers have control, such as infrastructure or institutional quality, play an essential role in attracting investment. These findings give support to various strands of literature that we drew upon in the theoretical framework.

Uncovering the impacts that private-sector investment has on the population proved not to be straightforward. Even though the literature is relatively abundant, it is flawed with multiple methodological issues that limit its internal and external validity. In this context, the findings should be interpreted with caution. Despite these caveats, most of the studies reviewed in our paper seem to suggest various positive impacts of private-sector investment projects, in particular in terms of incomes of contract farmers, outgrowers, employees or suppliers to supermarkets.

On the other hand, it is not clear how such investments affect poverty and inequality. While some investment schemes may be biased towards better-off farmers, there is evidence that worse-off smallholders or landless poor can also benefit from contract farming and other investment projects, such as estate-farming and other employment opportunities. More specifically, the poverty-reducing capacity of labor-intensive investments is related to the degree to which it employs unskilled labor, which is the major productive asset of many poor households. In particular, when such low-skilled jobs are taken by women, multiplier effects are especially large, as the increased earnings of women go towards investments in their children's nutrition, health and education. That, in turn, enhances long-run poverty reduction effects.

The review also suggests that private-sector investment projects can be drivers of technical innovations. Companies often provide participating farmers with improved technologies in the form of inputs, training in farming practices, or encourage farmers to use improved technologies that are locally available. Investment projects that establish certified organic agricultural production are especially beneficial, as they have significant positive ecological impacts and positive spillover effects due to increased knowledge about the appropriate use of organic fertilizer and water-saving practices. However, the studies that review investments in conventional agricultural production and consider ecological impacts report negative ecological impacts due to the excessive use of agro-chemicals and overuse of water.

On the other hand, little is known about remaining channels that influence the wellbeing of the local population, especially regarding impacts on public goods, such as water resources, soils and soil degradation, infrastructure or inflation. Additional analyses of the institutional arrangements between investors, governments and the affected local population are required, along with analyses of the links between these institutional arrangements and a broad range of observable impacts beyond income effects. In the absence of additional research, it is difficult to assess the real impacts of private-sector investments and to provide advice to policy makers and investors on how to design investments such that both investors and different subgroups of the local population benefit as much as possible.

These findings have several implications for policy-makers willing not only to attract FDI into the food and agriculture sector of their respective countries, but also to make it beneficial to local populations. First, while FDI location is largely determined by structural factors over which policy-makers have little control, our analysis showed the importance of amenable factors, such as infrastructure and governance. Improving these factors will not only encourage FDI inflows, but it will also have the potential to create conditions under which these investments will benefit the society as a whole. It is essential to involve multiple stakeholders including local governments, communities and non-governmental organizations in the processes related to FDI, particularly so in case of big projects, in order to make sure that the benefits of new investment initiatives will be fairly distributed and that the potential costs will be reduced. Additionally, an evaluation mechanism needs to be included in all initiatives aimed at increasing agriculture and food FDI to Africa in order to monitor progress and measure impacts over time. Finally, more research on the welfare, employment and other socio-economic impacts on communities located near large FDI projects is necessary.

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Appendix

Data Reliability Test

To test the reliability of the data, we draw a random sample of 37 investment projects, i.e. 5% of all reported projects, and conduct a google search for information on any discrepancies between the investment plans and their implementation (or that supports their agreement with one another). The results of this investigation show that all projects could be identified. In eight cases (23.5%), however, it is unclear whether the projects were in fact implemented. But since three of these were announced in 2015 and 2016 and are new projects rather than expansions of existing investments, implementation may still be underway, or media coverage may be lacking. In five cases, press releases announced the capital expenditures after the projects were implemented. Real capital investments were close to the planned amount in three cases, half the planned amount in one case ($17 million instead of $34.1 million) and 30% more than the planned amount ($100 million instead of $75 million) in another case.

The true number of jobs created could only be identified in one of the selected investment projects. In this case, fewer jobs (300 instead of 400) were created, although the company planned to hire an additional 400 people. Most of the 34 projects still appeared to be in operation today (2018), and only two closed down. In six cases, it was unclear whether the projects were still in place. These figures show that there is some variation in the data on investments for which post-completion information is provided, which is the sharp minority. For most projects it is not possible to find any data on the actual amount of money invested or the jobs created.

Table A1: Comparison of localized and not-localized projects – Subsectors

	Capital Investment (in million USD)		Share of not localized projects in total investments	Share of localized in total investments
	not localized	localized		
Agriculture, construction, & mining machinery	135.61	475.15	0.50%	1.74%
All other food	65.10	238.30	0.24%	0.87%
All other industrial machinery		5.80	0.00%	0.02%
Alumina & aluminium production and processing		1158.44	0.00%	4.25%
Animal food	104.10	365.84	0.38%	1.34%
Animal production	104.10	177.95	0.38%	0.65%
Animal slaughtering & processing	104.10	476.51	0.38%	1.75%
Bakeries & tortillas		227.40	0.00%	0.83%
Breweries & distilleries	245.20	4123.12	0.90%	15.13%
Coffee & tea	64.60	538.86	0.24%	1.98%
Converted paper products	11.90	8.17	0.04%	0.03%
Crop production	213.70	4811.87	0.78%	17.66%
Custom computer programming services		13.80	0.00%	0.05%
Dairy products	353.70	740.90	1.30%	2.72%
Fishing, hunting & trapping		50.00	0.00%	0.18%
Food & Beverage Stores (Food & Tobacco)	6.70	140.50	0.02%	0.52%
Food product machinery	96.40	75.70	0.35%	0.28%
Freight/Distribution Services		91.40	0.00%	0.34%
Fruits & vegetables & specialist foods	214.70	343.05	0.79%	1.26%
General purpose machinery		2.90	0.00%	0.01%
Glass & glass products		126.60	0.00%	0.46%
Grains & oilseed	263.91	845.98	0.97%	3.10%
Heavy duty trucks		94.50	0.00%	0.35%
In-Vitro diagnostic substances		42.60	0.00%	0.16%
Measuring & control instruments		2.90	0.00%	0.01%
Nonmetallic mineral mining & quarrying		55.60	0.00%	0.20%
Other (Beverages)		6.20	0.00%	0.02%
Other fabricated metal products		192.68	0.00%	0.71%
Paints, coatings, additives & adhesives	40.00	708.00	0.15%	2.60%

Plastic bottles		2.00	0.00%	0.01%
Plastics & rubber industry machinery	2.90		0.01%	0.00%
Plastics packaging materials & unlaminated film & sheets	205.43	356.45	0.75%	1.31%
Professional, scientific & technical services		27.30	0.00%	0.10%
Seafood products	141.24	319.25	0.52%	1.17%
Seasoning & dressing	134.00	430.14	0.49%	1.58%
Snack food	119.46	754.42	0.44%	2.77%
Soft drinks & ice	218.70	2033.42	0.80%	7.46%
Software publishers, except video games		5.60	0.00%	0.02%
Steel products		65.00	0.00%	0.24%
Sugar & confectionary products	469.40	3634.18	1.72%	13.34%
Textiles & Textile Mills		1.00	0.00%	0.00%
Ventilation, heating, air conditioning, and commercial refrigeration equipment manufacturing		40.96	0.00%	0.15%
Wineries		20.50	0.00%	0.08%

Table A2: Comparison of localized and not-localized projects – Industry Activities (excl. fertilizer)

	Capital Investment (in million USD)		Share of not localized projects in total investments	Share of localized in total investments
	not localized	localized		
Business Services		13.80	0.00%	0.06%
Design, Development & Testing	9.80	114.76	0.30%	0.48%
Education & Training	1.70	46.10	0.05%	0.19%
Extraction		55.60	0.00%	0.23%
Headquarters		91.35	0.00%	0.38%
Logistics, Distribution & Transportation	156.60	615.05	4.72%	2.57%
Manufacturing	3083.25	22394.88	93.01%	93.57%
Research & Development		104.90	0.00%	0.44%
Sales, Marketing & Support	63.60	380.29	1.92%	1.59%
Shared Services Centre		14.20	0.00%	0.06%

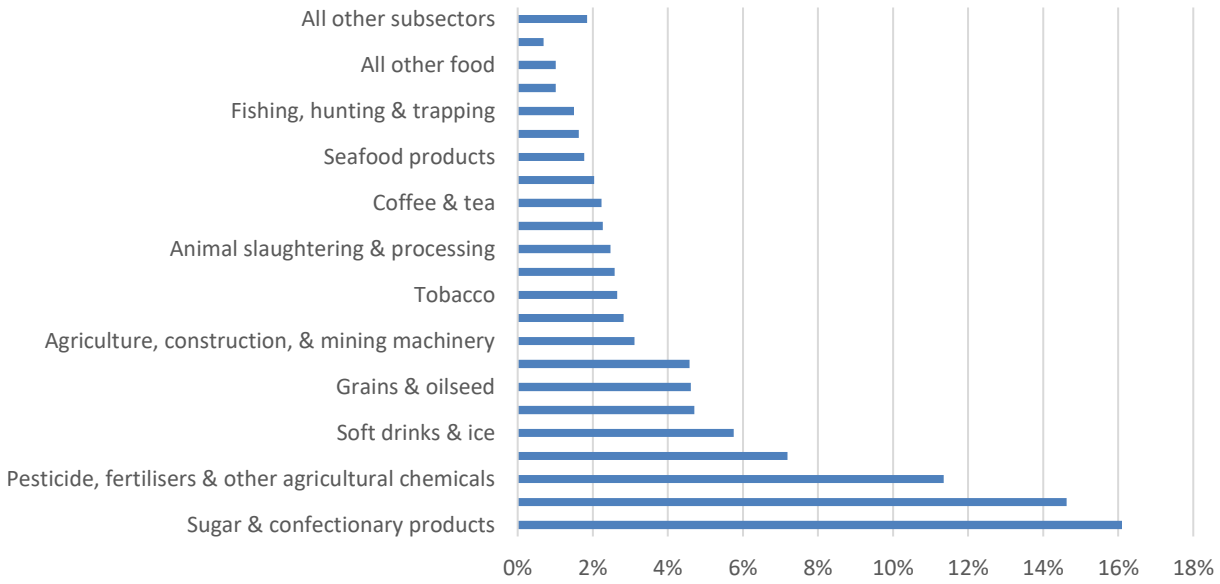

Figure A1: Share of jobs directly created through FDI in different subsectors 2003-2017

Table A3: Determinants of food and agriculture FDI (excluding fertilizer): first-differenced estimator

	Logarithm of FDI volume		Number of FDI projects	
	2008-2012	2013-2017	2008-2012	2013-2017
	(1)	(2)	(3)	(4)
Δ Logarithm of GDP per capita	5.335	0.768	17.48**	-0.355
	(3.175)	(2.503)	(7.410)	(4.579)
Δ Population	0.0147	-0.0644	0.305	-0.125
	(0.0989)	(0.0851)	(0.231)	(0.156)
Δ Agricultural land	-0.00887	0.204*	0.725***	0.429*
	(0.0842)	(0.120)	(0.196)	(0.220)
Δ Access to electricity	0.119*	-0.117	-0.0444	0.0972
	(0.0635)	(0.0739)	(0.148)	(0.135)
Δ Corporate tax	0.0250	0.0672	-1.848***	0.954***
	(0.218)	(0.190)	(0.508)	(0.347)
Δ Regulatory quality	-0.0286	1.460	-6.741	2.034
	(1.852)	(1.874)	(4.322)	(3.429)
Observations	48	49	48	49
R-squared	0.298	0.216	0.504	0.186

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A4: Overview over the empirical papers reviewed in section 5

Publication	Country	Sector	Type of investment, investor and size of investment	Aspects covered	Research Methodology
Abdul-Razak, Donkor, and Yeboah 2015)	Ghana	Horticulture (mango)	Organic Mango Outgrower Scheme (OMOS); Integrated Tamale Fruit Company (ITFC); nucleus organic mango farm covers160 hectares, outgrowers additional	Income effects, access to technology and finance, accessibility of inputs, infrastructure and water availability, ecological impacts, social capital and community welfare	Survey among 158 scheme participating farmers; 10 key informant interviews; descriptive statistics
Bellemare (2012)	Madagascar	Horticulture and grains	Lecofruit, Sodexo, Hasyma; Malto, Sila, Star, Tiko, Other	Income effects (gender-disaggregated)	Survey among 1200 households, half of which are participants in contract farming, covering 1301 contracts; contingent valuation experiment, IV estimation
Elepu and Nalukenge (2009)	Uganda	Horticulture and grains (sorghum, sunflower, rice)	Nile Breweries Limited (NBL), Mukwano Industries Limited, Tilda (U) Limited	Income effects, access to technology and finance, production and marketing risks, skill development, ecological impacts	Data from 246 sorghum farmers, 197 sunflower farmers, 242 rice farmers; informal interviews; descriptive statistics and non-parametric tests
Depetris Chauvin and Porto (2010)	Zambia, Malawi, Burkina Faso, Cote d'Ivoire, Benin, Uganda, Rwanda, Cote d'Ivoire, Malawi, Ghana	Horticulture, tropical beverages (cotton, coffee, cocoa, tobacco)		Institutional arrangements (level of competition), income effects (gender-disaggregated)	Data from of 12 case studies (household surveys), game theory model of supply chains used for simulations; first order effect approach

Publication	Country	Sector	Type of investment, investor and size of investment	Aspects covered	Research Methodology
Freguin-Gresh, D'Haese, and Anseeuw (2012)	South Africa	Different sectors		Access to technology and finance	Data from 110 households (contract farmers and others), 40 complementary interviews among selected households, 36 complementary questionnaires among farmers engaged in contracts, 239 additional short questionnaires; qualitative data analysis and econometric approach (probit model and other estimation techniques)
Getahun (2016)	Ethiopia	Horticulture (flower farms)		Wage income and rural employment, intra-household inequality and bargaining power, gender	Survey data from 664 households with women workers and a control group of 182 households; different estimation techniques, DID, Focus group discussions with working women and their husbands
Maertens, Minten, and Swinnen (2012)	Madagascar, Senegal	Horticulture (green beans, tomatoes)		Income effects, spillover effects, Wage income and rural employment, intra-household inequality and bargaining power	Survey data from 200 contract-farming households in Madagascar (vegetable producers), 450 households in Senegal (bean producers), 300 households in the Senegal (tomato producers)
Maertens and Swinnen (2006)	Senegal	Horticulture		Wage income, rural employment	Data from interviews with exporting companies, household survey covering 300 households, interviews with key horticulture institutions; econometric analysis using a treatment effect model
McCulloch and Ota (2002)	Kenya	Horticulture		Labor and income effects	Survey data from 263 households in rural and urban Kenya, packhouse and non-packhouse workers; descriptive statistics

Publication	Country	Sector	Type of investment, investor and size of investment	Aspects covered	Research Methodology
Minten, Randrianarison, and Swinnen (2009)	Madagascar	Horticulture (french beans)	Lecofruit	Accessibility of inputs, output prices and stability of output prices, spillover effect, institutional arrangements	Data from interviews at various levels of supply chain (processing and marketing level, supplier and farm households), survey of 200 contract farmers; descriptive statistics
Mwambi et al. (2013)	Kenya	Horticulture (avocado)	Avocado Growers Association of Kenya (AGAK)	Income effects, spillover effects	Survey data from 100 smallholder avocado farmers, incl. control group; propensity score matching technique
Wambui Muriithi (2014)	Kenya	Horticulture		Income effects	Panel data from 539 vegetable producer households (incl. control group); multinomial logit model and a two-stage panel data model
Benin and Walusimbi (2004)	Uganda	Palm oil	Bidco Oil Refineries Limited (30 000 ha of land for 25 years)	Institutional arrangements, political attention	Data obtained from Uganda oilseed producers and processors association (UOSPA) on prices, producers etc.; partial market equilibrium analysis
Väth and Kirk (2011)	Ghana	Palm oil	Oil Palm (Ghana Oil Palm Development Company (GOPDC)	Access to technology and finance	Data from a household survey with 1388 participants (plantation workers, smallholders, outgrowers and independent farmers)
Bolwig, Gibbon, and Jones (2009)	Uganda	Tropical beverages (coffee)	Sipi Arabica Scheme, operated by Kawacom Ltd., Acom Agroindustrial Corporation	Income effects, skill development, output prices and stability of output prices	Data from household survey with scheme participants (and control group); Heckman selection model, FIML selection model
Jones and Gibbon (2011)	Uganda	Tropical beverages (cocoa)	Esco (U) Limited	Income effects, spillover effects	Data from household survey of certified organic farmers and noncertified farmers; different econometric estimation techniques
Getaneh and Bekabil (2008)	Ethiopia	Grains (wheat)	Guder Agro-industry Private Limited	Institutional arrangements, income effects	Data from 120 farmers (incl. control group); treatment effect censored regression model

Publication	Country	Sector	Type of investment, investor and size of investment	Aspects covered	Research Methodology
van Wijk and Kwakkenbos (2012)	Uganda, Sierra Leone, Ghana, Zambia	Grains (sorghum)	Heineken (Neatherland), Guiness (Diageo UK), SABMiller (UK), West African Sorghum Chain Development (WASCD) Project	Skill development, accessibility of inputs, output prices and stability of output prices	Interviews with 41 persons 37 of the most important stakeholder organizations that were involved in any of the five cases; qualitative analysis
Rao, Brümmer and Qaim (2010)	Kenya	Vegetables		Production Technology and Technical Efficiency	Data from 402 farmers – 133 supermarket suppliers and 269 supplying vegetables to traditional markets. Structured questionnaire, meta-frontier approach and propensity score matching
Anderson, Chege, Rao and Qaim (2015)	Kenya	Vegetables			Sample of 336 households, Panel data
Chege, Anderson and Qaim (2015)	Kenya	Vegetables		Incomes, dietary quality, gender aspects	384 farm households, use of structured questionnaires. Simultaneous equation models
English, Jaffee and Okello (2004)	Kenya	Horticulture	Danish 6000 ha investment by Dansk Chrysanthemum and Kultur (DCK). Oserian Development Company from Netherlands Njoro Canners (NC) Kenya Canners (KC	Income effects	Survey of packhouse workers and non-packhouse workers living in the same residential areas of Nairobi, workers on farms owned by exporters, workers on large commercial farms, smallholders engaged in horticulture, and non-horticulture smallholders farming in the same region
Neven, Odera and Reardon (2009)	Kenya	Horticulture		Access to supermarkets channels, income of farmers	Two set of surveys; 115 Farmers (49 supermarket channel and 66 traditional channel); 51 farmers (14 supermarket channel, 37 traditional channel farmers); qualitative interviews

Publication	Country	Sector	Type of investment, investor and size of investment	Aspects covered	Research Methodology
Ahlerup and Tengstam (2015)	Zambia			Wage income	7000 smallholder farmers households
Herrman and Grote (2015)	Malawi	Sugar	EU and Afdb Funded outgrowers	Income and poverty of households	Household survey, qualitative interviews,325 outgrowers, 325 non participating households
Masakure and Henson (2005)	Zimbabwe	Non-traditional vegetables	Horticultural Promotion Council (HPC) with support from USAID. 141 small holder schemes, 8460 hectares, Hortico Agrisystems, 4000 small scale producers	Motivations to participate in contract farming as a small holder farmer, income	Exploratory interview, 40 in-depth-interview, in-depth and personal interviews with a sample of 300 contracting producers

Table A5: Data sources: country level analysis

Variable	Data source
GDP per capita	World Development Indicators (WorldBank); https://data.worldbank.org/; accessed 5.3.2018
Population size	World Development Indicators (WorldBank); https://data.worldbank.org/; accessed 5.3.2018
Productivity per worker	World Development Indicators (WorldBank); https://data.worldbank.org/; accessed 5.3.2018
Agricultural land	World Development Indicators (WorldBank); https://data.worldbank.org/; accessed 5.3.2018
Access to electricity	World Development Indicators (WorldBank); https://data.worldbank.org/; accessed 5.3.2018
Number of ports	http://www.worldportsource.com/countries.php; accessed 20.4.2018
Corporate tax	Compiled based on reports from KPMG and E&Y
Regulatory quality	World Governance Indicators; http://info.worldbank.org/governance/WGI/#home; accessed 20.4.2018

Table A6: Data sources: spatial pixel level analysis

Variable	Data source
Population density	CIESIN Gridded Population of the World (GPW), v4 http://sedac.ciesin.columbia.edu/data/set/gpw-v4-population-density-rev10
Education, men	N Graetz et al. (2018); doi:10.1038/nature25761; https://www.nature.com/articles/nature25761; http://ghdx.healthdata.org/record/africa-educational-attainment-geospatial-estimates-2000-2015
Education, women	N Graetz et al. (2018); doi:10.1038/nature25761; https://www.nature.com/articles/nature25761; http://ghdx.healthdata.org/record/africa-educational-attainment-geospatial-estimates-2000-2015
Health index	Public health index (2010) - ClimAfrica WP4; http://www.fao.org/geonetwork/srv/en/main.home
Accessibility	D.J. Weiss et al. (2018); doi:10.1038/nature25181; https://www.nature.com/articles/nature25181; https://map.ox.ac.uk/research-project/accessibility_to_cities/
Conflict fatalities	Acled; https://www.acleddata.com/
Agroecological zones	Harvest Choice (2019); https://harvestchoice.org/maps/agro-ecological-zones-sub-saharan-africa

[i] Note that according to FAO terminology (cf. AGROVOC Multilingual Thesaurus), the alternative terms for the food and agriculture sector include 'agribusiness' and 'agroindustrial sector'. In this paper, following the classification adopted in our dataset, we additionally use the term 'food and beverages cluster'. The fDi dataset we analyze in part 3 of the paper uses the cluster approach to separate investments in the food and agriculture sector from investments in other industries while the term food and agriculture sector is used in most other studies in the field. As we frequently refer to both, the fDi data and other studies, we use both terms interchangeably.

[ii] http://www.bmz.de/en/countries_regions/marshall_plan_with_africa/index.html, accessed 8.9.2017

[iii] https://www.compactwithafrica.org/content/compactwithafrica/home.html, accessed 8.9.2017

[iv] https://www.new-alliance.org/, accessed 8.9.2017

[v] In the context of both initiatives, the definition of agriculture covers what we refer to as food and agriculture sector in this paper.

[vi] https://www.growafrica.com/, accessed 8.9.2017

[vii] Here, agriculture is understood as crops, livestock, aquaculture and agroforestry (FAO, 2012).

[viii] The total accumulated investment by farmers worldwide, as measured by the value of agricultural capital stock, was estimated at $5 trillion in 2012 (FAO, 2012).

[ix] https://www.fdimarkets.com/; accessed 12.1.2018

[x] We start our review with papers analyzing data collected in the year 2000 or later to pick up from where other studies left off, e.g. Porter and Phillips-Howard (1997) or Glover and Kusterer (1990). Furthermore, around the year 2000, Structural Adjustment Programs (SAPs) that forcibly opened the doors to private investments in many African countries were transformed and became increasingly focused on poverty reduction. While the comparison of investments under SAPs versus under Poverty Reduction Strategy Papers is not our task in this paper, we want to limit our analysis of impacts of private-sector investments under the new regime.

[xi] Actually, the dataset contains data for the food, beverages and tobacco cluster. The total amount invested in this cluster sums up to $49.320 billion. Out of this amount, $584 million, about 1% of the total agricultural FDI inflow, was invested in tobacco production. As tobacco does not directly contribute to food and nutrition security, we leave it out and concentrate on the agricultural value chains of food and beverages only.

[xii] Taking into account their relatively small share, we didn't further differentiate between pesticides and other agro-chemicals.

[xiii] Formally, the investing company is Biopalm Energy Ltd registered in Singapore, and operating as a subsidiary of Siva Group.

[xiv] The latest update dates back to 2014 and refers to a demarcation process of 3,348 ha and 21,552 ha for two pilot plantation sites (information extracted from Biopalm Energy Ltd letter to Greenpeace). The Memorandum of Understanding signed with the government of Cameroon in 2011 stipulated that the project would entail 200,000 ha concession.

[xv] In this paper, we do not aim at assessing the Grow Africa impacts other than on investment volumes. Note, however, that critical points have been raised, especially regarding the impacts on smallholder farmers and food security (e.g. De Schutter, 2015; Global Justice Now, 2015; Bergius, 2015).

[xvi] https://www.growafrica.com/news/23-billion-invested-grow-africa-partners-between-2013-and-2015-500-million-invested-2015, accessed 23.1.2019

[xvii] We take the firm value measured by market capitalization as reported by the companies on their websites on 25th of September 2017. The ten largest companies participating in the Grow Africa initiative are: Nestle, SAB-Miller (Anheuser-Busch), The Coca-Cola Company, Unilever, (Dow) DuPont, Bayer CropScience AG, Heineken, Diageo Plc, Vodafone and Monsanto.

[xviii] https://www.growafrica.com/organisations/loi-organisations, accessed 5.10.2017. Note that this information is not available anymore on the Grow Africa website (as per January 2019).

[xix] Diageo, SAB-Miller, The Coca-Cola Company, Heineken, Olam International and Nestle (cf. Table 1 on p.19). The single biggest investor, Siva Group, did not participate in the Grow Africa process.

[xx] Note that The Coca-Cola Company did not specify the amount of its pledged investment in its LOIs.

[xxi] Note that the classification adopted in the fDi Markets dataset differs from the standard classification of the UNCTAD or the OECD datasets.

[xxii] In fDi Markets classification: manufacturing.

[xxiii] By locating investment projects, we mean finding their (relatively) exact position within a country. Amongst the projects whose destination could not be determined, there seems to be no systematic bias in terms of size or subsector; about 10% of the this invested capital is in the dairy products subsector, another 8% in the grains and oilseeds subsector and about 7% in the fruits, vegetables and specialist foods subsector. In general, the shares are comparable to the ones for projects that could be located (see A1 in the Appendix). The same applies when comparing the business activities of the investments projects that could be located and those that could not (see Table A2 in the Appendix).

[xxiv] Using the labor force rather than the total population would be preferred; however, the recent data on labor force was not consistent for African countries.

[xxv] This number refers to the parent companies. Counting subsidiaries, this amounts to 384 different companies.

[xxvi] It would be more straightforward to use the poverty rate; however, to our knowledge, no georeferenced dataset on poverty rate exists.

[xxvii] Investments flowing into areas for which no stunting level is provided are left out of the analysis, as ArcMap stores this data as missing values and does not include it in the classification.

[xxviii] Also, even once the projects are being implemented, the number of jobs created might fluctuate depending on the implementation phase.

[xxix] We exclude investments in the pesticides, fertilizer and other agro-chemical subsector, as these investments are extremely capital intensive and can thus be expected to have much higher capital-labor ratios than investments in other subsectors (see e.g. Gregory and Bumb, 2006; IFC, 2013).

[xxx] Induced effects refer to the final demand due to households re-spending the money they have earned in the economy.

[xxxi] The following subsectors are grouped under food processing: bakeries & tortillas, seasoning & dressing, animal slaughtering & processing, sugar & confectionary products, all other food, seafood products, snack food. All other subsectors are assigned to the industry division.

[xxxii] Iyanda (1999) estimates multipliers for FDIs in Namibia but the method used is unclear. Using input-output tables, Stilwell et al. (2000) calculate employment multipliers for South Africa and arrive at values of between 4 and 5.5 indirect jobs per job directly created but their numbers are only applicable to the mining sector and the authors indicate that employment impacts are considerably higher for the agricultural sector but they do not provide numbers on this sector.

[xxxiii] FAOSTAT only provides data on fertilizer production until 2002. Therefore, we cannot compare production levels before and after 2003, i.e. the time span for which we have the investment data.

[xxxiv] Morocco is the largest producer of phosphatic fertilizers in Africa and is the sixth largest producer worldwide. Tunisia, Algeria, and Egypt are producers of both phosphates and nitrogen fertilizers. The same applies to South Africa where significant phosphate rock deposits are found and the production of phosphate and nitrogen fertilizers is well established (Gregory and Bumb, 2006).

[xxxv] In the analysis, we also use the number of FDI projects as a dependent variable.

[xxxvi] The excluded countries are the following: Eritrea, Libya, Niger, Seychelles and Somalia.

[xxxvii] Note that in what follows, all the results refer to FDI inflows in the food and agriculture sector only, even if not specified.

[xxxviii] Bear in mind that since, as noted in section 2.2, our dependent variable, i.e. FDI volume, reflects investment intention, and not investment implementation, we can safely exclude the potential problem of reverse causality between FDI and GDP per capita.

[xxxix] Results are not reported.

[xl] Note that the number of observations is now lower due to the fact that we had to exclude islands in order to compute the Spatial Contiguity Matrix.

[xli] Emongor and Kirsten (2009) report similar findings for Zambia but do not control for self-selection at this point of their analysis. Therefore, their results might be blurred and are therefore not reported in detail here.

[xlii] The meta-technology ratio is the ratio of output for the frontier production function for a certain unit in the sample relative to the potential output defined by the meta-frontier function, given the observed inputs. A meta-production function in this case is an envelope of neoclassical production functions, assuming that farmers in supermarket and traditional channels are operating under different production technologies, which are represented in the form of group-specific frontiers. Estimating a meta-frontier model allows for the

estimation of technology gaps for producers under different technologies relative to the potential technology available to the industry as a whole and facilitates the interpretation efficiency scores by decomposing them into group-specific efficiency and technology differences (Battese et al., 2004; Hayami and Ruttan, 1985; cited from Rao et al., 2012).

[xliii] The exchange rate was 655.49 FCFA/Euro at the time of the study.

[xliv] The authors focus specifically on the literature on contract farming. However, their conclusions apply to all the literature we cover here.